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Chapter 1 : Electric Organ | eBay

"The Hammond sound" on its own is supposed to be a "portable" electromechanic substitute for a church organ. And it looks like one, too, so the Hammond organ players in rock bands tend to look quite out of style with their living-room furniture-style organ.

The preamp drive level is set by adjusting a trimmer swell capacitor accessible behind a removable plug located on the cover of the box containing the swell capacitor. On some spinets there is no access plug, and the whole expression capacitor cover box must be removed to access the trim screw. Here is the expression control on a M3 with cover on and off. The Procedure Select the A preset key, upper manual with drawbar setting 80 first brown drawbar and all four white drawbars pulled out to position 8. The expression pedal should be fully depressed maximum volume , Vibrato and Percussion off. The preamp trimmer on the organ should be adjusted fully clockwise. For a tube amplifier Leslie adjust the volume control fully clockwise. For a solid-state Leslie , , , , etc , all amp controls should be almost or fully clockwise. The procedure requires two people: If you play bass with the left hand, play bass on the first octave of the lower manual with the first four drawbars out to position 8. Play the low C-pedal if you are using pedals. While the first person plays the above, the second person should begin turning the trimmer slowly in a counter-clockwise direction, no more than 1 turn. If you like a clean organ sound then the final setting should be slightly less than the point where the Leslie starts to distort. Increasing the drive level by turning the trimmer more will only cause problems, as distortion can excessively heat the upper driver and woofer and may lead to their premature failure. The classic HammondGrowl is a direct result of correct preamplifier drive adjustment, as well as a well maintained organ and Leslie. Replacements are hard to come by, and the modern substitutions are not met with universal acclaim. To test your freshly adjusted organ and Leslie - If you have it adjusted for a slight distortion at maximum volume, the distortion should disappear or be greatly reduced by simply pushing in the first two drawbars 2 clicks to position 6. It should still be very loud and very clean, but should have no distortion. The desired result is to have some HammondGrowl on demand, and a clean organ sound at other times. Last edited on January 21, 3: The content of this page is Copyright C , , Geoffrey T. Dairiki and the other authors of the content, whoever they may be. This is free information and you are welcome redistribute it under certain conditions; see http: Absolutely no warrantee is made as to the correctness of the information on this page.

Chapter 2 : Electric organ - Wikipedia

An electric organ, also known as electronic organ, is an electronic keyboard instrument which was derived from the harmonium, pipe organ and theatre organ. Originally designed to imitate their sound, or orchestral sounds, it has since developed into several types of instruments.

