Adding MIDI to a Schober organ

by Peter A. Stark

This page discusses MIDI in general, and adding MIDI to a Schober organ in particular. But before you get carried away, let me start by saying that adding MIDI to a Schober organ is difficult, and in many cases may not be worth the effort. So here goes:

What is MIDI?

MIDI stands for Musical Instrument Device Interface. In simple terms, it is an electrical connection that allows you to send musical information from one place to another. MIDI carries the same sort of info as a piece of sheet music - when to play a note, which note, how loud, how long, on what instrument, and so on. It does not carry any audio or sound information itself, so you can't connect a MIDI signal to an amplifier or speaker and hear it play.

With sheet music, you need three things - someone to write or generate the sheet music, the sheet itself, and someone to perform it on an actual instrument. Same in MIDI - you need some device to generate the MIDI signal (which is most often a keyboard, but can also be a computer), the MIDI connection itself, and something to "play" the MIDI signal and generate the actual sound (which is most often done by an electronic device called a sound module or sound card.) Just as a live performer can choose *how* to play from sheet music, so the sound module can change the MIDI information by playing it on a different instrument, or in a different key. (In some situations, MIDI may even be used to control other devices, such as stage lighting.)

The MIDI connection itself is on two wires, but generally uses a 5-pin round DIN connector, of which only two pins are actually used. In technical terms, the connection uses a current loop driving an optical coupler at the receiving end; in lay terms, this simply means that it is a special kind of connection different from most other computer connections, used specifically because it avoids grounding problems in complex audio setups. Although most modern computers can send and receive MIDI, they are not electrically compatible, and so need a small adapter to connect to the 5-pin connector.

What is MIDI OUT?

Most MIDI signals come from a keyboard; you can buy fairly inexpensive keyboards from a warehouse club or Radio Shack which provide a round 5-pin connector on the back labeled MIDI OUT. But a MIDI output can also come from a computer, or from an interface on a normal instrument. For example, there are some devices which adapt a guitar or wind instrument to provide a MIDI output signal as they are played.

Generating a MIDI OUT signal is not trivial. For example, each time you press a key on the keyboard, the MIDI circuit has to send out thirty binary bits (a bit is either a 0 or 1) in a particular pattern called a "note-on message", and at an exact timing. Later, when you release the key, a similar set of thirty bits (the "note-off message") is sent out. Play a three-note chord, and you're talking about 90 bits (three times 30) when you start, and another 90 when you release it.

Most of the inexpensive keyboards with MIDI OUT provide it strictly as an extra feature which most buyers may not even use. These keyboards contain their own sound generation circuits (called "sound modules"), so people play the keyboard and hear the sound directly out of its speakers.

What is MIDI IN?

The MIDI IN connector is where the MIDI signal goes into. Most often, this is on a sound module, which accepts the MIDI control signals and converts them into an actual audio sound signal. So you can play a keyboard, send its MIDI OUT signal to the MIDI IN on a sound module, and hear the music come out of there. If your keyboard already has its own sound module, then your music may come out of two places - the keyboard itself, plus the external sound module connected to it. Only the more expensive keyboards have a MIDI IN as well as MIDI OUT; in that case, you could play one keyboard, but have the sound come out of another.

What is MIDI THRU?

Some devices with a MIDI IN jack also have a MIDI THRU. The MIDI THRU jack simply mirrors everything that came in on the MIDI IN. You can send a MIDI signal into it, and simultaneously forward it out from the MIDI THRU jack to yet another device. Not needed by most beginners, but useful for professionals.

What is a Sequencer?

A sequencer is either a separate device, or more often a sequencer *program* running in a normal desktop or laptop computer.
The sequencer accepts MIDI data, either from a MIDI IN jack or from a computer disk file, stores it, processes it in some way, and then outputs it to either the MIDI OUT jack or back to a disk file. One popular application is to play something on a keyboard, store it in a sequencer, make corrections or changes on the sequencer, and then send it back out to a module to be played. The changes might involve fixing wrong notes, changing timing, switching instruments, or even adding additional parts.

Sequencer programs for PC computers are quite inexpensive and powerful. If the computer has a sound card, it can even play the output directly without sending it out the MIDI OUT to an external device.

