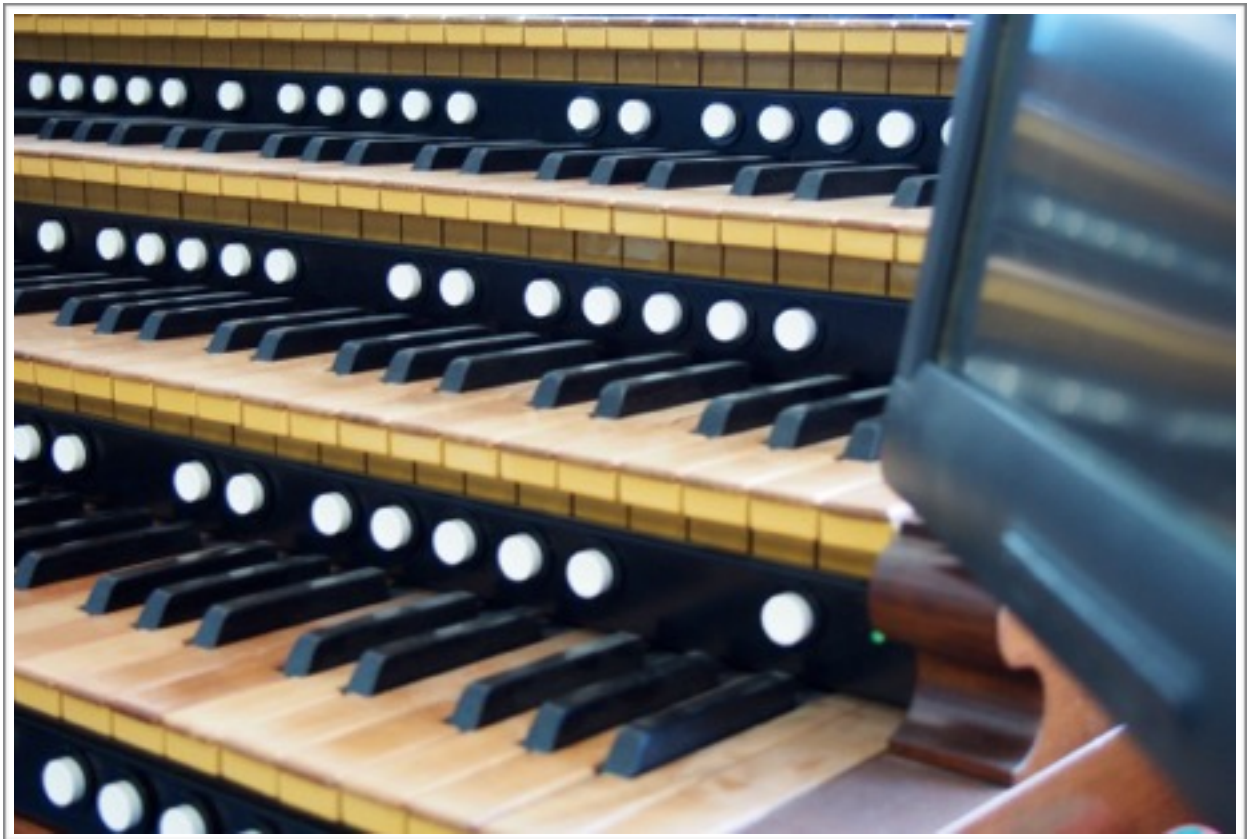


# Hauptwerk Explained

*A guide to understanding and getting started in the world of Hauptwerk*



Darryl Lee Wood from [MIDIWorks.ca](http://MIDIWorks.ca)

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*1st edition*

# Table of Contents

Introduction .....	5
Acknowledgements .....	5
What is Hauptwerk? .....	6
The Big Picture .....	6
How is Hauptwerk Different from Other Electronic Organ Technologies? ..	6
The Parts of a Hauptwerk System .....	8
The Computer.....	8
Hauptwerk.....	9
Hauptwerk USB License Dongle .....	9
Sample Sets .....	10
Keyboards, Pedalboards, Touch Screens and other control surfaces .....	10
Audio Cards.....	10
Amps and Speakers .....	11
MIDI Interfaces.....	11
Trying Out Hauptwerk .....	13
What do you need to try out Hauptwerk for yourself? .....	13
Step by Step Instructions .....	13
The Hauptwerk Ecosystem .....	20
Hauptwerk Corporate .....	20
Sample Set Makers.....	20
Contrebombarde.com .....	21
Ready to Go Parts Manufacturers.....	22
Scanner Board Manufacturers .....	22
Full Hauptwerk Console Manufacturers.....	22

Traditional Digital Organ Manufacturers.....	23
Pipe Organ Techs .....	23
Pipe Organ Manufacturers.....	24
Pipe Organ Parts Manufacturers.....	24
Pro Audio Retailers .....	24
Computer Stores .....	24
Hauptwerk Gurus.....	25
Other Organists.....	25
Other Hauptwerk Users .....	25
Is What I've Got Now Useful? .....	27
MIDI Keyboards.....	27
Wooden Keyboards .....	28
Pedalboards .....	29
Benches.....	30
Tables .....	30
Computers.....	30
Touch Screens .....	32
Speakers .....	32
Amplifiers .....	33
Console to Refurbish.....	34
Pistons, Solenoids and Other Bits .....	34
Planning Your Ideal Instrument.....	35
Pre-Fab .....	35
Building From Parts.....	35
The Computer.....	36
The Rest Of Your Console .....	38
Audio Cards (a.k.a audio interfaces or audio converters).....	39

Amplifiers .....	39
Speakers.....	39
Touch Screens .....	40
Draw Knobs and Tabs .....	40
Just so that we understand each other... a Glossary .....	42

# Introduction

I have been working in the virtual organ world since 2006. When I came to Classic Organ Works, they were mostly focused on building high-end pipe organ control systems. MIDIWorks was a very small portion of the business. I arrived with my recording studio background, saw Hauptwerk and said “now this stuff I understand; Recording interfaces, VST Audio, Software instruments... I can work with this”. Then Brett Milan showed me an early demo version of his Notre Dame de Metz set and I was hooked.

Since that time, I have helped hundreds of people (if not in the thousands) build Hauptwerk-based instruments for themselves. I’ve put Hauptwerk on the world stage in front of 50,000 people and a worldwide television audience and in the spare room of a guy who had been hauling a console shell around for 25 years. The book is then from the perspective of someone who gets to make people’s dreams come true for a living.

The purpose of this book is to explain Hauptwerk to the newbie, Explain the roles of the different components, How to assess what you already have at your disposal, How to set a plan of action for building an instrument. How to do a basic setup to test Hauptwerk out for yourself and remove the fear of setting up an instrument.

## Acknowledgements

Thanks to Erik Simmons, Angelina Oh, Rob Stefanussen and Raymond Garcia for their help in proofreading and suggesting helpful revisions.

# What is Hauptwerk?

## The Big Picture

If you've just stumbled upon this whole "Hauptwerk" thing, it can be somewhat confusing. Often the descriptions of it given by people trying to wrap their heads around the concept (and its implementation) can be even more confusing.

Hauptwerk is a software package, for Mac or PC, that facilitates the playback of sample sets (A.K.A. groups of pipe organ audio samples) taken from real and historic pipe organs. Hauptwerk acts as a host to an unlimited number of sample sets.

One of the features that distinguishes Hauptwerk from most other organ technologies is that its focus is to virtually recreate specific organs from a specific location. The idea is to give the user the experience of sitting at the console of that specific instrument and hearing what you play come from that instrument. Sample sets are named after the church or venue that houses the organ.

For example, where most digital organs might have "an English organ" or a "French organ", Hauptwerk sample sets will be called "1877 Salisbury Cathedral Willis" or "Organ of the St. Etienne Abbey in Caen".

To learn more about Hauptwerk's history visit <https://en.wikipedia.org/wiki/Hauptwerk>

## How is Hauptwerk Different from Other Electronic Organ Technologies?

From an overview, not much is different between a Hauptwerk instrument and a Digital instrument. You still use keyboards, pedalboards, expression shoes and pistons. Stops can still be selected using physical draw knobs or tabs. The electronics still have sampled or modelled pipe sounds that play back through amps and speakers.