The Electric Keyboard and the Synthesizer The piano, in various forms, has been a mainstay of Western music for hundreds of years. While the traditional piano found its place in classical music at the hands of countless composers, its versatility has made it a favorite instrument in all types of popular music as well. The origins of the piano are somewhat vague. Distant ancestors of the piano were played even in ancient times, and there are references to possible piano forerunners that date as far back as the year However, the earliest conclusive information known concerning piano-like instruments refers to the clavichord. The clavichord seems to have been invented some time around the beginning of the 15th century. The distinguishing feature of the clavichord is that it had a keyboard with keys that would cause strings inside the instrument to sound. The keyboard itself was an ancient idea already, having been used for organs and similar instruments as far back as the third century BCE. The idea of strings being struck, or plucked, in response to a keystroke also seems to have been in the air for some time before the clavichord appeared, but the clavichord seems to be the first instrument in which the two ideas were combined. The mechanism for causing the strings to sound is straightforward: When the pianist strikes a key, the tangent swings up and strikes the string. First, the force of the tangent striking the string, and therefore the volume of the note, depends on how hard the pianist strikes the key. Second, the tangent stays in contact with the string as long as the pianist holds the key, which tends to dampen the note. Differences in the sounding mechanism are the primary difference between this piano forerunner and another important piano ancestor, the harpsichord. The exact time of the invention of the harpsichord is as vague as that of the clavichord. The harpsichord appears, like the clavichord, to have been invented near the beginning of the 15th century, and it may be that at the time there was no clear distinction between the two types of instruments. There were, of course, no factories devoted to harpsichord or clavichord manufacture, no piano stores with a broad selection of keyboard instruments. Instrument makers crafted everything by hand, and gave names of their own choosing to the instruments. However, before long, the instrument that we recognize as the harpsichord began to appear. Overall it is very similar to the clavichord, with the significant difference being the mechanism for causing the strings to sound. In the harpsichord, each key on the keyboard is attached to a plectrum, which is a fancy Latin word for pick, in the sense of a guitar pick. They were made of crow or owl quills, or sometimes leather. When the pianist strikes a key, the plectrum swings up and plucks the string, much as a guitarist would pluck a guitar string. An important result of this mechanism is that the intensity of the note, that is, the volume, does not respond very well to the force that the pianist uses in striking the key. The intensity of the note is about the same whether the pianist barely touches the key or hits it with all his might. A distinct advantage that this mechanism has over that of the clavichord is that the plectrum does not stay in contact with the string, so the note is not dampened. Instead, the string vibrates freely until it settles back into silence naturally. The harpsichord, although it took some time to catch on, became especially popular among Baroque composers during the 17th century. Eventually, like all musicians, pianists seemed to begin wishing for something more. In particular, they must have wanted to enhance their expression by controlling the volume of the instrument, something that could not be done with the harpsichord. The Piano Before Electricity Credit is generally given to Bartolomeo Cristofori of Italy for creating the first modern piano, some time in the first decade of the 18th century. The significance of the name lay in soft and loud. An easy touch produces a very soft sound, while a forceful strike produces a very loud sound, as one intuitively expects from a typical modern piano. Using an incredibly complex mechanism attached to each key, Cristofori was able to combine a desired feature of the clavichord a note whose intensity can be varied by the pianist with a desired feature of the harpsichord strings being left to vibrate instead of being dampened. Perhaps not surprisingly, this amazing new instrument was largely ignored until it received some good press, in the form of a glowing review in by Scipione Maffei. Aspiring artists take note. Over the next couple of centuries, the piano grew and changed to keep up with the demands of composers and pianists. The industrial revolution introduced new technologies for creating better steel strings, and eventually the iron frames that were necessary to prevent the instrument from distorting under the tension of those numerous, high-quality strings. The primary advantage of this new mechanism was that it enabled the pianist to play the same key very rapidly in succession. Sequencing Before Electricity At the Centennial Exposition of in Philadelphia, several inventors exhibited pianos that played themselves automatically. These were the forerunners of the player piano. The best-known recording medium was a roll of paper that had holes corresponding to the notes that the piano would play. The idea of storing music as an abstract series of notes, to be played back by any compatible device, has come to be known as sequencing, which became an important chapter later on in the story of the synthesizer. It is interesting to note that this idea is much older even than the player piano. Although the music box is not much older than the player piano, clocks had for quite some time been using similar mechanisms to sound the hours. A bigger sound means bigger strings and a bigger piano overall. A typical modern concert grand piano is nine feet long. Popular musicians, who discovered the piano in the 19th century, were not so demanding, at least in those days. From near the end of the 19th century until the early- to midth century, popular ragtime and jazz were typically played on standard pianos. But jazz musicians love to experiment, and before long they had discovered the new organ, bringing it back into the story of the piano after a hiatus of many centuries. The Electro-mechanical Organ The first Hammond organs were not so much electronic as electromechanical. They produced each tone using a tonewheel mechanism, in which a metal wheel one for each key on the keyboard spins in front of an electromagnetic pickup similar to a guitar pickup. Critics pointed out that this new instrument had a tendency to produce unexpected and undesirable sounds, primarily chromatic harmonics and key clicks. Chromatic harmonics resulted from the tonewheels and their pickups all being very close together. A given pickup would often detect the spinning of a tonewheel other than its own tonewheel, causing the organ to produce an extra note unrelated to the key being pressed. Key clicks were a simple result of the electrical connection inside the organ when the organist pressed a key. The original, tonewheel-oriented Hammond B3 organ , although no longer manufactured, is still recognized as a classic, even legendary instrument held in high regard by everyone who knows anything about music. Many modern electronic keyboards have a setting that simulates the original Hammond organs. The two mechanisms were very different, of course, and had a different kind of influence on the overall sound of the instrument, but they both represented a kind of rudimentary special effect that would whet the experimental appetites of musicians in the years to come. The organ and all of its offspring for many decades afterward lacked the very feature that made the piano such a success: Most of them dropped the tonewheel mechanism in favor of the vacuum tube. An organ based on vacuum tubes still had some moving parts involved in producing the sound, but it was considerably less mechanical and more electric than the tonewheel organs. Also like the tonewheel, the vacuum tube has a devoted following, and there are many devices designed to make modern keyboards sound more like those based on vacuum tubes. One of the basic principles of these electronic devices was already there in the tonewheel mechanism: Other circuitry beyond the pickup may manipulate the electrical signal in some way, and then finally pass the signal to the speakers, which, of course, convert the signal into sound. Although technology advances have caused many of the details to change over the years, this fundamental means of using electricity to produce sound has remained the same over the years. Side Trips In , Harold Rhodes introduced an interesting side branch to the evolutionary tree of the piano. The Rhodes Pre-piano was a different sort of instrument altogether, more like an electrically assisted glockenspiel than a piano. Its resemblance to a piano was only superficial, in that it had a keyboard. When the pianist strikes a key, a hammer inside the instrument strikes two metal bars and sets them vibrating. The Rhodes, which ultimately became the Fender Rhodes , is unique. It did not develop into new kinds of pianos, but instead became yet another classic, leading to myriads of modern synthesizer specialists attempting to duplicate its distinctive sound. In fact, decades later, Yamaha introduced a synthesizer, the Yamaha DX7 , that had a mode that attempted to duplicate the original Fender Rhodes sound. This instrument was not a piano, and not really electronic. Transistors could be arranged in groupings that would replace vacuum tubes and all of the associated electromechanical parts in an organ, using a fraction of the space, consuming far less electricity though few cared in those days , and generating considerably less heat. As mentioned before, the basic principle of sound production did not change when instrument manufacturers switched from tube-based sound to transistor-based sound: These devices at first bore no resemblance at all to a piano. They tended to be boxes within boxes, surrounded by dials and wires. There was no keyboard. Quite a bit of technical knowledge and a deep understanding of audio principles were necessary even to use them. In order to produce a particular sound, the user would connect one or more of these boxes with cables, then adjust various properties of the boxes using dials and sliders. If one understood enough, one could cause the synthesizer to produce sounds very similar to a real piano. Before long, those in the know began experimenting with ways to produce sounds similar to other instruments, and then finally, to produce sounds that had never been heard before. In addition to being nearly impossible to use, the first synthesizers had a serious limitation as musical instruments. Astounding as it may seem to those of us who discovered music after the electronic age began, early synthesizers could produce only one note at a time, that is, they were monophonic. Surprisingly, these devices were used for creating music. Sampling Sounds At about the same time that electricity-based sound production was germinating, Harry Chamberlin invented the Chamberlin, which, through some shady, greed-oriented machinations that are typical in the music industry, evolved into the Mellotron. Instead of synthesizing a sound, Chamberlin recorded the desired sound onto audiotape so that it could be played back when the pianist struck a key. The instrument contained an actual audiotape playback mechanism under every single key. And of course, for each instrument that the musician might want to simulate, there was a bank of eight-second audiotapes, again, one tape for each key. The technique of recording a sample of the desired sound for use in later playback is known, unsurprisingly, as sampling. Although audiotape is no longer used in modern devices, the technique of sampling persists. Synthesizer Advances The Moog rhymes with vogue Company, in , took a decisive first step toward making synthesizers more accessible to musicians by introducing the Minimoog. Still, this was a monophonic synthesizer, capable of producing only one note at a time. It could not play even a simple chord, in spite of the apparent promise of the keyboard. It took a few years for synthesizer manufacturers to begin making polyphonic instruments, that is, synthesizers capable of producing more than one note at a time. Moog took a step forward in with the Polymoog , but this was actually paraphonic, not a genuinely polyphonic instrument. It could play more than one note at a time, but there was a catch. If the pianist struck multiple keys simultaneously, all was well.