So What About a MIDI Schober?

Adding a MIDI IN jack

Forget it. Not quite impossible, but very close to it. Because of the way that the Schober notes are controlled, doing it with MIDI is simply not practical. To do it right, you would have to not just let the MIDI IN play the right notes, but also control the stop switches, couplers, and other controls. Unless your Schober is hooked up to a particularly good sound system, the final sound results would probably not match some of the more common sound modules anyway.

Adding a MIDI OUT Jack

This is also difficult, but at least feasible and definitely more useful.

The idea here is to add an interface circuit, which connects to each keyboard switch (and, hopefully, to other switches, such as stop switches, as well), and generates the appropriate note-on and note-off signals (and perhaps other control signals as well) in response.

Most large organs generate DC voltage outputs from their keyboards, which are then sent to separate sound generators or even to pipe valve magnets. These DC signals can be tapped off and sent to a MIDI OUT controller; conversely, MIDI IN circuits can receive MIDI signals and send out DC control signals that operate the organ as if they had come from the keyboard.

On the other hand, Schober organs (as well as many other home organs) key audio directly -- both their keyboards, as well as their stop switches, coupler switches, etc. are directly connected to audio lines. There is no DC control voltage that can be tapped off to control MIDI circuitry.

Schober keyboard contacts are also connected backward from what we need. In simple terms, what we need for a 61-key MIDI keyboard is a one-to-many connection, where one DC voltage entering

the keyboard can be sent to 61 different output wires, one for each note. But Schober (and other home organs) use a many-to-one connection, where 61 different signals coming into the keyboard are switched into one audio output wire as needed.

The gist of this is that adding a MIDI OUT to a Schober organ requires a complete rewiring of the keyboard from a many-to-one connection into a one-to-many, which makes it completely incompatible with the normal Schober sound generation circuits.

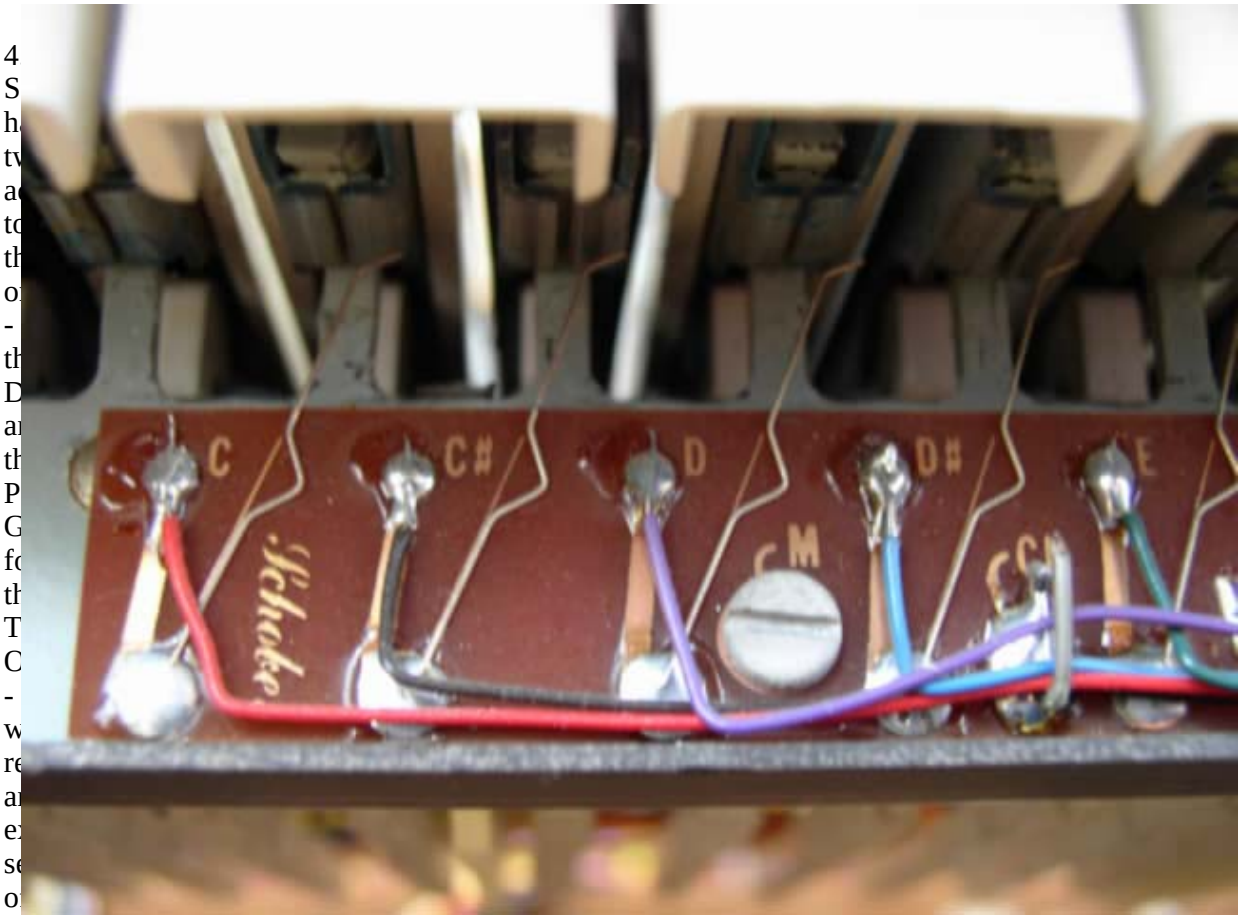
So there are very few ways of adding a MIDI OUT to a Schober:

1. Completely gut the organ, get rid of all Schober sound generation circuits, and go for just MIDI. You can reuse the keyboards, pedals, and other controls, but are then totally committed to using MIDI sound modules or computers to generate all sounds. This is the approach that I am currently using; it is documented here.

2. Rewire the keyboards to use Devtronix keying (see later), and then add MIDI to that.

3. Rewire only *one* of the keyboards to MIDI, and keep the Schober sounds in the other keyboard. But it may be easier to just mount a cheap Casio keyboard somewhere nearby and play it that way.

4



contacts
to be added at the front of a keyboard to control these addons. If you have those contacts, then you could use them to add MIDI to that keyboard. My recollection is that they did not cover the entire 61-note compass of the keyboard, but that is probably not that significant. The photo at the right shows what they looked like. (But ... let me add that a friend has experimented with this approach, and found that it does not work well at all. These extra contacts are intermittent, and they are also difficult to adjust so that all the keys require the same amount of movement to play.)

(There *may* be another approach. I thought about it once, and discarded the idea as being too messy, but this same friend has recently brought it up again. It *may* be possible to leave the original Schober wiring as is, but detect the pressing of a key by looking at either the signal level or the impedance at a

switch contact. Some additional circuitry would be needed to 'massage' that signal to key the MIDI circuits, and I'm just bringing it up for your consideration in case you have masochistic tendencies!)

What/who is Devtronix?

Keying audio directly in keyboards has always been a problem - when the keyboard contacts get dirty or corroded, some notes may not play or may be scratchy. Many years ago, Ray DeVault of Devtronix came up with a solution - rewire the keyboard to produce DC control voltages, and then provide a separate control board which uses those DC voltages to actually switch the audio. Unfortunately, DeVault has since passed away, but the Devtronix boards are still periodically available (try Google to search).

The Devtronix boards were actually a very good solution, and a number of Schober owners have already done that conversion. If this includes you, then you are in luck -- adding MIDI OUT would be a cinch.

How do you add MIDI OUT to a keyboard?

Once you have DC keyboard signals, it is actually quite easy. A number of manufacturers make interface boards which accept the 61 (or more) outputs from a keyboard, and generate the required note-on and note-off MIDI messages. The typical price of such boards is in the $200 to $300 range (US), and you will need one for each keyboard you interface. If you are handy and know some electronics, you can build your own for about $50 per board, using the instructions here.

So why bother?

Good question. Mainly because adding a MIDI output to an old organ allows you to use modern sound generators to produce possibly more realistic sounds. If these sounds are *added* to the normal sounds an organ produces, then even a small number of new voices can be a big improvement. But if you lose the basic organ sounds (such as with a complete gutting of a Schober organ), then you need a lot more new MIDI stuff to make up for what you lost. But that is another story...