However, the similarities end there like they would if you compared a Chevette and a Ferrari by saying that both have 4 wheels, seats and a steering wheel. What's under the hood

matters a great deal as well as the manufacturer's attention to detail. They do have a similar function but they are very different in many ways.

Because Hauptwerk is software, it has the ability to take on new capabilities and organ sample sets as developers create them. Also because it's software, the user has the ability to choose the capability of the computer hardware that runs Hauptwerk.

As a side note, whether you know it or not, your current digital organ also runs on a computer. It's just that the one in your console is not as apparent, as it is with Hauptwerk, because it's not a personal computer.

Normally, if you purchase a traditional digital console, the sounds and combination action is fixed and unchangeable. You are also perpetually confined to fixed number of physical coupler, stop, and piston switches. You would also be limited to the same number of manuals as when you purchased the console.

However, with Hauptwerk as the engine for your instrument, there are no more of these kind of limitations. All you need to do is to change your hardware to match the sample set and the limitation is gone.

If, however, you do manage to find a limitation, chances are it won't be long before it too is gone.

# The Parts of a Hauptwerk System

So, what are all of the parts of a Hauptwerk instrument and how do they work together?

- Computer
- Hauptwerk Software
- USB License dongle
- Sample set(s)
- Keyboards, Pedalboards, Touch Screens and Other Control Surface Equipment
- Audio Interface/Sound Card
- Amplifier
- Speakers

## The Computer

**The Computer** is probably the most distinctive and exciting aspects of a Hauptwerk instrument when compared to any digital organ you may have interacted with. Those traditional digital organs run on embedded computers that are rarely seen unless you open up the back of the console. Hauptwerk instruments, in stark contrast, run on regular, Windows PCs or Apple home computers.

Depending on your own relationship with computers, this detail with either excite you or scare you.

If you can start your own computer, install software on a computer, know what a USB port is and can figure out how many USB ports are on your computer, know how to plug a monitor into your computer, know that rebooting fixes the majority of things that “just stopped working”, you should have little to no problems setting up a Hauptwerk system. You will probably have a few questions, but there are more than enough people around willing to answer your questions. Your options for customization and for upgrading components is virtually unlimited.

If computers are the terrifying unknown to you, don't despair. You can still have a Hauptwerk based instrument. You just need a dedicated resource person who can set it up for you and guide you when things confuse you. If you don't have someone who will do this for you, there are



people you can hire to do it for you and some companies who supply consoles ready made for people such as yourself. What you sacrifice in customization and upgradability, you gain in peace of mind.

If you still plan to try it on your own, you should also consider purchasing a Mac, rather than a Windows computer, because realtime audio applications are easier to set up and troubleshoot on a Mac.

The computer functions kind of like the building for a factory. The building (computer) provides the place for stuff to get done. It has the docks where raw materials come in and finished goods come out of (USB ports, Firewire ports, video ports etc). It has to have enough warehouse space to store what it needs to store (RAM, hard drive space).

## Hauptwerk

If the computer is like the factory building, Hauptwerk is the company that occupies the building. It fills up the warehouse space with audio files. It makes sure that orders are routed to the right docks and customers. It makes sure that everything is processed quickly and properly.

## Hauptwerk USB License Dongle

The small, currently blue, USB license dongle stores the user's unique authorization to use Hauptwerk's various features. It also stores the authorization to use many of the different sample sets that a Hauptwerk user can purchase.

Each time Hauptwerk is started up, it looks for the dongle. If it's plugged into the USB port, and it holds one or more licenses, it will start Hauptwerk. If it looks for the dongle and it's missing or doesn't contain any license, it will either allow you to use the Free version or give you the choice of evaluating the Basic Edition or the Advanced Edition of Hauptwerk.

When you purchase a license for the right to use Hauptwerk or any sample sets, make sure you update the license dongle according to the manufacturer's instructions.

If your dongle license is not updated for the version of Hauptwerk you are running, you will hear a “chime” every 15 seconds. If the license for the sample set has not been added to the dongle, you will not be able to load the sample set.

## Sample Sets

These are the raw material that fill the warehouse space. They are the many individual pipe samples that get stored in the warehouse area of the factory. When the computer (factory) is shut down, all of the parts are kept in storage. When the factory is open, the parts are being used in the machinery of the factory.

## Keyboards, Pedalboards, Touch Screens and other control surfaces

These send the orders to the factory. They tell the company (software) what to do with the raw materials (audio samples) in the warehouse. The company then starts to process the order for shipping. When you press a key, these devices use a language called “MIDI” to send the orders. “MIDI” stands for “Musical Instrument Digital Interface”.

Just as orders themselves are not the same as the product that is shipped by the company, MIDI is not the same as Audio. MIDI only tells the factory what audio files to process.

To learn more about MIDI in depth check out "[I Want A MIDI" - Clarifying MIDI Misconceptions](#)" and "[Clarifying MIDI Misconceptions - Pt II](#)"

## Audio Cards

When goods come out of the company warehouse, they need to be processed in order to turn them into something that can be shipped to the customer. What comes out of this warehouse are the 1s and 0s that make up a digital audio file. What processes those 1s and 0s into a product (an analogue audio signal) that the amps and speakers (shipping company) can use is the audio card. This processor area can be inside the main factory (an internal sound card) or it can be housed in a separate building (an external sound card).

## Amps and Speakers

The job of the amps and speakers are to get the processed audio files to where you can interact with them by hearing them. In this whole factory analogy, they are kind of like the shipping company, who delivers the product and the store where you the product is displayed and picked up.

## MIDI Interfaces

Somehow, the “MIDI” orders talked about in the “Keyboard, Pedalboards, touchscreen and other control surfaces” section has to get into the computer (... or factory).

There are different ways for MIDI instructions to get from your control surfaces into the computer. How the MIDI gets into the computer depends a lot on the MIDI devices themselves.

Some MIDI devices have built-in MIDI interfaces and can plug directly into the computer by a USB cable. In the factory analogy, it would be like someone phoning in an order.

Some devices do not have MIDI interfaces built in. They only have 5-pin MIDI jacks on them. So they need a way to transmit the MIDI messages into the computer. In these cases, they need a MIDI interface to translate and transport the MIDI signals into the computer.

Sometimes the MIDI interface is a standalone device that plugs into a USB port on the computer. This is like having the orders delivered by courier through the factory front door at reception.

Sometimes, the MIDI interface is built into the audio card. This is like the courier company delivering the orders to the shipping/receiving docks in the separate building that does the audio processing.

Any of these ways of delivering MIDI “orders” is fine.

It's also ok if they come in different ways all at once. You can have one order come in at reception and another order come via courier at the delivery docs. All that matters is that the orders get there.

# Trying Out Hauptwerk

## What do you need to try out Hauptwerk for yourself?

- A Mac running OS X 10.7+ or PC running Windows 7+ with at least 2GB of RAM.
- A MIDI keyboard that connects to the computer by USB or a regular MIDI keyboard and a MIDI to USB interface (e.g a MIDISport 1x1)
- A USB cable
- A MIDI cable (if needed to connect the MIDI keyboard to the MIDI interface)
- Something to listen to Hauptwerk with; a great set of headphones or some computer speakers of some sort.
- Download Hauptwerk at [www.downloadhauptwerk.com](http://www.downloadhauptwerk.com). Download the “Full Installer”.

Note: These computer requirements are the bare minimum so that we can test Hauptwerk out for yourself. If your computer exceeds these requirements, so much the better. Once you show yourself that its possible for you to get a sound out of your computer, you will feel much better about building your own instrument.

## Step by Step Instructions

### *Step 1*

Download the “Full Installer” version of Hauptwerk from [www.downloadhauptwerk.com](http://www.downloadhauptwerk.com). Run the file and complete the installation. Then close Hauptwerk.

### *Step 2*

Connect your MIDI keyboard to the computer. If the keyboard plugs into the computer directly by USB, great. Do that. If it needs a MIDI interface, plug the MIDI interface into the computer and connect the MIDI Out of the keyboard to the MIDI In of the interface.