Chapter 3 : Electronic instrument | music | theinnatdunvilla.com

There are also speakers and effect units that zero in on the Leslie rotating speaker sound that's integral to the B3 theinnatdunvilla.com Hammond Leslie Rotary Speaker re-creates the classic old-school B3 sounds while being compatible with just about any electronic keyboard.

Professional Electricians and Solar Installers Hammond Electric specializes in solar installation and electrical repairs for commercial and residential locations. The foundation in electrical gives us an advantage when installing the right solar panel set-up for your business or home. Solar for Business Commercial building solar installations are one of our specialties. We can build a structure if you need solar installed on your farm. Electrical Repair Our local electricians are ready for any electrical repair, electrical wiring, or electrical work you need for home or business. Let up install and upgrade your new equiptment. See All Services Commercial Solar Solar systems have many benefits for businesses both financially and environmentally. Capable of handling the electrical needs of small office buildings to large agricultural settings, solar only enhances the staying power of any business in more ways than one. Purchasing solar for your business not only significantly reduces these costs, but offers a no maintenance required solution to your energy needs. Return on Investment Businesses in CA receive an average of Coupled with government incentives and tax breaks, investing in solar is a financially sound decision to make for any business. Essentially, the business is pre-paying for up to 30 years of energy, with immediate paybacks and long-term savings. Solar systems have proven time after time that they most commonly pay for themselves in just under 10 years. Solar energy implementation also increases the value of the business property, placing the organization at an advantage should the need or desire to sell arise. There are multiple options available to ensure the unique financing and solar needs of a business are met accurately and effectively. Get a Quote Enphase Microinverters The microinverter is responsible for converting the energy captured by the panel into useable energy for your property. Microinverters are placed directly beneath each panel, where it turns the DC aka sunlight into AC, which becomes the electricity you use to power your residential, commercial, or agricultural environment. It is important for this particular component to be working appropriately, and functioning well at all times. This is why Hammond Electric gladly uses Enphase Microinverters. Enphase offers 5 different types of microinverters, which ensures compatibility with virtually any solar panel system chosen for installation. Jim submitted his project estimate in a very clear and understandable format and very competitive pricing. My system was put on my computer so I can monitor how my system is performing and a report on how many trees I save every month not to mention the money I save. It is pretty cool to know you are not adding to the atmosphere as many carbons as you would have, if not taking advantage of solar power. Thanks Hammond Electric for bringing me into the 21st century and I feel great about it. So jump aboard everybody and let us ride this solar trend into the future with Hammond Electric. Yep, it was HOT! Jim went out of his way to make it affordable and to make sure I got the best price available for solar power. His work was flawless with a professional focus on detail. Thank you Hammond Electric.

Chapter 4 : Hammond organ - Wikipedia

The Hammond organ is an electric organ, invented by Laurens Hammond and John M. Hanert and first manufactured in Various models have been produced, most of which use sliding drawbars to specify a variety of sounds.

A single note C played on a Hammond organ Problems playing this file? Unlike an American Guild of Organists pedalboard, a console Hammond normally has 25 pedals. As with pipe organ keyboards, the two manuals are arrayed on two levels close to each other. No difference in volume occurs regardless of how heavily or lightly the key is pressed unlike with a piano , so overall volume is controlled by a pedal also known as a "swell" or "expression" pedal. In contrast to piano and pipe organ keys, Hammond keys have a flat-front profile, commonly referred to as "waterfall" style. Early Hammond console models had sharp edges, but starting with the B-2, these were rounded, as they were cheaper to manufacture. Most console Hammond pedalboards have 25 notes, with the bottom note a low C and the top note a middle C two octaves higher. Hammond used a note pedalboard because he found that on traditional note pedalboards used in church pipe organs, the top seven notes were seldom used. A drawbar is a metal slider that controls the volume of a particular sound component, in a similar way to a fader on an audio mixing board. As a drawbar is incrementally pulled out, it increases the volume of its sound. When pushed all the way in, the volume is decreased to zero. Most Hammonds contain nine drawbars per manual. The other drawbars generate various other harmonics and subharmonics of the note. A very popular setting is i. Console organs have one octave of reverse colored keys naturals are black, sharps and flats are white to the left of each manual, with each key activating a preset; the far left key C , also known as the cancel key, de-activates all presets, and results in no sound coming from that manual. The selected percussion harmonic fades out, leaving the sustained tones the player selected with the drawbars. The volume of this percussive effect is selectable as either normal or soft. Before a Hammond organ can produce sound, the motor that drives the tonewheels must come up to speed. On most models, starting a Hammond organ involves two switches. The "Start" switch turns a dedicated starter motor , which must run for about 12 seconds. Then, the "Run" switch is turned on for about four seconds. The "Start" switch is then released, whereupon the organ is ready to generate sound. This briefly cuts power to the generators, causing them to run at a slower pace and generate a lower pitch for a short time. The telharmonium used revolving electric alternators which generated tones that could be transmitted over wires. The instrument was bulky, because the alternators had to be large enough to generate high voltage for a loud enough signal. The Hammond organ solved this problem by using an amplifier. By the start of the s, he had designed a spring-driven clock, which provided enough sales for him to start his own business, the Hammond Clock Company , in As well as clocks, his early inventions included three-dimensional glasses and an automatic bridge table shuffler. Hammond was inspired to create the tonewheel or "phonic wheel" by listening to the moving gears of his electric clocks and the tones produced by them. Lahey, to help him achieve the desired organ sound. While attorneys for Hammond argued that the test listeners were wrong or guessed nearly half the time, witnesses for the FTC claimed that Hammond employees had unfairly manipulated the Skinner organ to sound more like the Hammond. Hammond also claimed that although the hearing was expensive for his company, the proceedings generated so much publicity that "as a result we sold enough extra organs to cover the expense. Several dedicated organ dealers set up business in the United States [40] and there was a bi-monthly newsletter, The Hammond Times, mailed out to subscribers. Console organs have two note manuals and a pedalboard of at least two octaves. Most consoles do not have a built-in power amplifier or speakers, so an external amplifier and speaker cabinet is required. Spinet organs have two note manuals and one octave of pedals, plus an internal power amplifier and set of speakers.

