

## The ultimate solution for MIDIfying a pipe organ

This topic is only related to traditional pipe organs, with mechanical action, note channels and sliders. It may be specially of interest to organists sensitive to the subtleties of touch of this type of organ.

### Two reasons for MIDIfying a pipe organ

The first reason for MIDIfying a pipe organ is most often its limited possibilities due to its limited size. For example, an organist would like a Soubasse 16 for his positive at home, but there is not enough room for it, both in area and height. The use of additional digitalized sounds is a solution. Only a few stops may bring the required degree of satisfaction. Then, if the organ is MIDIfied, an expander with an Hi-Fi chain may bring a first response at a reduced cost.

Another reason, more ambitious, for small or medium size organs, may be the desire to play virtual historical organs with Hauptwerk. A computer with a sound card is now necessary but the same MIDI system is required.

### Drawbacks of usual keyboard adaptations

For MIDIfying an organ, standard sensors such as reed switches, Hall or optical devices are added to the keyboards, more or less easily. The problem is often the poor response under the fingers for an organist used to a mechanical action. There are solutions as described in my post of May 26, 2008 « Reduction of key depression before emergence of the sound ». However, with an hybrid organ, it is difficult to adjust the sensors so that real and virtual pipes speak exactly at the same time. Moreover it is impossible to keep the right adjustment for long because of temperature, humidity, wear, etc.

### New solution without any addition to the keyboards

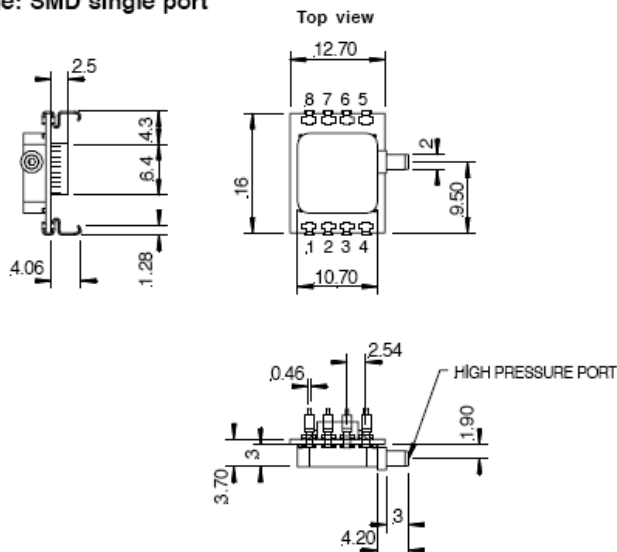
**The proposed solution uses a pressure sensor for each note channel to generate the On-Off signal.** In such a case, there is nothing to adjust : the real and the virtual pipes will always sound right without any further need for an adjustment. If the mechanical action becomes unadjusted it will not affect the simultaneous response. The aging of a solid state pressure sensor is negligible. With the response of an expander or of a HW sample set, the organist cannot detect any difference between the response of the pipe organ and that of the virtual additions. If a virtual historical organ is used alone, the organist has more the feeling he plays the original organ with its precise mechanical action.

### The pressure sensor

On the web, only one source of convenient pressure sensor was found, which does not mean that there are no other adequate products. A small and reliable sensor was found at SensorTechnics, Germany. It is a full silicon one, with a tiny port, ref SQ276-07018 (base HCLA12X5 HU, SMD single port, 0 - 6 mbar). The dimensions are shown hereafter.

**HCLA...H...**

**Package: SMD single port**



Pin	Connection
1	+Vs
2	GND
3	Vout
4	I / C *
5	SCL
6	I / C *
7	
8	SDA

\* Internal connection.  
Do not connect for any reason

third angle projection  
dimensions in mm

A small polyurethane tube ID 1.6 mm, OD 3.2 mm, ref. ZK071248, connects the air channel to the sensor port. The length of this tube has no significant importance since the air displacement is small; there is no air flow. The modification to be brought to the pipe organ is more discreet than adding sensors to the keyboards. I assume an administration in charge of Historical Monuments can accept such an intervention, limited to small holes that can later be sealed nearly without visible trace. The electronics can be located where it is convenient.

The cost of these sensors in February 2008 was 35 €, VAT excluded. It is not cheap, but they need little labor to be connected to the wind chests and no adjustment.

A question that comes immediately is “what happens if no register is drawn” (if only virtual pipes are played) ? Indeed the air channel is filled and the air leaks are supposed to be small. There should be a delay before the MIDI signal is Off. We did not meet the problem, even with a commutation point corresponding to 20 % of the rated pressure. Experiences can be made with the slider of a Larigot : the smallest pipes do not trail. Slider chests have enough leaks.