### *Step 3*

Start Hauptwerk. Since you’re just testing Hauptwerk out, you probably don’t have a license dongle. Don’t worry about that for now. You’ll see this...



Then you'll see this....



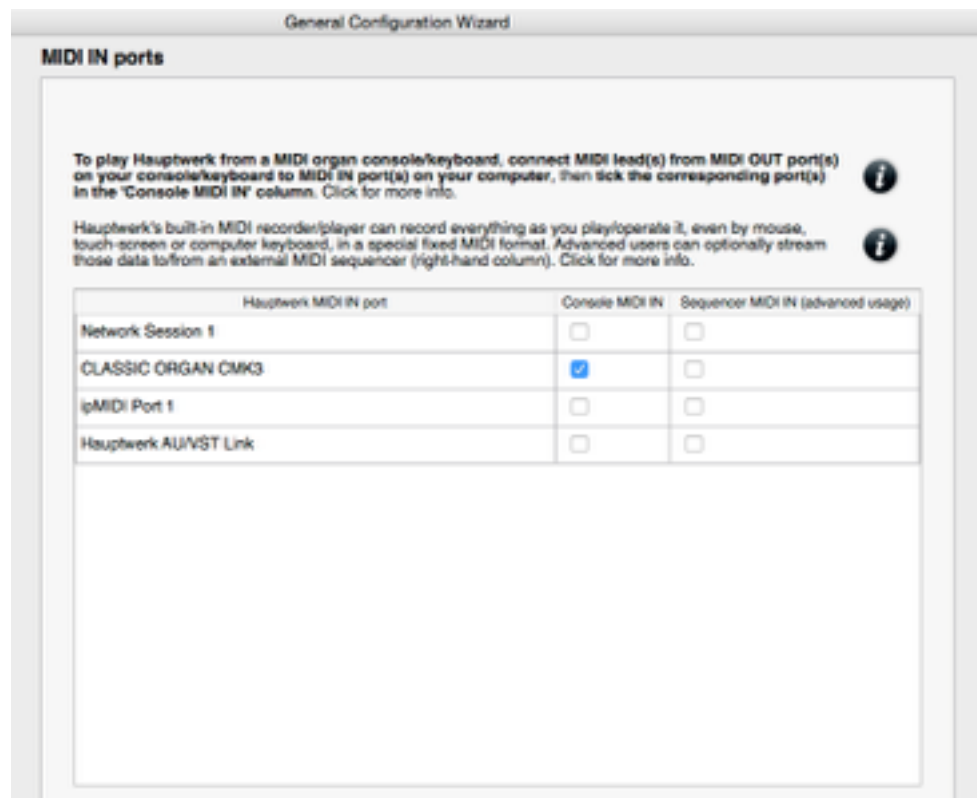
Just select the “Free Edition” and click “Continue”

The first time Hauptwerk opens it automatically opens a configuration wizard. To begin, click “Next” as instructed. Click “Next” through the “Reset settings” and “Confirm” screens that follow.

On the MIDI Ports screen, make sure your keyboard or MIDI interface is selected in the “console MIDI in” column. Here, our CMK3 Keyboard is the device we will be using.

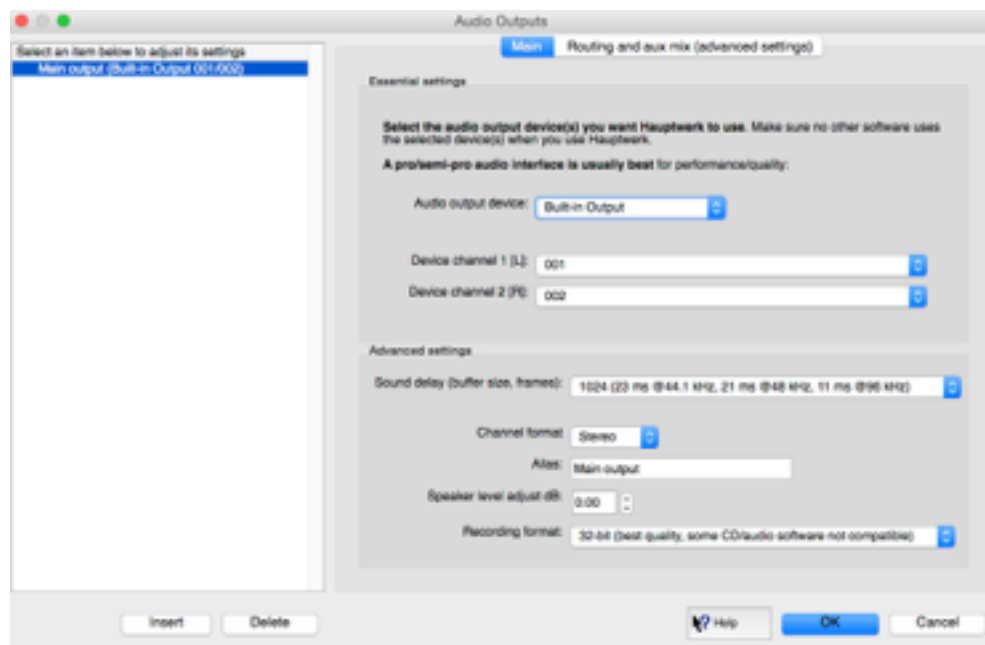
### *Step 4*

Click “Finish” on the next screen when asked.



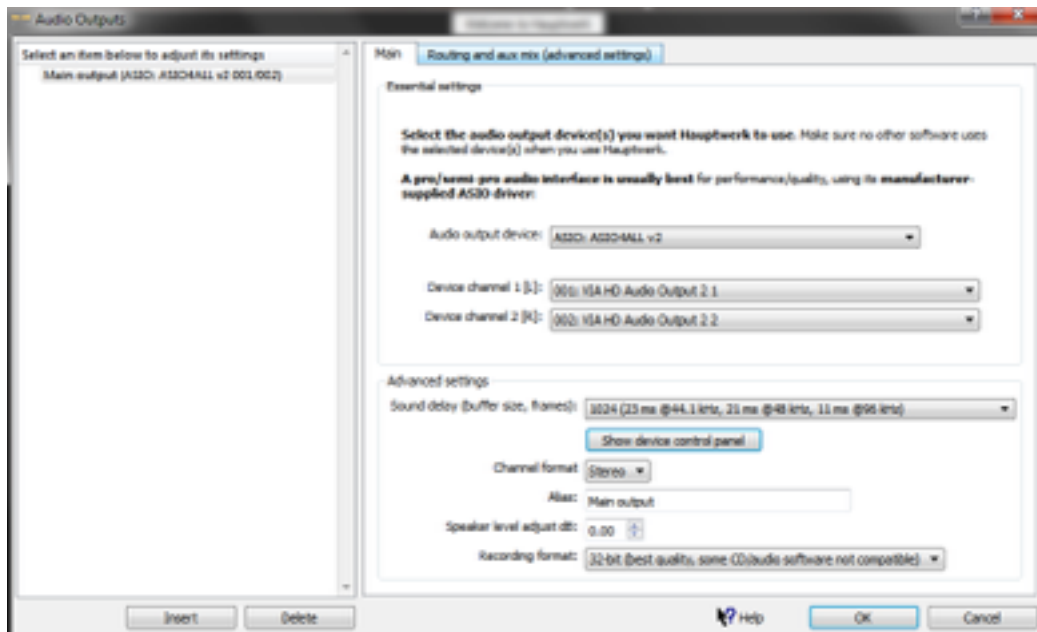
## Step 5

Next is the Audio Outputs screen. If you have a Mac, you can leave the settings as default for testing purposes. Then plug a set of headphones into the headphone jack on your Mac.



If you have another audio device, that you already use (e.g external sound card, USB audiophile preamp etc), hooked up to your Mac, you can select that device from the “Audio output device” dropdown menu. Then select the channel of that device that go to your amp or powered monitors in the “Device channel 1” and “Device channel 2” fields.

If you are using a Windows PC, you will probably have a choice of several items in the “Audio output device” dropdown menu. Look for one that has “ASIO” or “low latency” in the title. If you have not purposefully installed another audio card, chances are that all of these items refer to different software drivers for your computer’s native sound card. So, connect your headphones or audio system to the output of that card.