Chapter 5 : Hammond organ power cord replacement help | Electronics Forums

The cone is the device where electrical energy is converted into acoustical energy; if it is deficient the resulting sound will suffer. If you meant does it sound as good as the speaker did when it was new, I honestly can't say.

Hammond e e repair successful The repairs that I made to my Hammond e were successful. This organ was given to me by a good friend. I picked it up at his home about 2 years ago non-functional. The motor started but only the C tone and the A tone barely sounded. I immediately knew that there was a problem with the tone generator. I took the organ with the bench to my garage. I did not get the pedals from him and he did not know what happened to them. The organ sat in my garage for a year before I had the chance to look at it. I was forced to look at it when a church pastor contacted me about the organ through a colleague. I told the Pastor that I would take a look to see if the repairs would be simple. If I could get it working in a week, I would sell it to him. I found that it needed too much work to get it working fast and it needed a set of pedals. I told him that I could not sell it in this condition. I could have sold it as is but I also wanted a chance at repairing a Tone Wheel Generator and this was it. It is difficult to see inside of the tone generator when the organ is fully assembled and through the back of the organ. I did notice that the Vibrato scanner was not turning. This certainly meant that the Vibrator Scanner was frozen and a torque spring on the tone generator popped loose. This is a common problem with the e I had to lift up the scanner to see under it before I tried to free the vibrato scanner. This is a tedious process where care must be taken to prevent damage. I did not desolder the wires on the TWG because I assumed that I could just lift the TWG high enough to put a torque spring back in, oil it up and the generator would spill normally again. Sometimes the motor torque spring will snap on these organs and it is easy to replace. But when the torque springs inside the TWG pop out, they can be very hard to put back in and you have to dissemble complicated things to get at them. There are torque springs along the length of the TWG drive shaft. There is one big torque spring next to the motor and as the drive shaft goes to the other end of the TWG, there are torque springs for each major section of the TWG. The torque springs serve two purposes: The second use of the torque spring is to keep the shaft from bending during motor start up. This powerful force would bend the shaft and do damage to the Vibrato Scanner. To make this more complicated, there are also torque springs on each tone wheel assembly in the TWG. If you break one of these, you are facing a major problem. It may be impossible. Study the Tone Generator here: I used a block of wood to hold it up and to keep it from sliding. It is heavy and delicate with wires still attached. This was trouble for me because I did not have a replacement and all my efforts in contacting Hammond parts vendors did not pay off. One of them told me that it was impossible to get one and it would be impossible to put it in. I happened to contact a company that makes torsion springs. They asked me to mail them the broken spring for evaluation. To my surprise, I received five new springs in the mail within two weeks. The springs were exactly the specifications on the old spring. They also sent a specification letter with the spring explaining its torque specifications. I was elated, excited, buzzed, and just plain happy! The company sent these at no cost and informed me that if I needed more, there would be a cost. Now I had to get the spring back in the TWG. It took a pair of extra long needle nose pliers and a set of dental tools to get the spring back in position. It was very hard to do. Once I got it into position, the spring had to clip into a tiny hole in the bearing on both sides without bending the spring out of shape! When it finally rested properly, I had my own party in the garage. The last bearing before the Vibrato Scanner was binding badly. You can tell by the way the torque spring before it was behaving. I had to squirt extra oil. To get it real loose, I had the pain of getting the cover off the Vibrato scanner so that I can get some oil on the bearings in there too. The inside of the Scanner was clean but very dry. I turned the Vibrato Scanner and the motor shaft without electricity slowly until the oil took affect. I am brave now. The organ is oiled now and I am ready to turn on the motor to see if the TWG will spin freely. I oiled each tone wheel bearing manually and let the oil soak in for a few hours before I turned on the motor. Surprisingly, this organ is in original condition on the inside. It looks as if it was never taken apart after it was built at the factory. It had an easy life and just needed a good dusting on the inside. After some research, I found that Hammond switched to the better components in this organ era. All should be OK for the startup.

The moment of truth came as I plugged in the power and turned on the motor. The TWG started up and settled normally. The next step was to reconnect the amps to see if I could get sound from the generator. I took out my wood block jack stands and set the TWG back down on its moorings. I fired up the organ and the tubes warm up. No red tubes and no pops and crackling from the amps. I walked around to the front and started pressing keys. I was getting sound!!! As I moved switches and draw-bars, the organ groaned, popped, and scratched but it all worked. It was off-line for a very long time and now it had to wake up and run. It seemed to want to wake up slowly but it was on its way. When I returned, it was still idling good. It will need a new filter cap. It is humming and popping and I can tell that it is coming from the main amp filter cap. I will replace it soon. The next step was to deal with all the broken keys on the consoles. I found an auction on Ebay that included a complete set of diving board keys from an L organ. I won the auction and received the box of keys after one week. Replacing the keys took two days. Someone dropped something heavy on them. Thank goodness that the key combs were in like new condition. It takes time to get to the point where the keys are replaced. Many parts were removed and moved out of the way to get to the keys. I did the lower tier first. I was surprised to find that there was very little dirt and crud in the beds. This organ was like new and must have been kept covered in a house. I replaced all the keys and the organ started to look better. This organ did not come with a set of pedals. In my hunt for the pedals, a Hammond technician had a very beat up set up pedals. I am still missing the two upper pedals and decided to make them from wood stock. I stripped them, sanded them, and put several coats of heavy duty urethane. The natural wood was dry rotted on the bottom edges so I decided to paint the casing dark brown with a good vinyl paint. I left the white pedals natural with a good three coats of heavy urethane. The black pedal wood also received a coat of dark brown paint. However it looks like I will have to make them. Black Pedals Painted Brown they look good! I replaced all screws with new brass screws.

