Prerequisites

Before starting.

Giving "resurrection" to an Hammond X-66 organ implies several conditions that are outlined here under.

Evidently, an experienced know-how in audio-electronic is compulsory to envisage this project but this is not sufficient, the technician must also be preferably musician or at least have an adequate musical knowledge and have an ear for music.
If not, better to not go any further and let do the job to somebody else.
While having those fundamental criteria, having this know-how is not sufficient.
This adventure requires also other prerequisites that are summarized as follows:

1. Test equipment.

Measuring equipment are basic tools for any technician. This is not only valid for restoring or repairing organs but it's a general rule for those who are daily involved with electronic repairs, I mean "bench-technicians", those who are handling iron solders...

Measuring equipment are the interfaces between the unit under repair and the technician. As a consequence of this, the technician must trust at 100% his test equipment. He must be sure that values measured are correct, realistic, undoubtful. One solution is to compare values with other test equipment for which there is no doubt at all. The other way is send test equipment for recalibration if any.
This being said, here under are the recommended elements.

One dual-beam oscilloscope (2x 35MHz f.i.) with probes
One 4-digits multimeter (Fluke ...) as well as an analog one if possible
One digital capacimeter
One variable auto-transformer (0V - 260 Vac)
One dual DC Power Supply (0 – 40 Vdc / 1A)
One LF-Generator (20 Hz – 20 KHz)
One Frequencymeter (0 Hz – 100 MHz)
Two load resistors 8 Ω / 1% / 250 W (Dale)

2. Small tools.

Of course, a set of basic tools commonly used by any electronic technician is required. No real dedicated tools are needed. However, European technicians will be forced to purchase one set of US keys since metric ones will be of no use in those instruments. Nevertheless, a special 'jig' has been designed for the keyboard alignment. Will see it later on in the keyboard chapter.

3. Technical documentation.

The Service Manual X-66 is the reference file, the bible to have on hand at any time. I greatly recommend to print it, it's much easier to get it on hard-copy than operating with a lap-top PC that is always on 'screen-saver' when you need it. Insert everything in a binder, make several sections as you like, write your personal notes, etc..

Before starting, it is also strongly recommended to watch the DVD 'Hammond Inside' issued by my friend Alain Kahn early 2007 on which a complete Hammond B3 is dismantled and restored. A lot of chapters found on this DVD can be applied to X-66 console as well such as: scanners, keyboards, drawbars, f.i.
An exceptional mine of technical information. This DVD made by Alain Kahn is in fact the " B3 bible " containing all tricks, advices, recommendations.. amassed during more than 30 years on Hammond organ repairs and restorations. Nobody else did that beforehand. This DVD is indeed an outstanding reference and tool that any Hammond technician should certainly own. No doubt about that.

4. Working place.

The X-66 is not a small instrument and when dismounting, it becomes even bigger ! Add one or two tone-cabinets, more than 20 m² are needed to work in confortable conditions. In my case, I had no workshop, nor empty space in house to do it, so I decided to leave the car outside and block the entire garage for the X-66 and tone-cabinets during restoration. The environmental conditions should be also taken into consideration as well. Humidity is harmful to organs. Installing everything in a garage has another advantage (unless you have other free space somewhere else): when you are fed up of working, leave everything as it is, switch off the light, close the door up to the next day, nobody cares.

5. Other equipment.

When opening a 30 or 40 years old organ, beside dust, spider's webs, collection of insects, toothpicks, confettis, pin needles, drops of Coca-Cola or the like, paper clips, it's unbelieved what you can find inside. *When I was working in a previous company, we even found one scorpion in one unit. Fortunately, it was dead ! Amazing but true.* This little story to simply illustrate the need of a powerful vacuum-cleaner.

Another good accessory is an air-compressor of about 6 bars pressure. Not really essential but 'nice to have it' when cleaning PCB's and mechanical parts, motors, relays f.i. and specially usefull to remove the well-known magnetic dust particules found everywhere in almost all Hammond's.