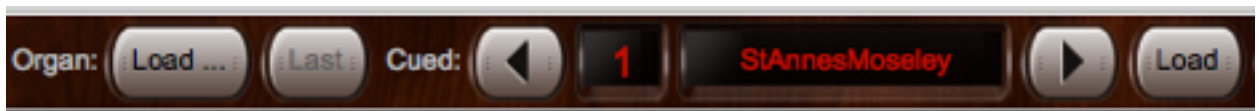


If none of the selections have either “ASIO” or “low latency” in the title, just leave the default device in the field. Again, it’s probably your computer’s default, built-in sound card. Connect headphones to that.

Once this is done, click “OK”

## Step 6

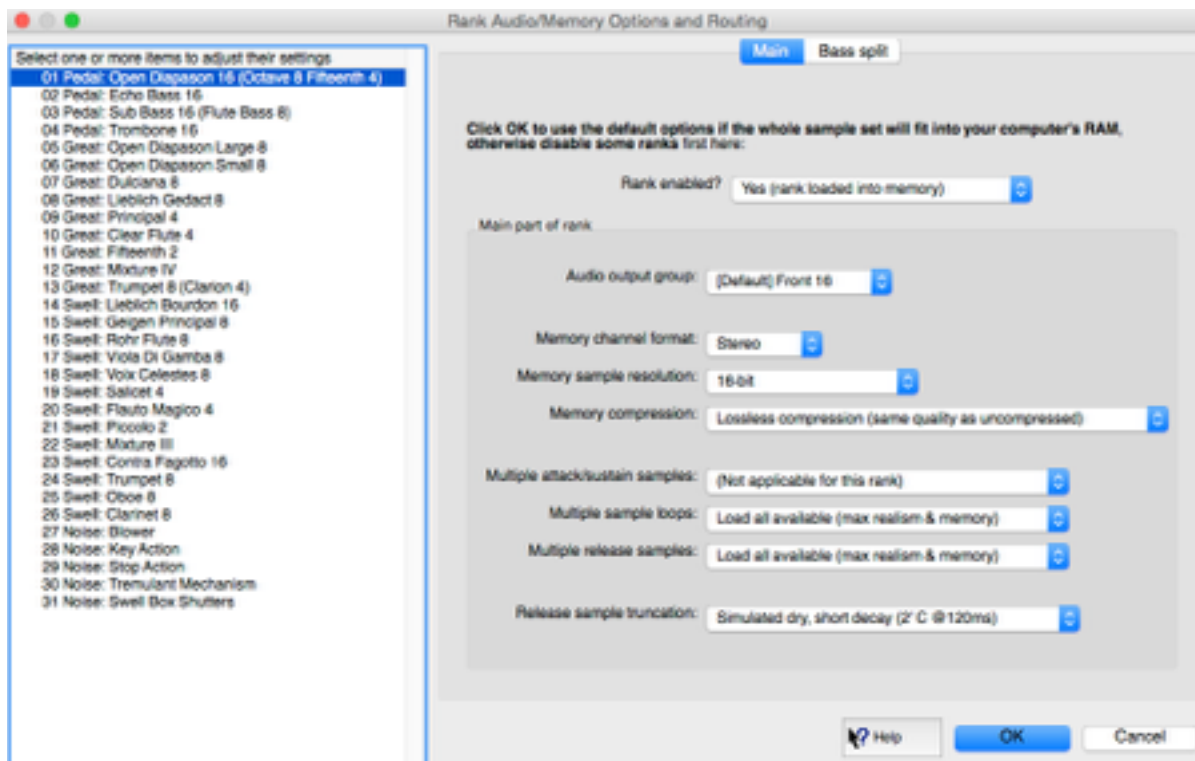
Load the St. Anne’s Moseley organ.



Click the “load” button to the **right** of the St. Anne Moseley selection at the top of the screen.



A “Rank Audio/Memory Options and Routing” screen will appear. Don’t worry about this for the moment. Click “OK”.



## Step 7

Hauptwerk will begin to cache the Hauptwerk samples. Unless you get an error message, you will get a screen that looks like this soon enough.



If you have gotten to this point, I suggest that you try Hauptwerk to see how it sounds.

Take your mouse and click on the “FF” button just under the Great manual. Then click on the keyboards with the mouse. If you’ve done things properly, you should hear some sound come out of your headphone or speakers.

If it works, and you hear sound, then move on to the next step to connect your keyboard to Hauptwerk. If you do not hear sound, go back through the steps to see what you missed.

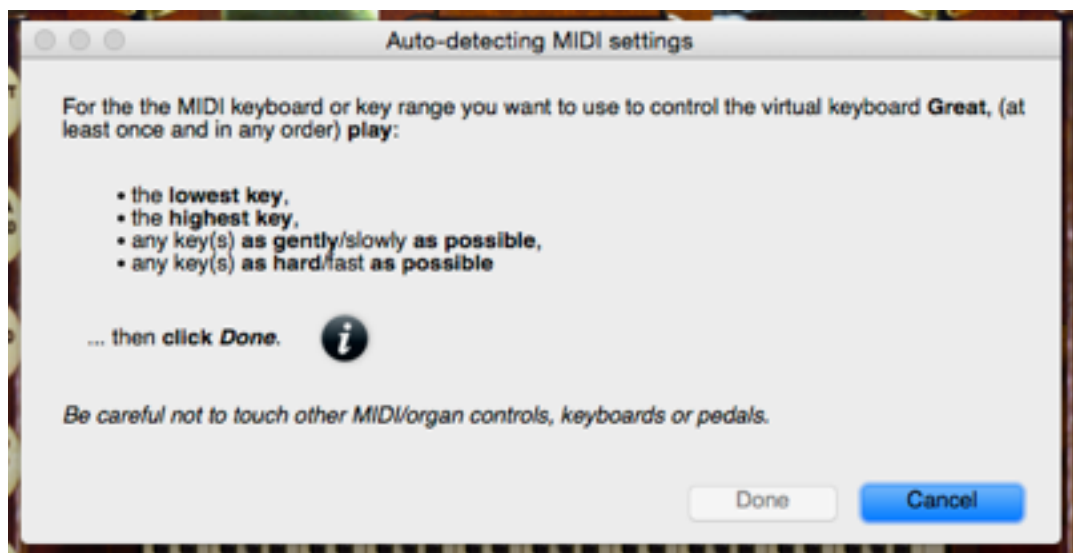
## Step 8

If you are using a PC, right-click on the Great manual on-screen. If you’re using a Mac, Control-click on the Great manual. You’ll see a pop up menu.

Select “Auto-detect MIDI/trigger settings for keyboard: Great..”



Another box will then appear. Press and release the lowest key on the keyboard. Then press and release the highest note on the keyboard. Then click “Done”



If the “Done” button does not work, then something is not right with your MIDI set up. Go back, make sure all of your devices are plugged in properly. Make sure they are all plugged in properly before you start Hauptwerk. Then check that your MIDI device is selected in the General settings > MIDI Ports > Console MIDI in column (as shown above).

If you repeat the steps and you still don’t hear sound remember the first law of engineering: “It works better when it’s plugged in”. Then remember the second law as well: It works better when it’s turned on.

## *Step 9*

You’ve done it! All by yourself! You have set up Hauptwerk on your computer. Not so bad, right?

I hope you’re feeling excited now about the possibilities open to you. Play around with Hauptwerk. Make yourself at home a bit. Auto-detect the Swell or Pedal and connect it to your keyboard as well for fun. Experiment a bit. Get ready to start thinking about what you might want in a fully functioning Hauptwerk console.

# The Hauptwerk Ecosystem

Now that you have tried Hauptwerk out for yourself, you should know what resources are available to you as you contemplate building your own instrument.

- Hauptwerk Corporate
- Sample Set Makers
- Contrebombarde
- Ready to Go Parts Manufacturers
- Scanner Board Manufacturers
- Full Hauptwerk Console Makers
- Traditional Digital Organ Manufacturers
- Organ Techs
- Pipe Organ Manufacturers
- Organ Parts Manufacturers
- Pro Audio Retailers
- Computer stores
- Other organists
- Other Hauptwerk users
- Hauptwerk Gurus for hire

## Hauptwerk Corporate

Milan Digital Audio owns the Hauptwerk brand and is the company that supports and develops the software package the we all know as “Hauptwerk”.