Chapter 6 : TheOrganLoft: Hammond e e repair successful

Hammond organ oil combined with knowledge of the system is the number one most important ingredient in the maintenance and restoration of any tone wheel Hammond organ. A Hammond B3 organ has many internal moving parts that require lubrication.

The wheels were notched according to pitch, and an electromagnetic pickup much like that on an Electric Guitar sensed those notches and rendered a musical note. The Drawbars combined those harmonic tones to produce the inimitable Hammond Organ sound. When a note is played, the tones pass, just as water through a faucet. The random starts of each wave played allow for phase interaction, producing the rich tone so prized in the vintage Hammonds. Each Digital Tonewheel can be voiced for Volume, Timbre, Motor Noise and Leakage; enabling the musician to tailor the Modern Hammond to match the characteristics of any Vintage Hammond, or to create their own vision. At our website, You may now download and install custom Tonewheel sets provided by some of our Artists, as well as other vintage Hammond Organs as cloned by our in-house expert staff. Adopting the harmonic standards and nomenclature of the Pipe Organ, Mr. This variation gave the musician millions of combinations of harmonics, and assured that every Hammond player would be able to summon a unique voice. An extra level to the expression a Hammond Organist had at their fingertips was added because the Drawbars could be manipulated in real time. The Sk Series features real drawbars in the size, shape and configuration of Vintage Hammonds. The Drawbars also serve the Combo and Pipe Organ divisions, but with a slightly different function. It adds a silken quality to the sound by adding a second, slightly detuned pitch to the original in the Chorus Mode, and repeat-modulating the pitch slightly in Vibrato mode. As with the Tonewheel Generator, Digital control allows a wide range of adjustment that was simply not possible on the original. As the Antique organs aged, the components acquired their own unique qualities. These adjustments are saved per preset. This sound was reminiscent of an xylophone or clave, and became immensely popular, immediately. Perc gave the Organ a bright highlight, and every generation of music has embraced this sound. Controls for the Perc have the classic nomenclature, familiar to anyone who has ever played a Hammond. On the Sk series, Perc is executed in the Digital realm, allowing a wide range of controls the organists back in the day did not possess. You can control the volumes and decay times as well. As a key was depressed, the contacts sequentially touched, and the circuits were completed to produce the Organ tone registered by the Drawbars. The very nature of Electric circuitry dictated a click could be heard at the top of each note played when the current-carrying key contacts touched. Laurens Hammond considered that click to be a nuisance, and worked to no avail in order to rid his organ of that imperfection. The jazz players who embraced the Hammond Organ, however, found the click to be a percussive highlight, and wanted nothing to do with its eradication. To make matters worse, as the Vintage Hammonds aged, the click became more pronounced, and by the Rock and Roll era, Key Click assumed a role of importance that Laurens Hammond could never imagine. The timbre of the click may also be adjusted. Hammond would have greatly approved of the Sk, as you can turn the click all the way off if you desire, creating a Vintage Hammond Organ that could not exist in the physical world. The inclusion of this obscure feature demonstrates the commitment to authenticity Hammond has brought to the Sk Series. It was introduced as a part of Mr. The control was a cocktail of upper Mid and High frequencies the proportions of which were, until recently, held secret. The public however, took the combination of Hammond and Leslie to heart, and so it remains to this very day. It is difficult to think of one without the other, although Mr. Hammond never allowed Hammond Dealers to sell Leslie Speakers. For both Hammond and Leslie, the golden goal was to produce a Leslie that did not require motor-driven speakers, and the goal has been reached in the Sk series, with the finest Digital Leslie we have ever produced. Now the elusive effect can be had where space and mobility have heretofore denied it. As an added benefit to being produced in the Digital realm, many aspects of the effect can be adjusted and tailored to ones own taste and requirement. In addition, 8 factory Cabinets, comprising the most popular Leslie Models like the , , , Vintage H, and others are available for instant choice. The advent of transistor electronics brought forth smaller, more affordable portable Organs. The Thomas Organ Company in the U. The sounds of all three classic instruments are faithfully reproduced in the Sk series, with the ability to register them in the exact way you were able to on the originals. The Pipe Organ division uses the Drawbars as Drawknobs to select the stops you choose. Now you can take this majestic sound wherever you desire, whether it is to accompany Worship, Perform Classical Organ Literature, or Practice with Headphones in your Dormitory Room. Progressive Rock groups have relied on the sounds of Classical Pipe Organs, and have had to compromise with the few inflexible samples contained in Synthesizers and Samplers, but now the sky is the limit with a Classical Pipe Organ that can be registered in the traditional manner. Your Sk-series instrument has a total of 20 Pipe voices â€” nine 9 for the Upper Manual, nine 9 for the Lower Manual and two 2 for the Pedals. Below is a list of the voices and the screen abbreviations:

Chapter 7 : Tonewheel General Hospital - : - Hammond Organ and Leslie Speaker Parts

The sound of the classic Hammond tonewheel organ and its Leslie rotary-speaker cabinet is an instantly recognisable element used in virtually every genre of popular music, and although the very first Hammond organ â€" the Model A â€" appeared in , the instrument that everyone associates with the familiar, nay revered, 'Hammond Sound' is the.