The pressure sensor used has a digital output, but it is not MIDI compatible. The output used is the analog one, which means that the speed signal is available. It is the true speed signal, the one that is related to the air pressure rise. It is very difficult to extract such a speed signal from the corresponding small initial key displacement. I still feel uncomfortable with the sample sets using today’s approach: too artificial. But if there are happy customers of such solutions, why not... We have not developed a solution that uses the derivative of the pressure signal. The analog signal is converted to On – Off.

#### Example of a pipe organ equipped with pressure sensors

A small secondhand pipe organ, built by Lötzerich in Germany, was found at “Instrumente Ladach” in Wuppertal, De. It is shown without its right side shutter. Its height is 2,4 m.



This small organ has two manuals, 56 keys, and a pedal of 27 keys. There are only 5 stops, with 27 common bass pipes for the three keyboards. However the pedal has its own wind chest, then available air channels. The ergonomics, often a weak point of positives, is excellent: large music stand not too close to the eyes, front pipes



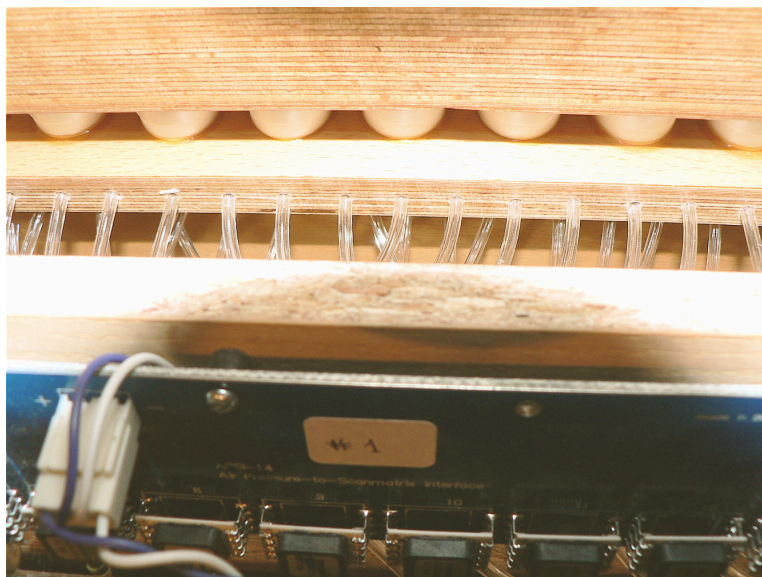
high enough not to injure the organist's ears, pedal board and bench well designed (for European standards), and of course excellent mechanical action without any roller board.

Largonet / Midiboutique in Bulgaria has developed the electronics and its gallery shows the organ and the electronics. <http://largonet.net/midiboutique/sales/gallery/gallery.html>

The electronics shown hereunder is that of the manuals, located behind the music stand. It is arranged to keep an easy access to the pallet box.



The next figure shows the connection of some pressure tubes to the pedal wind chest.



This organ has been equipped with the pressure tubes and the Largonet electronics by "ORGUES GIROUD Successeurs" in France. <http://www.orgues-giroud.com/pageindex.htm> . The boss himself, Mr. Jacques Nonnet, did put much care to this work and this implementation is perfect.

### Use with an expander

The choice of expanders for organs (with only sounds of pipes!), is limited. The target was first to add a Soubasse 16; the drawknob "Calcant" was used to call this stop, nearly permanently used. It has been borrowed to an Ahlborn expander type Archive 201 which is very easy to tune on the pipe organ. With the floor standing loudspeaker Klipsch RF 63, it is difficult to guess if this Soubasse is actual or virtual. The added expression pedal allows to adjust the sound level according to the stops drawn. Some other stops can be usefully called directly from the Ahlborn front panel: the Posaune 16, the Flute 4 and the Oboe of division B. But the choice of stops that sound like organ pipes is limited: for example the Trumpet 8 is too ugly to be used together with real pipes.

### Use with Hauptwerk

With Hauptwerk, the simultaneous use of real and virtual stops is rather exceptional. The quality of the mechanical action gives much pleasure when playing sample sets of historical organs. In the application described, a second set of loudspeakers, smaller, is used for the swell.

### Total electronics cost

The total cost of the electronics including pressure sensors to equip a pipe organ varies only with the number of keyboards. Considering that there is nearly no interest to MIDIfy 61 keys (at least in Europe), the total cost for two manuals of 56 keys and pedal is about 6000 €, VAT excluded; this is much less than the cost of a Soubasse. In France, the average cost per stop for a pipe organ seems to be in the 12 000 € range (to be checked with organ builders).

There should be amateurs to equip their positive with pressure sensors, or to buy an equipped positive, which, for those who can afford it, gives more pleasure to the eyes, to the fingers and to the ears than a dead console! There are secondhand positives that can be bought at the cost of a good quality digital organ.