The [www.hauptwerk.com](http://www.hauptwerk.com) website retails the Hauptwerk software, software upgrades, and most (if not all) commercially available Hauptwerk sample sets.

It also hosts the Hauptwerk forum (<http://forum.hauptwerk.com>). The forum is the largest of it's kind to do with anything Hauptwerk related. The community is very responsive, largely courteous, knowledgable and very helpful on all matters Hauptwerk. Do your research before you ask questions but don't be afraid to ask if you're stumped. You won't be sorry and you might find a friend.

## Sample Set Makers

These are the folks who slavishly record, clip, loop, de-noise, edit, edit, edit, edit and edit, the samples to present them to you for use with Hauptwerk.

It's a thankless job really. It's done in the middle of the night, all alone, for 1000s of pipes with anywhere from 3-10 samples per pipe. I had one sample set maker tell me that he could figure out how long he'd nodded off, while holding a note, by the length of the sample.

Mostly, there is not a lot of contact with a sample set maker after a set is purchased unless you have a corrupted installation file or you are on their mailing list. However, they can be of some assistance in installing their sample set if you have no other help available.

## Contrebombarde.com

[Contrebombarde.com](http://Contrebombarde.com)'s Concert Hall was started as a bulletin board to post and share music, made using Hauptwerk, with other Hauptwerk users.

Since then, it has become the largest Hauptwerk community outside of the Hauptwerk forum with a whole lot of resources for you to tap into.

With many thousands of pieces of music uploaded, you can use it to simply listen to organ music, evaluate sample sets, compare sample sets, get registration ideas, technique, create playlists of your favourites, get feedback on your own uploads, give feedback to others, and discover new repertoire.

In addition to the music itself, Contrebombarde has a blog called "[The Barde](#)" with different categories:

- [Sample Set Spotlight](#) - In depth looks at various Hauptwerk sample sets
- [Hauptwerk Technical](#) - Technical advice articles to help you understand and better implement your Hauptwerk instrument
- [Playing and Pieces](#) - Advice on technique and highlighting certain featured uploads
- [Featured Contributors](#) - Meet some of the characters who upload music to concert hall
- [Cool Gear](#) - Product reviews for gear that are tailored to explain their impact on Hauptwerk users
- [Setup Gallery](#) - See what others have done with their Hauptwerk instruments

Other, important features at Contrebombarde

[Meet & Greet](#) - Find other Hauptwerk users and enthusiasts near you or wherever you are travelling and arrange a meeting with them.

[Organ Database](#) - Here you can browse all of the different sample sets available for Hauptwerk with links to uploads made using each instrument.

The database is searchable by builder, type, number of manuals, genre, country, and price among other things.

Live Chat and Direct Messaging - logged in users can communicate directly with each other by leaving messages or chatting in realtime.

## Ready to Go Parts Manufacturers

These are companies who make consumer-ready MIDI keyboards, pedalboards, and other products specifically for your Hauptwerk instrument.

To find these companies, search for “MIDI keyboard Hauptwerk”.

These companies will, generally, help you to assemble, hook up and get their products working with Hauptwerk. You can call or email them to assess their helpfulness and quality of service with any questions you have before you decide to purchase from them.

The advantage to using these companies is that you can customize your instrument however you like. You can build it in stages or add to your instrument later if your needs change.

Some of these companies also sell computers specifically configured for and/or pre-installed with Hauptwerk as well.

## Scanner Board Manufacturers

These companies are particularly useful if you have decided to retrofit an existing console to add MIDI capabilities.

Before you decide to retrofit a console, you may wish to read this article on the subject “Is It Worth Converting A Console To "MIDI" For Use With Hauptwerk?” available at [contrebombard.com](http://contrebombard.com)’s blog “the Barde”.

If you’ve got the skills to do this, and decided on this course, then try searching for “MIDI scanner hauptwerk”

## Full Hauptwerk Console Manufacturers

Some companies provide pre-assembled full consoles. They tend to cater to those who want the simplicity of choosing between model A, B, or C and who won’t miss the flexibility of changing their console later.

Most of the time, these companies offer the option to include the computer and audio equipment as part of the full console for your convenience.

This is often a very attractive option for Church organ search committees.

Search for “Hauptwerk consoles”.

## Traditional Digital Organ Manufacturers

These are the companies who make the regular digital organs that everyone used up until Hauptwerk came along with their individual dealers.

If the console was manufactured prior to 1985, there is no chance that it has MIDI capabilities unless someone has modified the console.

If the console was manufactured after 1985, it has the potential of already having some built-in MIDI capabilities that can be used with Hauptwerk. If it does have MIDI capabilities, that does not necessarily mean that what it can do is optimal for controlling Hauptwerk. However, it might give you the basics of keyboard and pedal output.

If you have concluded that a MIDI-capable, traditional digital organ console is what you want, then here are some things to consider.

Your name brand dealer often needs to take trade-ins to sell new organs. Usually, those trade-ins are not worth much (no matter what they tell you). You have a good shot at negotiating a deal on one of these because the dealer needs you but you don't NEED them. You have lots of options for your Hauptwerk console. They do not have lots of potential buyers.

Establish that the console outputs a different MIDI channel for each manual and pedal. If it does, then it will likely work for Hauptwerk.

These dealers can also be a good source for buying second hand benches. Sometimes, they have extra pedalboards with the potential to add MIDI capabilities to. Just make sure you know what's involved in adding MIDI to a pedalboard before you purchase one.

## Pipe Organ Techs

These companies can be great resources for second-hand, high end console shells, pipe façades, pedalboards to modify for MIDI, benches (especially adjustable ones), and full wood or exotic keyboards.

If you purchase a keyboard or pedalboard from them, make sure that they already have contacts on them. Adding contacts later is an expensive proposition. Don't forget that you will also have to add a MIDI scanner as well even if it does have contacts. So, for the best deal, make sure the item already has working contacts.

These companies also often have used toe studs, expression shoes, music racks, as well as draw knob and tab solenoids that can often be re-used with MIDI scanner and driver boards.

Make sure any expression shoes you purchase have a working 3K - 10K Ohm potentiometer and something to turn the pot installed on them. Retrofitting a shoe can be difficult after the fact.

A local Pipe Organ Tech is also useful to hire for rewiring pedalboards, keyboards, and swell shoes that you have salvaged. Sometimes you can manage doing this on your own. However, if you do not wish to attempt it on your own or if you think you're in trouble, these people can help.

They are especially useful if you decide to tackle wiring up a lot of tabs and draw knobs or if you're trying to understand how the console is currently wired and wondering if you can reuse most of the existing wiring in a console with a scanner board you have purchased.

## Pipe Organ Manufacturers

These companies can have some of the same advantages as Pipe Organ Techs. However, it's less likely. They are more likely to make new items than they are to have old ones lying around.

If you want custom-made, pipe organ grade consoles though, this is certainly an option. Likely, they will have to consult on the electronics for the console since they will be different than what they normally use.

Doing things with a pipe organ company is usually the most expensive option by a large margin. Typically, you engage a pipe organ manufacturer if you're looking for a specific, custom result and price is a secondary consideration.

## Pipe Organ Parts Manufacturers

These companies are, again, a source for new, small components such as solenoids, toe studs and other switches. Typically, they do not sell to individuals. However, some do. Don't expect much help with wiring advice or installation help. They assume you know what you're doing if you're purchasing from them as you are supposed to be an industry professional.

## Pro Audio Retailers

If you know what you are looking for, you know the brand and you know the model, these guys are great. Their pricing is usually good because they buy a lot of that stuff and sell it to non-organists. They usually have good return policies and shipping rates. In other words, they're useful for purchasing commodity items like MIDI interfaces, audio interfaces, powered monitor speakers, control accessories (e.g Launchpads), audio cables, headphones and the like.

They do not tend to be useful for advice pertaining to Hauptwerk. In fact, much of their training is contrary to what is useful for Hauptwerk.