Tonewheel and Hammond organ After the failure of the Telharmonium business, similar designs called tonewheel organs were continuously developed; For example: Germany â€" optical -tonewheel sampling organ, marketed â€"s One of the earlier electric tonewheel organs was conceived and manufactured by Morse Robb, of the Robb Wave Organ Company. Built in Belleville, Ontario, the Robb Wave Organ predates its much more successful competitor Hammond by patent and manufacture, but shut down its operations in due to lack of funding. Tonewheel right rotates beneath Hammond drawbars The first widespread success in this field was a product of the Hammond Corporation in From the start, tonewheel organs operated on a radically different principle from all previous organs. In place of reeds and pipes, Robb and Hammond introduced a set of rapidly spinning magnetic wheels, called tonewheels , which excited transducers that generated electrical signals of various frequencies that were mixed and fed through an amplifier to a loudspeaker. Instead of having to pump at a constant rate, as had been the case with the reed organ, the organist simply varied the position of this pedal to change the volume as desired. From the beginning, the electronic organ had a second manual , also rare among reed organs. While these features meant that the electric organ required greater musical skills of the organist than the reed organ had, the second manual and the pedalboard along with the expression pedal greatly enhanced playing, far surpassing the capabilities of the typical reed organ. The most revolutionary difference in the Hammond, however, was its huge number of tonewheel settings, achieved by manipulating a system of drawbars located near the manuals. By using the drawbars, the organist could combine a variety of electrical tones and harmonics in varying proportions, thus giving the Hammond vast "registration. This feature, combined with the three-keyboard layout i. The classic Hammond sound benefitted from the use of free-standing loudspeakers called "tone cabinets" that produced a higher-quality sound than small built-in speakers. The sound was often further enhanced by rotating speaker units, usually manufactured by Leslie. The Hammond organ was widely adopted in popular genres such as jazz , gospel , pop music , and rock music. Occasionally the legs would be cut off these instruments to make them easier to transport from show to show. The most-popular and most-emulated organ in the Hammond line is the iconic B3. Although portable " clonewheel organs " started to synthesize and displace the original Hammond tonewheel design in the s, it is still very much in demand by professional organists. The industry continues to see a lively trade in refurbished Hammond instruments, even as technological advances allow new organs to perform at levels unimaginable only two or three decades ago. Other than the variations of tonewheel organ design, for example, a purely electronic interpretation of the pipe organ based on " additive synthesis " design seemed a promising approach. However, it required a huge number of oscillators, and these circuit scales and complexities were considered a technical bottleneck, as vacuum tube circuits of those days were bulky and unstable. Benjamin Miessner realized that a hybrid approach, using acoustic tone generators along with electronic circuits, could be a reasonable design for commercial products. These vibrations were detected by a number of capacitive pickups , then the resulting electric signals were processed and amplified to create musical tones. Following World War II and a business transfer, production resumed in by the Rudolph Wurlitzer Company and continued into the early s, including some models retaining the Everett name from to Yamashita, invented the Yamaha Magna Organ in It was a multi-timbral keyboard instrument based on electrically blown free reeds with pickups , similar to the electrostatic reed organ developed by Hoschke a year earlier. The heat generated by early models with vacuum tube tone generators and amplifiers led to the somewhat derogatory nickname "toaster". Baldwin Electronic Organ, designed by Winston E. After the war they became more widespread; for example, the Baldwin Piano Company introduced its first in with 37 vacuum tubes. They were also more convenient to move and store than were the large one-piece organs that had previously defined the market. By the late s the home organ market was dying while the portable keyboard market was thriving. Frequency divider organs â€" [edit] Schematics of Frequency divider organ using transformer-divider In French Early electronic organ products released in the s and s were already implemented on frequency divider technology using vacuum tubes or transformer-dividers. With the development of the transistor , electronic organs that used no mechanical parts to generate the waveforms became practical. The first of these was the frequency divider organ, the first of which used twelve oscillators to produce one octave of chromatic scale, and frequency dividers to produce other notes. These were even cheaper and more portable than the Hammond. Later developments made it possible to run an organ from a single radio frequency oscillator. Frequency divider organs were built by many companies, and were offered in kit form to be built by hobbyists. A few of these have seen notable use, such as the Lowrey played by Garth Hudson. Its electronic design made the Lowrey easily equipped with a pitch bend feature that is unavailable for the Hammond, and Hudson built a musical style around its use. Console organs sâ€" [edit] A typical modern console organ Johannus Sweelinck 35 Console organs, large and expensive electronic organ models, resembled pipe organ consoles. These instruments had a more traditional configuration, including full-range manuals, a wider variety of stops, and a two-octave or occasionally even a full note pedalboard easily playable by both feet in standard toe-and-heel fashion. Console organs having note pedalboards were sometimes known as "concert organs. With their more traditional configuration, greater capabilities, and better performance compared to spinets, console organs were especially suitable for use in small churches, public performance, and even organ instruction. The home musician or student who first learned to play on a console model often found that [s]he could later make the transition to a pipe organ in a church setting with relative ease. College music departments made console organs available as practice instruments for students, and church musicians would not uncommonly have them at home. Home organs sâ€" [edit] See also: Electronic keyboard , Chord organ , and Drum machine During the period from the s through approximately the s, a variety of more modest self-contained electronic home organs from a variety of manufacturers were popular forms of home entertainment. In the sâ€"s, as technology progressed, they increasingly included automated features such as: A full-featured home organ in Farfisa Pergamon One-touch chords Hammond S-6 Chord Organ in Glide Lowrey organ in [19] â€" pitch downs about a semitone by footswitch, to simulate a slide on Hawaiian guitar or trombone. Automatic Orchestra Control Lowrey organ in [19] â€" turns a single note on upper manual into a full chord designated on lower manual.

Chapter 8 : The Electric Keyboard and the Synthesizer

A gain switch allows the Leslie Pedal to be used in a guitar effects chain, or direct inject into a sound reinforcement system/keyboard amp. Category Music.