Lighting is also extremely important to perform a good job. When working inside organs, it is so essential to adjust lighting accordingly. I strongly recommend one (or more) good lighting system with magnifying glass, an inspection lamp is also welcome and small mirrors.

You cannot imagine how many defects can be detected by carefully inspecting the inside, just by seeing like that without touching anything.
Hundred examples can be given such as: burnt resistors, leaky capacitors, oxidization on contacts, broken leads, cold solders, unsoldered wires, cracks on PCB's, open components, loosen screws, unplugged connectors, blown fuses, overheating marks on PCB's, burnt relay coils, tarnished contacts, open copper tracks on PCB's, unscrewed switches, worn belts, loosen springs, clogged gears, etc.

6. Chemical products.

Restoring an organ implies cleaning. Then the adequate chemical products are needed such as contact cleaner, acetone, denatured alcohol, epoxy glue, varnish, vaseline, etc.. Clean dusters, sandpaper, metal wool.. all basic stuff.

7. Hammond X-66 parts.

The X-66 was not manufactured in huge quantities such as B3'. As a consequence of this, parts are not easily foundable. In USA, several Hammond parts suppliers are still in position to provide some X-66 spare parts.
If X-66 parts are no more available, then it's up to the restorer to find alternative solutions.

Electronically, it's quite possible to find equivalent (or better) parts to replace the defective ones. On a mechanical standpoint, it's somewhat more complicated (broken keys in keyboards f.i.) but some acceptable ways out are possible.
To my opinion, restoring organs is a kind of new art (kidding again).

8. List of Acronyms.

Acronyms are often used when explaining technical matters. For easiness of understanding a dedicated section has been set up (Appendix) with most of commonly used acronyms found in this X-66 restoring.

Some personal advices.

- When flipping the keyboards, install case scratch protectors (see Trek II – Ref. CSP-1) on the wooden parts to avoid severe scratches on the sides.

- Hammond organs are manufactured with numerous metal plates for chassis, shields, brackets, etc.. *Really built like a tank, I find*.
Nevertheless, be careful, those metal parts do have sharp edges and burrs.
Take care to not be injured.

- When restoring organs, I'm always connecting the instrument through a variable transformer that is also galvanicly isolated from AC Mains. An amperemeter is also in series to monitor current consumption. Since test-equipment are mostly earthed (at least in Europe), sometimes ground loops are created generating 'strange behaviours' thant can be avoided in doing so. Just an advice.

- Before touching and dismounting any part or entire module, it is strongly recommended to take close-up pictures beforehand as it was produced in its original state. With today's digital cameras, it's so easy, load pictures on your PC laptop.
In case of doubts and that's happen more often than expected (believe me), you can refind your way quite easily. Something that seems evident during dismounting can become a problem several weeks later.

Don't trust too much you own memory, premature senility sometimes may play unexpected nasty tricks !

Takes max. personal notes and sketches on paper, put reference labels as much as possible inside the instrument, on cables or write guide marks everywhere needed with permanent markers f.i.
The X-66 console is a quite complex instrument. No right for mistake.

- When re-mounting the inside, try to reposition the bundles of leads as original. Unsuitable leads dressings can also generate interferences, hum & noise, crosstalk, oscillations sometimes. Ground points are also important. Rubber insulated cables with crackles (generally carrying AC Mains voltage) must be replaced for evident security reasons.

- It is also a good practice to check if all screws are thoroughly fastened on both mechanical and electrical parts. After several decades, it is quite usual to notice that copper wires notably do exhibit some slackenings and hence poor contacts or intermittent failures (the worst ones).

Of course, for keys of manuals, you can do it but gently (see the Keyboards section for details).

- Last but not least, for fun of course, unfortunately the Murphy's Law is also in application even on the X-66 consoles. This litlle screw that falls somewhere that it should not and it takes you half-an-hour for recuperation, this iron solder that drops on your foot, that dead 9V battery of multimeter …and the list is not exhaustive.

Remember that ***' Anything you try to fix will take longer than you tought '*** *and* ***' If anything may go wrong, it will '****. Well known, no way to escape.*
Thanks Mr.Murphy.