Have a read though the article "[Hauptwerk Home Audio Explained for Pro Audio Retailers](#)"

## Computer Stores

These guys are kind of like **Pro Audio Retailers**. If you know exactly what you want, they're great. There is not much point in asking them for advice on what you need for your Hauptwerk computer though. It's not their fault, we just have a fairly unique set of specs that we need and it is different from 99.9% of their customers.



Some of the aforementioned parts and console retailers are better positioned to advise you on what you need for your Hauptwerk computer than the computer store employees. Even if they do not sell computers themselves, they can tell you what you should be looking at.

There are also companies who sell Hauptwerk-ready computers specifically.

## Hauptwerk Gurus

These are people who will advise you on creating, or fixing your existing Hauptwerk instrument for a fee.

If you are not getting any help from the companies that you're buying your equipment from, or if you want someone to handle assembling a system made by multiple suppliers for you, these people are great.

They're also great if you have managed to mess up your existing system and it's to the point where you are having trouble sorting out the problem on your own.

Chances are that you can research and contact previous customers via the Hauptwerk Forum or by asking for references from the Guru directly. This is a step that you do not want to neglect.

## Other Organists

Chances are that you are an artistic-type person. As such, you are fairly in tune with and sensitive to the opinions of others. That's ok. It's part of the job description.

If you've been in the music biz for any length of time, you have also realized that there also are many discontented, unfulfilled and bitter artistic types who are more than willing to share said qualities with you. These are not the people to ask for opinions regarding Hauptwerk or your own project.

Instead, look for people who are positive and helpful. If you must ask for advice on the topic of Hauptwerk, ask "how to" instead of "if I should". Chances are that your ears have already answered the "if I should" question which is why you are reading this. Hauptwerk instruments really are amazing.

Something about Hauptwerk lit a fire under you and inside of you. Protect that fire.

## Other Hauptwerk Users

Hauptwerk users are more than happy to acknowledge and discuss any advantages, disadvantages and/or compromises between Hauptwerk instruments and real pipes because they are living them. Engage with these folks through the resources mentioned already. You'll be pleasantly surprised.

You can find lots of willing Hauptwerk users and enthusiasts at the [Meet & Greet](http://contrebombarde.com) at [contrebombarde.com](http://contrebombarde.com).



# Is What I've Got Now Useful?

We already discussed all of the components that are part of a Hauptwerk instrument. Now let's see what equipment that you already have and evaluate it to see what we can re-use for your Hauptwerk instrument.

If you plan to purchase a ready-made console, you may want to skip this section. However, if you're purchasing just the console without the computer and audio equipment, you can skip down to those parts.

We're going to look at what to look for that will make each item usable with Hauptwerk or eligible for refurbishing. Keep in mind that you can always upgrade them later if they are functional but not ideally what you want. The idea is to get you up and running with some sort of instrument as fast as possible.

## MIDI Keyboards

If you have multiple MIDI keyboards that you want to use with Hauptwerk, it is most likely that you can use them. The things you'll want to find out about each keyboard:

- Can I set it to its own unique MIDI channel?
- Does this keyboard have a MIDI Merge built in?
- Does it have a USB output on it?
- What MIDI channel is this keyboard set on currently?

As long as each keyboard can be set to send on one MIDI channel, and that channel can be different from your other MIDI devices, you can use the keyboard in a multi-keyboard setup.

Find out what channel each of your keyboards is sending on. It will be a number between 1 and 16. If there are any keyboards set to the same channel. If there are, then change them so that each one is set on a channel that none of the others is set to.

Having a merge built in is very helpful with being able to chain multiple keyboards together and reduce the number of MIDI ports needed going into your computer.

If the keyboard has USB output built into it, you plug it directly into your computer without the need for a separate MIDI interface.

If you haven't already read the articles mentioned above, you may wish to read them now to help understand about MIDI channels, and Merges. "[I Want A MIDI" - Clarifying MIDI Misconceptions](#)" and "[Clarifying MIDI Misconceptions - Pt II](#)"

## Wooden Keyboards

Things to find out:

- Are there working contacts on this keyboard?
- If it's wired already, how is it wired? Parallel on a common or matrix-wired? If matrix, what is the pattern of the matrix?

Keyboards without existing contacts mean adding the expense of purchasing and installing contacts for your keyboards. On top of that, you will also need to purchase a scanner board to scan the contacts and for conversion to MIDI.

Generally, if there are no contacts on the keyboards, there is little cost savings to using those over replacing them with MIDI-ready keyboards that are on the market. The only reason for continuing would be that the keyboards are inherently valuable (e.g ivory tops or exotic in another way), or that making them work is what you have decided to do for a non-monetary reason (it belonged to so and so, save a tree, etc.)

The best case scenario is that there are already working and wired contacts already installed on your keyboards. Then you only need to find out how they're wired and purchase the appropriate scanner board for that kind of wiring.

If the keyboard is matrix-wired, check to make sure it is wired in an 8x8 matrix. That is the easiest to find scanner boards for. Accommodating other matrixes is difficult and usually requires rewiring the keyboard contacts.

## Pedalboards

- Are there working contacts on this pedalboard?
- If it's wired, how is it wired?
- If it does not have contacts, does it have magnets on the ends of the keys?

Pedalboards without existing contacts mean adding the expense of purchasing and installing contacts as well. Again, you will also need to purchase a scanner board to scan the contacts and for conversion to MIDI.

The best case scenario is that there are already working and wired contacts already installed on your keyboards. Then you only need to find out how they're wired and purchase the appropriate scanner board for that kind of wiring.

If the keyboard is matrix-wired, check to make sure it is wired in 4 groups of 8. That is the easiest to find scanner boards for. Accommodating other matrixes is difficult and usually requires rewiring the keyboard contacts.

If there are no contacts on the pedalboard, check to see if there are magnets on the ends of the keys already. If there are, then see if you can get a hold of the set of reed switches that were in the console as well - even if it means taking the panel. It's relatively easy to wire an existing switch array to a scanner board.

Unlike keyboards, it's usually worth the money to re-wire a pedalboard even if it has no contacts. There is more than enough savings in doing so compared to purchasing a new pedalboard - providing the actual pedalboard is in good working order and was a quality pedalboard to begin with.

## Benches

Benches are benches. Scrounging a used organ bench is a good money saver. New benches are expensive to ship in addition to the cost of the bench itself because they're bulky and heavy. You can probably pay to have an old bench refinished with the money you would save on the shipping for a new bench alone.

## Tables

Finding a suitable table means finding a table that has the top surface of the table at about 32" from the floor or one that can be adjusted to that height. and has enough clearance between the legs to accommodate a pedalboard. Preferably, there is enough room under the top for your legs as you play as well. Usually, a pedalboard is approximately 56" wide.

The top surface of Middle C on the lowest keyboard should be 29 1/2" above the naturals on the pedalboard directly below it. So, the actual height of the table needed will depend on your keyboards as well. 32" is then an approximation.

## Computers

Officially, the minimum requirements needed to run Hauptwerk are available at [www.hauptwerk.com/learn-more/requirements/](http://www.hauptwerk.com/learn-more/requirements/) . If you have anything within that range, you will be able to run Hauptwerk and the St. Anne's Moseley sample set that comes with Hauptwerk.

However, in order for it to handle the sample sets that you wish it to run, you will need to find out what the RAM requirements are for those sample sets. Take the largest requirement and use that as the amount of RAM you will need in your computer. If your mother board (and, your operating system in the case of Windows PCs) can use that amount of RAM, then you can use

this machine for your Hauptwerk instrument. There are exceptions to this rule but, for most people, this guideline is very effective.

## *RAM*

To check the RAM requirements needed for your sample set, you can visit the sample set manufacturer's website or use the [organ database at contrebombarde.com](http://organ.database.at/contrebombarde.com).

To learn how to check how much RAM is already in your computer, do an internet search for “how to find RAM *insert your operating system here*”. This will show you how to find out how much RAM you have and what kind it is. Sometimes it will even tell you if there are empty RAM slots so that you can add more RAM.

If you have a Mac and wish to find out how much RAM your computer can have, you only need to do a search for “maximum RAM in *insert mac model insert year of manufacture*” (e.g maximum RAM for mac pro 2012). There are all sorts of resources out there to tell you how much the manufacturer specifies as well as how much it can really handle. Apple tends to play down how much RAM their products can use.