Within it are produced all the tones and tone combinations of the organ. The electrical waves are made audible by suitable amplifiers and loud speakers, contained within the console. The block diagram Figure 7 shows the chief components of the instrument. Electrical impulses of various frequencies are produced within a unit known as the "tone generator", containing a number of "phonic wheels" or "tone wheels" driven at predetermined speeds by a synchronous motor and gear arrangement. Each phonic wheel is similar to a gear, with high and low spots, or teeth, on its edge. As the wheel rotates these teeth pass near a permanent magnet, and the resulting variations in the magnetic field induce a voltage in a coil wound on the magnet. This small voltage, when suitably filtered, produces one note of the musical scale, its pitch or frequency depending on the number of teeth passing the magnet each second. A note of the organ, played on either manual or the pedal keyboard, generally consists of a fundamental pitch and a number of harmonics, or multiples of the fundamental frequency. The fundamental and eight harmonics available on each playing key are individually controllable by means of drawbars and preset keys. By suitable adjustment of these controls the player is enabled to vary the tone colors at will. The resulting signal passes through the expression or volume control and through the preamplifier where vibrato is introduced to the power amplifier and the self-contained speakers. Reverberation is added electrically by a second amplifier which drives a reverberation speaker, also located in the console. The operation of the controls of this model is covered in the following paragraphs. Still holding it, push the "run" switch on "on" position. After leaving both switches on for about four seconds, release the start switch to return to its normal position. If the console is very cold, or if a frequency regulater is used, it may be necessary to hold the start switch slightly longer. A pilot light shows when the organ is turned on. When a preset key is depressed it locks down and is released only when another is depressed. The exception to this is the cancel key at the extreme left, which serves only to release any key which may be locked down. Only one preset key is used at one time. If by mistake two are depressed and locked, they may be released by means of the cancel key. Each preset key, with the exception of the cancel key and the two "adjust" keys at the extreme right of the group, makes available a different tone color which has been set up on the preset panel located inside the console. These tone colors are set up at the factory in accordance with a standard design which: They may be changed, if desired, by removing the back of the console and changing the preset panel connections in accordance with instructions on a card located near the preset panel. When either "adjust" key is depressed, the organ speaks with whatever tone color is set up on the harmonic drawbars associated with that key. Figure 4 shows one group of harmonic drawbars, by which the organist is enabled to mix the fundamental and any, or all, of eight different harmonics in various proportions. The third bar from the left controls the fundamental, and each of the other bars is associated with a separate harmonic. If a drawbar is set all the way in, the harmonic it represents is not present in the mixture. Each drawbar may be set in eight different positions by the organist in addition to the silent position. Each position, as marked on the drawbars, represents a different degree of intensity of the harmonic it controls. When drawn out to position 1, the harmonic it represents will be present with minimum intensity; when drawn out to position 2, with greater intensity; and so on up to position 8. A tone color is logged by noting the numerical position of the various drawbars, For instance, the tone set up on Figure 4 is known as tone 34 After a tone is so logged it may be made available again by setting the harmonic drawbars to that number. When the left drawbar is used, emphasis is given to the lower harmonics, and similarly the higher harmonics are emphasized when the right drawbar is used. The pedal drawbars are located between the two sets of manual drawbars. In "soft" position it reduces the volume of the whole instrument. It is particularly useful when playing in a small room or when the organist wishes to practice without disturbing others. It operates on the two manuals and pedals equally; that is to say, once the manuals and pedals are balanced, they retain their relative balance over the entire swell pedal range. VIBRATO The vibrato effect is created by a periodic raising and lowering of pitch, and thus is fundamentally different from a tremolo, or loudness variation. It is comparable to the effect produced when a violinist moves his finger back and forth on a string while playing, varying the frequency while maintaining constant volume. The vibrato mechanism includes an electrical time delay line, which shifts the phase of all tones fed into it. A rotating scanner, mounted on the main tone generator, picks up successive signals from various line sections. These signals represent various amounts of phase shift, and the combination of signals produces a continuous frequency variation. These Models have the "selective vibrato" feature which makes the vibrato effect available on either manual separately or on both together. Two tilting tablets control the vibrato for the two manuals, while the rotary switch Figure 5 selects the degree of vibrato or vibrato chorus effect. The "Great" tablet controls the vibrato for the pedals as well as for the Great manual. The four tablets from left to right select Percussion on or off, normal or soft Volume, fast or slow Decay, and second or third Harmonic tone quality. Percussion tones are produced by borrowing the second or third harmonic signal from the corresponding manual drawbar, amplifying it, returning part of the signal to the same drawbar, and conducting the balance of the signal through push-pull control tubes where its decay characteristics are controlled. The Percussion signal is then combined with the signal from the manuals and pedals after the vibrato circuit but ahead of the expression control. The control tubes are keyed by the eighth harmonic key contacts and busbar. It includes a tone wheel, magnet, and coil for each frequency. Mounted on top of the generator are tuned filters to insure purity of the tones. Its purpose is to amplify the signals before sending them to the amplifier. This unit also houses the electrical portion of the swell or expression control. It receives the signal from the Preamplifier and increases it in power to drive the two 12" speakers. A portion of the output signal of the power amplifier passes through the reverberation unit to the reverberation amplifier and this drives a third 12" speaker housed within the console. The degree of reverberation heard can be regulated by rotating the knob marked "Reverberation Control" shown in Figure 5. In operation, an electrical signal from the amplifier is applied to the driver unit in the reverberation device which then converts the electrical signal into mechanical energy. This energy is transmitted through springs to a pickup unit where a part of it is converted back to electrical energy. The remaining portion is reflected back to the driver and again back to the pickup at a time interval determined by the spring lengths. This transaction continues until the signal energy is reduced to one millionth of its original value. The transfer time from driver to pickup and the reflections within the system itself produce the reverberation effect. Reverberation from the console is not transferable to these Tone Cabinets. This permits use of the self contained speaker or the added tone cabinet independently. One position of the control permits both to play simultaneously. Complete instructions for its installation accompanies the kit. If the frequency is not regulated, the pitch of the organ will be irregular. When a console is set up for operation, the anchoring must be loosened so that the generator will float freely on its spring suspension system. No damage will result if this is not done, but the console will sound noisy, and the same is true if the anchoring is loosened but the console is not level. If the console is to be moved a long distance the anchoring should be tightened during such moves. Instructions for loosening and tightening the generator in the console are given on the instruction card contained in the bench. The tone generator is lubricated by putting oil into cups inside the console. Add oil in accordance with the instruction within the console. When placement of console has been completed after loosening of generator, as described above, the reverberation unit if necklace type should be unlocked by moving its lever "up". The unit should be again locked whenever the console is moved, even if only a few feet. Consoles, serial number above do not require any locking or unlocking operation. To replace the pilot lamp, remove the back cover, if the console has one. It is a pin type lamp, 6. A picture of this generator is shown below. The generator assembly includes a shaded-pole induction motor for starting, a non-self-starting synchronous motor for driving the unit after it is started, and a Vibrato Scanner mounted on the synchronous motor. The entire assembly is mounted on two long steel angles which also provide the means of mounting the tone generator in the console. The method of mounting is such as to minimize the transmission of vibration from the tone generator to the console. A drive shaft, resiliently coupled to the synchronous running motor, extends the entire length of the generator. Twenty-four driving gears, two each of twelve sizes, are mounted on this shaft, and the drive shaft itself is divided into several sections connected by flexible couplings. The starting motor is mounted at the end of this drive shaft, opposite to the synchronous motor. The rotor of this motor will slide endwise when current is supplied and engage a pinion on its shaft with a gear on the generator driving shaft. When the organ is started, the starting switch is turned on and held for about 8 seconds while the starting motor brings the system up to slightly greater than synchronous speed. The "run"switch is then turned on. This switch simultaneously connects the synchronous motor and introduces a resistor in series with the starting motor thus reducing its driving power. With a braking action of the synchronous motor and a loss of power of the starting motor, the system slows to synchronous speed and the synchronous motor begins to carry the load. A period of about 4 seconds should be allowed for this to take place, after which the starting switch may be released. The starting switch springs back to the "off" position, and turns off the starting motor, which is then disengaged from the rotating shaft by a spring. It should be noted that the synchronous motor can supply power only at synchronous speed. Therefore, if for any reason the system fails to reach synchronous speed it will not continue to run after the starting switch is released. Failure to start properly is usually due to increased oil viscosity or low line voltage and may sometimes be overcome by a increase in starting time. As the schematic diagram indicates, the "run" switch in its "off" position shorts out the wirewound resistor attached to the line panel. If the "run" switch is defective in its "off" position, the generator will not start because this resistor will be permanently in series with the starting motor. Before assuming that there is anything amiss with the motors, short out this resistor and start the generator in the normal manner. If the generator operates satisfactorily, replace the "run" switch.