If you have a brand name model of Windows PC computer (e.g Dell Studio XPC), you can use the same search as above. You may or may not need the year of manufacture.

If you do not have a brand name PC, do a search for “how much RAM can I put in my computer”. There are lots of step-by-step resources that will help you to find out what your particular RAM limits are.

Also, if you are a Windows user, you should probably also search for “maximum amount of RAM *my version of Windows*”. Different editions of the OS allow users to use different amounts of RAM. It's best to know that your OS will let you use the amount of RAM that you intend to put in your machine before you install it and find you also have to purchase an OS upgrade.

## *Processor*

The first thing to check are the minimum requirements according to Hauptwerk by visiting [www.hauptwerk.com/learn-more/requirements/](http://www.hauptwerk.com/learn-more/requirements/).

If you are just hoping to get started with Hauptwerk, then the minimum requirements are great. As long as you have anything over the minimum, you'll be able to have some fun.

If you are looking to use large sample sets, then you will want to make sure that your computer meets or exceeds the recommended specifications.

## Touch Screens

Things to check with regards to touch screens:

- Are the drivers compatible with your operating system? Most touchscreen will work on a PC with moderately current operating system. Mac users will need to check with the manufacturer. ELO touch screens reliably work with both Mac or PC.
- Will the touchscreen drivers work with 2 screens? Some do not.

If you already have some touch screens and you can't get them working with your computer, I highly recommend visiting [www.touch-base.com](http://www.touch-base.com). They make custom touch screen drivers for all sorts of different touch screens so that they will work with all sorts of computers. You can search for your monitor and operating system and get a trial version. Purchasing the driver will be a few hundred dollars but much less than purchasing brand new touch screens.

## Speakers

While we are talking about evaluating the speakers you already own, it's worth reading the "[Considerations When Choosing Speakers For Hauptwerk](#)" article so that you have some background on the subject.

Not all speakers are created equal. For organ projects, speakers are useful in pairs. Odd numbers of the same kind of speaker are not useful because the samples are optimized for stereo output.



Unless, your speakers and amplifier are horrendously mis-matched power-wise, you should be able to hook up almost any pair of speakers you own to at least try them out with Hauptwerk. Make sure your amplifier is turned right down and only turn it up slowly to test out the speakers.

Useful things to know about each of your speaker types:

- Power rating (e.g up to 200 Watts)
- Resistance (e.g 8 Ohms)
- Type of connector (e.g screw down terminal, banana plug, 1/4" TRS, etc)
- Frequency response (e.g 30 Hz - 20 kHz)

These values should be listed on on your speaker. Likely, they are on the panel beside the connectors used to hook up the speaker.

Usually, it's worth a shot to, at least, try out the speakers you have. If you like the way they sound, then great. If you don't, then you can move on and get something that is more suitable.

## Amplifiers

Much like your speakers, if you already have an amplifier, it's worth seeing how it sounds before purchasing a new one.

Some things you will want to know about your amplifier:

- What is the lowest resistance speaker that you can use on the amp? This is especially relevant if you're using Pro Audio or semi-pro equipment where 4 Ohm and 8 Ohm speakers are relatively common.. If your speakers have an 8 Ohm rating, you don't want to put them on an amplifier that wants 16 Ohm speakers. The rating should be written on the amp somewhere.
- Make sure that you know what connectors are used to connect to and from your amplifier. Are they RCA, 1/4" TS, TRS, XLR, screw down terminals, banana plugs, speakon or something else? You need to know this information so that you can purchase appropriate cables.

- It is also useful to know the input level needed for your equipment. Consumer amplifiers use -10 dB inputs. Professional amplifiers use 0 dB up to +4 dB inputs. If you're not sure which your amp is, leave Hauptwerk's output trim at the -10dB default.

## Console to Refurbish

This could be an entire book in itself. Suffice it to say, if you plan to refurbish a console to work as it used to, it needs to be done as a labour of love. It shouldn't be done as a way to save money. Most people do not save money when refurbishing consoles.

What you can do economically is re-use the shell. There is usually some great wood and decent craftsmanship in the shell that would be expensive to duplicate or replace. Replace the keyboards. Re-use the pedalboard and possibly the expression shoes. Replace stop jambs with touch screens.

## Pistons, Solenoids and Other Bits

If you have some of these items already sitting around, that's fine. However, they are going to be technically difficult to mount, wire, scan and/or drive when compared to other things like keyboards and pedalboards. They aren't quite as essential to getting started as you might think. They will also burn up time, energy and money that you can otherwise use to get playing.

Leave these items for later. Focus your initial efforts on getting keyboards, pedalboards and shoes that function.

Pistons are very useful and worth hooking up.

Solenoids (moving draw knobs or tabs), tend to lose their usefulness in a multi-organ Hauptwerk environment. The shifting stop names and layouts make them clumsy to label. Touchscreen are a much better option. They are useful for couplers though. Couplers do not tend to change a whole lot between sample sets. Even if they are missing from a sample set, you can use the native ones built into Hauptwerk if you like.

# Planning Your Ideal Instrument

Because Hauptwerk instruments are software-based and there are endless combination of the other components, the sheer volume of possibilities can be overwhelming.

The first thing to do is figure out whether you want to go with a turnkey instrument from a Full Console maker or if you want to customize or build a console in stages.

## Pre-Fab

If you want to go with a ready-to-go-pre-assembled console, then you need to talk to the company, get some references you can call and talk with. Ask what they like about the console and what they do not like. See if you're able to live with the things they don't like. Then ask about the service and customer experience that they have experienced when purchasing from this company. You can also take to the Hauptwerk forum to see what people's experiences have been.

Every company is going to have some good reports and some customers where stuff just went wrong. That's just the way things are. Life happens. More important is how the company handled the situation. Ask those that had things go wrong how the company handled it. Hopefully, they did a good job in the face of bad things. That's always worth a lot. In the end, the company you go with should have many more good reports floating around than they have bad ones.

## Building From Parts

The majority of Hauptwerk users have, historically built their instruments piece by piece. For some, the reason is an economic one. For others, it was the knowledge that they finally had control over what components went into their instrument and, when needs changed, they could adapt.

They were no longer held hostage by the traditional digital console manufacturers where to add an extra manual meant an extra \$10K-\$20K. Now, it's simply the cost of another keyboard and some key cheeks.

This section is primarily for those building from plug-n-play parts rather than for those looking to refurbish a console piece by piece.

*\* I should note that I do have a bias here. Because Hauptwerk is so flexible and changeable, I think in terms of your Hauptwerk console parts in a modular way. The idea is that you can always add to your instrument later. At [MIDIWorks.ca](http://MIDIWorks.ca), we design our products that way on purpose so that you can change as your Hauptwerk needs change. Not all manufacturers do that. So, just be aware of that bias as you read further.*

## *Decide Which Sample Sets You Love As A First Step*

The computer you choose is the limiting factor for your entire instrument. How much RAM you can have in your instrument determines which sample sets you can run effectively. So, it makes sense to start your planning by figuring out what the requirements are for the largest sample set you will be putting in your computer; even if you're not going to purchase it immediately, use that spec as your reference when ordering the computer.

## The Computer

Firstly, you need to be aware of the amount of RAM you will need for your computer to run the sample sets you plan to run. Even if you know it will be some time before you purchase that huge sample set you want, you should get a computer that has the capability to run it. As long as the basic power is on the mother board, you can always add more RAM later if you plan properly up front.

Be more concerned with the number of cores that the processor has rather than the speed of the individual processor. Multiple cores mean more things can be done at the same time. Its like that you get more stuff done when you have 8 people working at half speed than it is to have 2 people working full speed.

Hauptwerk needs to be able to access the RAM very quickly. However, the more RAM, you have, the more processors it needs to access that RAM quickly.

Here are some good processor to RAM ratios for you to follow as a safe, general rule: 2/16, 4/32, 6/64, 8/96, 12/128. This will give you a fairly reliable performance to RAM ratio that will keep you out of trouble.

When using this rule, go by how much RAM the motherboard is capable of supporting rather than the amount you plan to put in the machine right now. That way, you have room to upgrade your instrument without it getting bogged down.

So, in practical terms: If your motherboard is capable of using 64 GB of RAM, make sure that you have at least 6 core processors on the board. Do this even if you only plan to put 32GB in it right now. If you get only 4 core processors on the board and want to move from 32GB to 64GB RAM, then the 4 processors will not be able to keep up trying to process 64GB of RAM fast enough for Hauptwerk to run properly.

## *Other Considerations*

Aside from the amount of RAM the computer can hold, here are some other things to look for that just make life easier and reduce the need to upgrade later:

- Make sure the video card can handle at least 2 monitors. Admittedly, my advice assumes that you will want two screens. Some people are perfectly happy with one screen. Most sample sets have a screen view that allows you to control everything from one screen. However, for the minimal expense it takes to have a video card that supports 2 screens and the minimal time it takes to ask, I think it's well worth it. Most people I know want 2 screens at some point. It's far less hassle to provide for this eventuality up-front than it is to change things later.
- Make sure it has lots of (lets say 6 or more) USB ports and/or Thunderbolt ports built into the chassis if possible. It saves you having to add a hub later.
- Solid State Drives (SSD) are very handy if you can swing it. They load large sample sets many times faster than regular hard drives. They are not strictly necessary though.
- A 1TB or greater hard drive or SSD is hard to fill up even for most Hauptwerkers if the computer is strictly for Hauptwerk. 2TB if you plan to run other applications on the computer. Having said that, I don't know anyone who has ever regretted getting more hard drive space than they needed right now. Somehow it fills up eventually.

- Don't get suckered into adding a super-duper video card unless you plan to use the computer for something other than Hauptwerk that is graphics intensive. Hauptwerk can use a basic video card that will handle 2 monitors just fine.
- Make sure the operating system is supported by whatever audio card you plan to use. This is mostly if you plan to purchase either a used computer, or a used audio card.

## The Rest Of Your Console

Much like with the computer, when you know the requirements for the largest sample set, you likely know what other equipment you will need to procure. If you know that your largest sample set has 4 keyboards, pedals, and 3 shoes on it, then you already have a defacto shopping list or spec for a console bundle.

Do you have to purchase everything all at once? My thinking on that is “no”\*. However, it depends on whose equipment you're planning to purchase. If you think you might want to purchase your console parts in stages, it will affect which companies' products you can look at purchasing from. If you are unsure if you can add more items later, make sure you ask the manufacturer or retailer up-front if that is possible and how easy it is to add more.

Questions to consider:

- Can I start with the basics to get me playing and add more later? This could be buying keyboards, pedalboard and shoes first and adding nice wooden cheeks and console products later or it could mean buying 2 keyboards now and adding 2 more later.
- Are the new products I'm looking at compatible with the ones I already have (assuming you're hoping to mix and match for a while)?
- How easy is it to add another keyboard and/or cheeks later?
- How easy is it to add another expression/crescendo shoe later?

Other considerations:

Expression shoes can be paired with different kinds of functions in Hauptwerk. They do not always need to be mapped to the same function.

So, if you have one sample set with Choir, Swell and Crescendo shoes, and another set with Choir, Swell and Solo shoes, you might think that you need 4 shoes. However, you could repurpose the shoe that controls the Crescendo in one sample set to control the Solo in the other if you wish. If that seems like a good solution to you, you would only need 3 shoes.

In general, try and find products that are flexible. You never know when Hauptwerk will come out with a fancy new feature or there will be a new sample set released that you want to take advantage of. Life always has limitations, to be sure. However, you don't want to engineer yourself into a position where you are stuck with limitations if you don't have to be.

## Audio Cards (a.k.a audio interfaces or audio converters)

The most comprehensive guide for choosing a sound card is available at [contrebombarde.com](http://contrebombarde.com) in the **Hauptwerk Technical** area of the blog. The article is called [Choosing an Audio Interface \(a.k.a. "sound card"\) for Hauptwerk](#).

In brief however, decide how many channels of output you want for your Hauptwerk instrument. Then decide how particular you are with sound quality. There are 8-channel sound cards for \$499. There are 8-channel sound cards for \$1800. Is there a difference in the sound quality? You bet. The difference is not smoke and mirrors.

Will you notice a difference? I don't know. However, if you are not already consuming high-end audio products for your recreational listening or recording studio, then chances are you'll be happy with the less expensive model. Don't sweat it.

If you cringe at the sound quality of mp3s, CDs, purchase audiophile headphone amps and obsess over your vinyl collection, you probably want to go with the high-end stuff.

## Amplifiers

The argument for amplifiers is much the same as it is for sound cards. If they're not something you are already sensitized to, then chances are that you don't need to go too fancy. Get one that has a distinct input for every output that the amplifier says it has. For example, if the amplifier says it has 8 channels of output, there should be inputs 1-8 as well. If the amp says it has 8 outputs and 4 inputs or 2 inputs, then this is not the amp you're looking for.

## Speakers

Try and roughly match the wattage of the speaker with the output wattage of the amp. Keep the wattage of the amplifier less than the wattage of the speaker. So, if your speakers are rated

for 220W, get an amplifier that has output of 120W or 200W per channel. What you do not want is to have an amplifier that is rated 200W and speakers rated for 70W.

One of the most comprehensive articles on selecting speakers for Hauptwerk is [“Considerations When Choosing Speakers For Hauptwerk”](#) in the Hauptwerk Technical area of Contrebombarde.

## Touch Screens

The only things I would add to what I said about touch screens in “Is What I Have Useful?” is that most of the sample set console graphics (stop jambs, console layouts, control screens etc) are roughly square. They fit nicely into the 4:3 traditional screens. On the newer, 16:9 screens, the square-ish images have large blocks of black on either side of the image. So, most of the time, it makes sense to get 4:3 ratio screens. If you do get 16:9 screens, you’ll probably want to mount them in portrait orientation rather than in landscape orientation.

An opposing opinion, though, is that you can fill up the large “blocks of black” on the 16:9 screens with the floating control screens found in View > Large Floating Control Panels in the hauptwerk menu.

## Draw Knobs and Tabs

Matching Hauptwerk with a draw knob or tab console is taking the most exciting and flexible thing in the world of pipe organs and marrying it with the most rigid and inflexible (and expensive) component of the pipe organ world. Usually, this means that the inflexible element wins by limiting the flexible element.

Traditional consoles work best when they are expected to control a single sample set or a few sample sets that are very similar in layout and stop selection.

Stop layouts in sample sets are as unique and individual as the the number of sample sets that exist. This is even more pronounced when you start comparing different styles of organ (e.g Baroque vs. French Romantic). The on-screen layouts and stop selection rarely match up from set to set. So, to expect a single, fixed console to easily control multiple sample sets just screams “bad idea”.



However, people persist in doing this. I totally understand the impulse to do this. Traditional consoles look great. The tactile aspect is not something to be lightly ignored. However, it's ultimately impractical and extremely expensive to implement well.

So, here are some thoughts on how to do this smartly if you insist on doing so with a diverse collection of sample sets:

### *Style of Stop Jambs*

The toughest issue comes from trying to label multiple sample sets in a way that takes advantage of the divisional layout of the jambs and which is quick to implement. The absolutely ludicrous example would be having to replace all of the engraved draw stop caps each time you switched between sample sets.

North American-style, diamond layout stop jambs are perhaps the most difficult to work with. So, consider working with either a terraced console or a British-style console. These lend themselves to labeling the stops with titles over top of the draw stop instead of on the head of the stop. So, you will be able to print the labels on strips and change them fairly quickly. Rows of tabs also allow for this type of labeling.

### *Label Only The Things That Don't Change*

One compromise that you might want to consider is using touchscreen for the stops but have a coupler rail of tabs. This allows you to have the flexibility of different stop layouts on the screens but to have tactile controls for commonly used switches, available on-the-fly, while playing.

The labeling on these switches never needs to change as they can be useful with any sample set. If those switches are not natively part of the sample set, Hauptwerk has a built-in coupling system that the switches will work with.

# Just so that we understand each other... a Glossary

Multi-channeling (how this differs from “surround”)

MIDI

Polyphony

ASIO