Chapter 9 : A Service Manual

Electronic organ, also called electric organ or electrophonic organ, keyboard musical instrument in which tone is generated by electronic circuits and radiated by loudspeaker. This instrument, which emerged in the early 20th century, was designed as an economical and compact substitute for the much larger and more complex pipe organ.

The 4th harmonic repeats from tone 56, G of the top octave. The 5th harmonic repeats from tone 52, D of the top octave. The 7th harmonic repeats from tone 49, the lower C of the top octave. The 8th harmonic is repeated from tone 44, G in the fourth octave. Note that the 6th and 8th harmonics actually repeat some tones twice. Since the lower tones that are folded back are actually present in the instrument for the pedals, it is possible to rewire a Hammond for true bass, with no lower foldback. The quirk is that the lowest octave of tonewheels are cut with a more complex shape and provide a waveform that is closer to a squarewave, with some 3rd and 5th harmonics present. The diagram below shows the effect of the harmonic foldback on the top and bottom notes of the keyboard. The lowest note has its sub-fundamental folded back, even though the tone generator goes low enough, represented by the width of the grey bars. Notice that this means that if you play the top C, it actually includes two of the same tones tones 80 and 85 three times over! In theory the full 5 octaves of the B3 keyboard would require 61 basic tones, plus 3 octaves above for harmonics and one octave below for the sub-fundamental harmonic. Since there are only 91 tones available, the need for foldback is clear. Key Click The mechanical key contacts on the B3 have audio level signals present on them. Switching these directly through to the output caused audible clicks. These clicks have become a signature part of the Hammond sound. The clicking is caused by a combination of the nine key contacts not shutting simultaneously, and contact bounce exacerbated by dirty contacts. This causes a random rapid switching of the signal in the initial portion of the note. Since this switching introduces transients, we hear this as a sound with much random high frequency content â€” a click. This could be simulated either by adding in transient noise, or by electronically simulating contact bounce. Each bin contains 2 tonewheels which are connected to the same driven gear. There is a certain amount of magnetic leakage between tones that are in the same bin, so it is possible to hear harmonic leakage either four octaves above or below the required tone. Good copies of the Hammond include this leakage. So what is this circuit and how does it work? In short, it is a 9 stage delay line. The delay is produced using LC phase shift circuits. It can produce only a very short delay of around 1mS. A variable delay is required for vibrato or chorus, and this is generated by the rotating scanner arm picking up signals from each stage of the delay in turn. Because of the way this is done air-gap capacitor, essentially the effect is a fade between one stage and the next. The scanner is set to scan each tap from 1 through to 9 and then back again 9 to 1. This is equivalent to a triangle wave modulation of the delay time. The complete cycle, from 1 to 9 and back, is 16 steps. Any good copy has to be able to provide this speed. Juergen Haible has spent some time copying the original Hammond scanner circuit and producing a modern copy. Unfortunately his circuit is not currently available online. It uses a real LC phase-shift delay line, coupled to a pair of VCAs and other circuitry to do the fading from one stage to the next. This apparently produces an extremely close copy of the original sound, without any moving parts. Other, less stringent, copies would be possible using BBD devices. The problem with these would be getting the extremely short delay times required. Most chips would have too many stages and too slow a clock to get the times required. Problems with copying the B3 There are various problems with copying the B3. Generating 91 individual sine wave tones This is not so easy to do, and even harder at reasonable cost. Ideally, the waves should not have fixed phase relationships between related notes, although they do have a reasonably fixed relationship in the original organ. The spring couplings between stages in the tone generator give this some fluidity though. This fixed-but-not-fixed phase relationship is another interesting aspect of the technology, but one with an unknown influence on the sound. Switching the tones to the busbars The original organs have nine contacts under each key. Even this is insufficient, since they rob one contact from a harmonic when the percussion is switched on. For every key that is pressed down, at least nine individual frequencies must be passed to nine separate output mixers, and a signal must be passed to a percussion circuit. This is the fundamental problem with any fully polyphonic organ â€” and all the best ones are. The easy parts of the B3 The output circuits are pretty straightforward. These harmonics are then mixed in the final output mixer before being amplified. Getting this to sound like a B3 is a question of tone and technology â€” using tubes not transistors and so forth. Working out the frequencies of the tones used The frequency of a particular tone depends on a number of things: The ratios in the Hammond are as follows: