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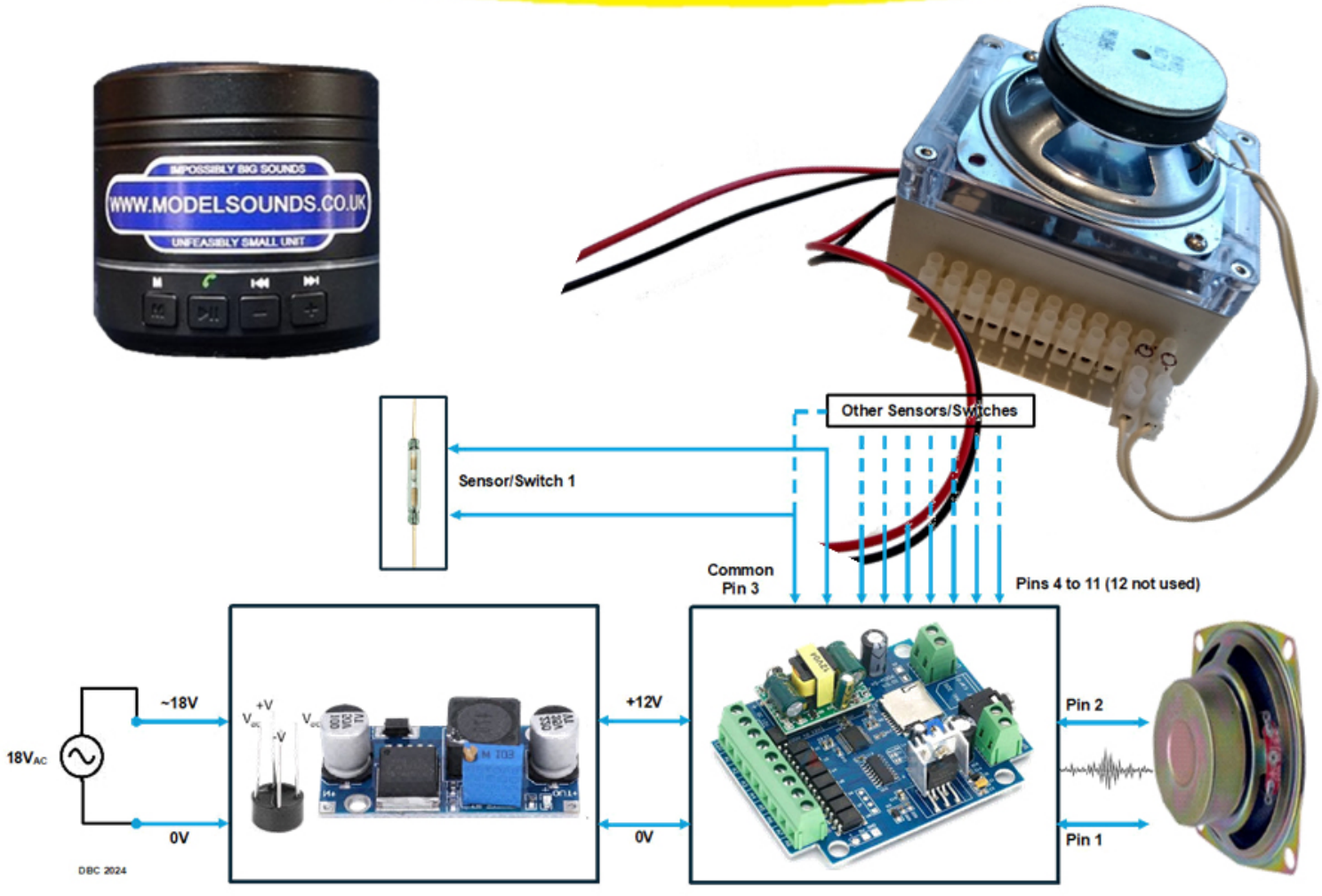

A New Dimension:
Layout Music & Sound

by Dr Gordon Rankine

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A New Dimension: Layout Music & Sound

by Dr Gordon Rankine

1. (Nieder-)Sherwood Terminus with Sound Generators in all Buildings – Track Sensors Hidden by Snow

Adding Sound to the Garden Layout

Many modern G-Scale locomotives can play sounds. Not only the diesel engine or steam chuffing sounds, but also whistles, firebox, compressors and so on. If a loco is sitting in a station buzzing away, it seems entirely reasonable, if not desirable, that the station has its own cacophony of sound. This article offers an inexpensive and easy set of solutions to add ambient sounds to a station, or any other part of the layout, adding to the realism especially when being filmed for personal use, the family or social media.

The addition of sounds, typical railway station announcements, the general hubbub associated with a station, bands or cafes, and music, is freely available from the wealth of sound tracks accessible on the internet. These may easily be added to by any enthusiast. While this article is not a 'how to', any reader can use my solutions, with no electronic knowledge, to brighten up the running experience, adding an extra dimension to the running pleasure, or just amusing the children!

There are several proprietary sound systems available, mostly aimed at indoor H0/00 layouts. These may also be used for our G-Scale world. For example, Figure 2 shows a current sound generator by Model Sounds. It is reliable, reasonably inexpensive, and programmable by the user with a laptop, but it is not intended for outdoor use. For many applications, a major drawback is that it handles just one MP3 track on a Micro SD card, which loops. It is not triggered by external switches or track detectors. I will show how it is very easy to make DIY systems for outdoor use, which are much cheaper, more satisfying, and much more flexible, requiring no more skills than that for kit-building.

There are many sources of the required sounds in MP3 format on the internet. Almost any MP3 piece of music is suitable, and the endless choice is that of the constructor. As my layout is Swiss-German (more or less), I required three sound types, all Germanic in flavour: track, station, and ambient background. This alone precludes many proprietary systems, which are generally not user programmable.

At Christmas, I have The Salvation Army playing Christmas carols, and at least one playing 'Jingle Bells' for my grandchildren! Organ music for the church is easy, whilst I have 'Oompah' or 'Alpenhorn' music for the stations and the bandstand (Preiser has great Alpenhorn figures).

2. Compact Single-track MP3 Player (Modelsounds)

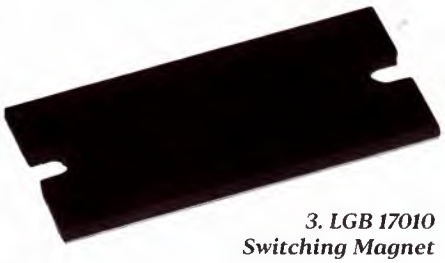
A sound may be set off by means of a switch or the action of a passing train. I trigger the general ambient noise in a station which play continuously, such as people speaking, glasses clinking, birds singing, with mini switches. These play tracks that run for minutes or hours. However, they can become tedious after a while! For train related sounds, I use loco-driven signals. The immediate benefit is the automatic nature of the trigger and corresponding sound at the appropriate time as the train passes.

Component List

A simple loco-driven sound system suitable for installation in buildings, requires:

1. A locomotive (or wagon) fitted with magnet (Figure 3), and a LGB 17000 or 17100 track contact (Figure 4) or an in-track reed switch trigger (Figure 5), and/or a momentary switch;
2. a power supply to drive the electronics, typically 12V DC;
3. a MP3 sound board;
4. a watertight enclosure to house the electronics (Figure 7);
5. and a waterproof loudspeaker to broadcast the sounds.

Apart from the track contacts or manual switches, all the other elements are housed inside a trackside building. They are still exposed to



3. LGB 17010 Switching Magnet

4. LGB Track Contacts: older 1700 (top) and newer 17100 (bottom)

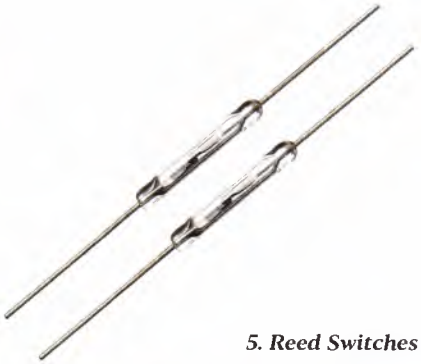
moisture but not the driving rain, a common feature of a Scottish summer, or the frost and snow in our typical winters!

Track Sensor

I use a simple sound trigger comprising a locomotive fitted with a magnet, such as the LGB 1701/17010 Switching Magnet (Figure 3) and reed switches embedded in the track. Track detectors in stations trigger suitable station announcements, mine in 'Schweizer Deutsh'. Detectors outside the stations usually trigger music. By way of an example, I have three tracks that pass a church. Each detector triggers a different piece of organ music: wedding, funeral, or fun stuff.

The LGB 17000/17100 track contact contains a reed switch and a pair of diodes. It is intended to control other LGB devices as part of the EPL system. It works as a sound trigger but is quite expensive. As can be seen (Figure 4), the LGB 17100 is designed to sit between the sleepers. However, it is prone to movement and interferes with track cleaning. An equally good solution uses just a reed switch (normally open configuration) mounted on a sleeper. At around 30p each, this is a much cheaper alternative. Both are triggered by a magnet fixed to the locomotive's motor.

Figure 6 shows a reed switch mounted on a sleeper. The wires from the switch are passed through two holes drilled in the sleeper and then the switch is glued to the sleeper. The cable wires could be soldered directly to the reed switch, but I chose to use Molex connectors. Using connectors means that the reed switch may be removed in the event of damage,



5. Reed Switches

6. Reed switch fixed to a sleeper

without removing the corresponding piece of track. It is easier to solder the wires and crimp before inserting the connector. The reed switch is less obtrusive than a LGB 17100 and could be further concealed by a little black gunk or glue.

Power Supply

Sound systems are remarkably power hungry. In the garden, anything playing must be audible from distance. In practice, this turns out to be around 4 or 5W without annoying the neighbours. Accordingly, just under half an amp is required (in a 12 Volt system) to be delivered to the loudspeaker. As most of my station buildings have sound, not to mention all the internal and external LED illumination in buildings and platform lighting, a meaty power supply is required. I use LGB 50110 AC transformers that produces 5.5 Amps at 18 Volts.

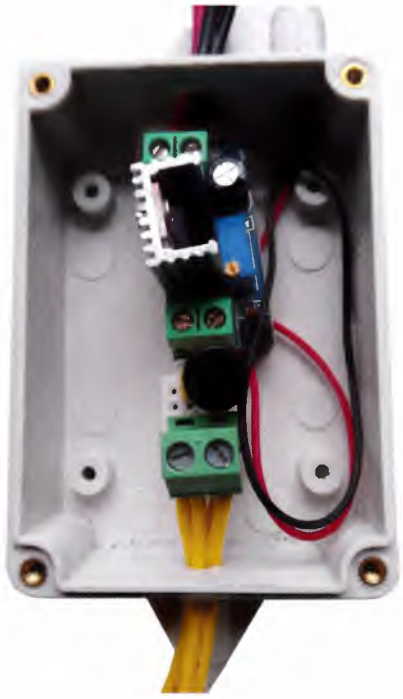
If you would prefer to pipe 12V DC round the layout, then skip to the next section. This was my original intent until I found 'AliExpress' online and the cheap (less than £1.00) adjustable step-down converters, also known as buck converters. I use these to convert AC to DC in each building where there are sound boards and/or lighting. I used the 'LM2596 DC-DC Buck Converter Voltage Regulator', but any step-down converter that converts to a lower voltage is suitable.

When I buy, I just buy the cheapest or those that have screw connections. This board requires a bridge rectifier to convert 20V AC to 14V (average) DC. Slightly more expensive versions are now available with built-in bridge rectifiers to create an AC to DC step-down converter.

Not only are these devices cheap enough to fit one in every building, but they are also small and light, and may be suspended on the connecting wires. However, I tend to use nylon spacers or mini-breadboards, glued to the floor of the enclosure, with nylon screws (no metal, not even stainless). I use a small waterproof enclosure for each PSU to make a standard interchangeable component box for installation in buildings with lightning and/or sound.

Occasionally, I use converters in an enclosure to generate both 5V and 12V DC outputs. Normally, I drive the internal LED lighting and sound boards with 12V DC, though the LED strips I use would operate at 18V and be a bit brighter.

The PSU module usually has two or three DC outputs. One of the 12V outputs drives the sound module, while the remainder drive the LED lighting in the building. The exposed PSU, Figure 7, shows two yellow connections into the rectifier. One is used for the input 20V AC supply, and the other connected directly as an AC



7. PSU in enclosure

output to the next structure. This daisy chain method cuts down cabling in relatively dense building areas. This PSU has a 12V LED to indicate when there is power to the PCB as there is no other indication. Note: in this case the rectifier is mounted with the input block on a small breadboard, but it could have been left floating. The blue potentiometer is clearly visible to set the output voltage at 12V DC but it may be used to set any desired output value. I use a convention for these connectors to avoid wrong connections. Yellow is always 20V AC in my modules.

Watertight Enclosure

Figure 8 shows an IP65 Waterproof Junction Box, one of a range of waterproof enclosures with clear plastic covers. Notwithstanding that the enclosures are meant to be waterproof, I replace the screws with stainless steel equivalents (I only use stainless steel screws and bolts outside, which makes life much easier when changing elements years later). I also add rubber feet to keep them out of standing water. I have had such boxes inside railway buildings for years with no ill-effects, but they are not exposed to rain.

8. IP65 Waterproof Junction Box enclosure

Sound Board

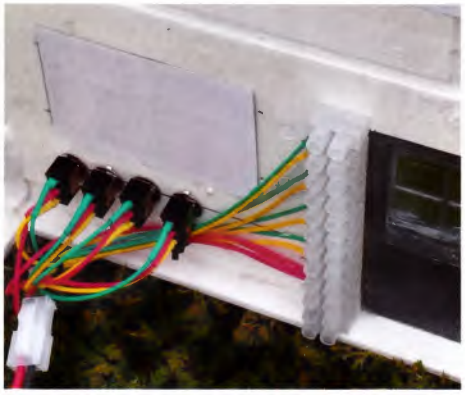
There are several similar MP3 sound boards available from online suppliers such as AliExpress or eBay for a few pounds, which are suitable for use in the garden (with weather protection). They all use mini-SD cards, but some have screw connectors while others require soldering. For example, the DY-HV8F DY-HV20T uses a mini-SD card of up to 32 GB. It also has a Micro USB connector, which allows MP3 files to be downloaded into on-board flash memory. It is easily programmed with MP3 files, one per contact associated with each of the 8 inputs. Even an 8 GB SD card can contain an awful lot of sound or music (I have one station ambience track that is 8 hours long).

Triggering a sound is simple: one of the eight inputs is activated by a momentary reed switch (triggered by a loco magnet) or an SPDT momentary action switch. Where switches are used, in parallel with sensors, I mount them on the building rear wall. In this case, waterproof switch covers are required. Unfortunately, the volume control is screwdriver control pot on the PCB on all the sound boards I have used. A bit of a nuisance but it protects the potentiometer from dampness. Either set up the volume required before screwing down the lid, or else drill a hole in the enclosure and use a plastic plug. I use both methods.

I assign two sounds to each (momentary) SPDT switch rather than using eight switches for the eight sounds in parallel with sensors. This gives switch up/down for two music track choices. Hence only four switches, with rubber covers, are required. One word of caution. The miniature toggle switches available are very cheap, but appear to have different thread types, both US and European. Consequently, getting the right waterproof cover requires some care. Although ordinary bare SPDT momentary switches can be used, pre-wired switches are available from suppliers such as Railroom Electronics. Rather more expensive but they do make life a lot easier for older fingers! I suggest bench testing each of the components before mounting in its enclosure. It is easier to enter the SD card with the desired music. Furthermore, the board is usually a tight fit and tricky for big fingers!

It is not entirely obvious but the four switches on Figure 9 are connected to a two-part interlocking connection block, Figure 10, mounted to the left of the rear door. They come in two sizes. I use the larger for (track) power and the smaller for signal levels to avoid plugging a power terminal into a board. This allows most of the wiring and boxes to be removed easily, giving full access to the interior. This was not an obvious requirement until storm damage required such access to effect repairs. It helps avoid the bird's nest tangle of wires. These are not waterproof, but I have not had problems to date.

I use a standardised connection model, so that the boxes may be switched around. Both PSU and sound



9. Switch Assembly on Building Rear Wall

10. Two-part Interlocking Terminal Connector

boards may be put in a single larger enclosure, which is more economical of space, but interchangeability is useful and desirable. The convention that I adopted is to distribute power by the female half using yellow cables (rightmost in image) to reduce chances of casual short-circuit when moving things around. This allows buildings to be power daisy-chained from the AC source, which is easier than routing separate cables to each module. The modules may be located on the building floor, stacked on top of each other, or even on the side as there are no internal moving parts.

Waterproof Loudspeaker

I use waterproof speakers that are as large as possible: 3-4 inch or bigger. For reasonable sound without distortion or clipping, the loudspeaker should be 4 to 8 ohms with an 8W rating. Generally, I mount them on the sound module (figure 11). It means sound and speaker form a unit which is easier when moving modules around. It is important to have a tight connection between the speaker and the enclosure as the enclosure acts as a sound board.

The illustration of the sound enclosure, Figure 12, illustrates the connections. The 12-pin terminal is hidden on the bottom side and the

11. Sound module with top-mounted speaker using enclosure as sounding board. Pins 1 & 2 on the right of the 12-way connector are reserves for the loudspeaker outputs.'

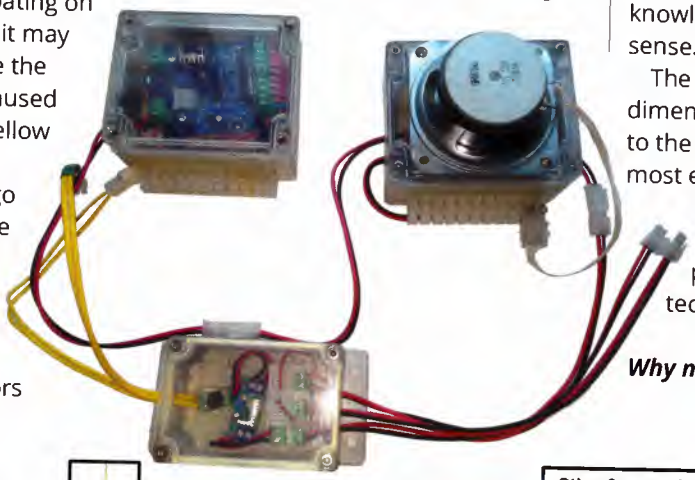
12. Sound board floating in enclosure supported by the trigger wires.

cables to it are under the board. The sound board is floating supported by the cables. The terminals are numbered 1 to 12 from the right-hand edge. I have left the board floating on the connecting wires, so that it may be pulled up a little to change the Micro SD card. It has never caused a problem. In this case, the yellow wires from the loudspeaker output (yellow to signify AC) go to Pins 1 and 2. The blue cable (extreme right at bottom of connector) is the common return for the reed switches and is connected to Pin 3. The remaining eight connectors are connected to Pins 4 to 11, corresponding to music tracks 1 to 8. This is the convention I use and recommend it to other constructors.

In the February storm, I lost five major buildings and two others damaged. It was a struggle to find replacement Vollmer buildings. However, I managed to procure some from Switzerland, London, and Italy. Rebuilding allows this roofless image, Figure 13, showing the typical building contents. In this case the station. It illustrates the complete assembly. The four switches (eight soundtracks) on the rear panel, linked to colour-coded ribbon to make a tidy wiring harness. Power to the sound box supplied by the smaller PSU box, which also powers the internal LEDs. Everything may be disconnected and removed quite easily. The fixings could be further tidied up for indoor use, but outdoors access is frequently required to change music Micro SD cards. The seven repaired and replaced buildings that were involuntarily 'flown' to the lawn are now hinged at the front directly to the platform. They tilt forward for easy access to the electronic modules and cabling inside.

13. Half-built replacement Vollmer station showing the switch cluster, PSU and sound box, waterproof speaker and strip LED lighting.

14. Sound Modular System: PSU (centre) to Sound Box only (left) and Sound Box plus Speaker (right)



Conclusion

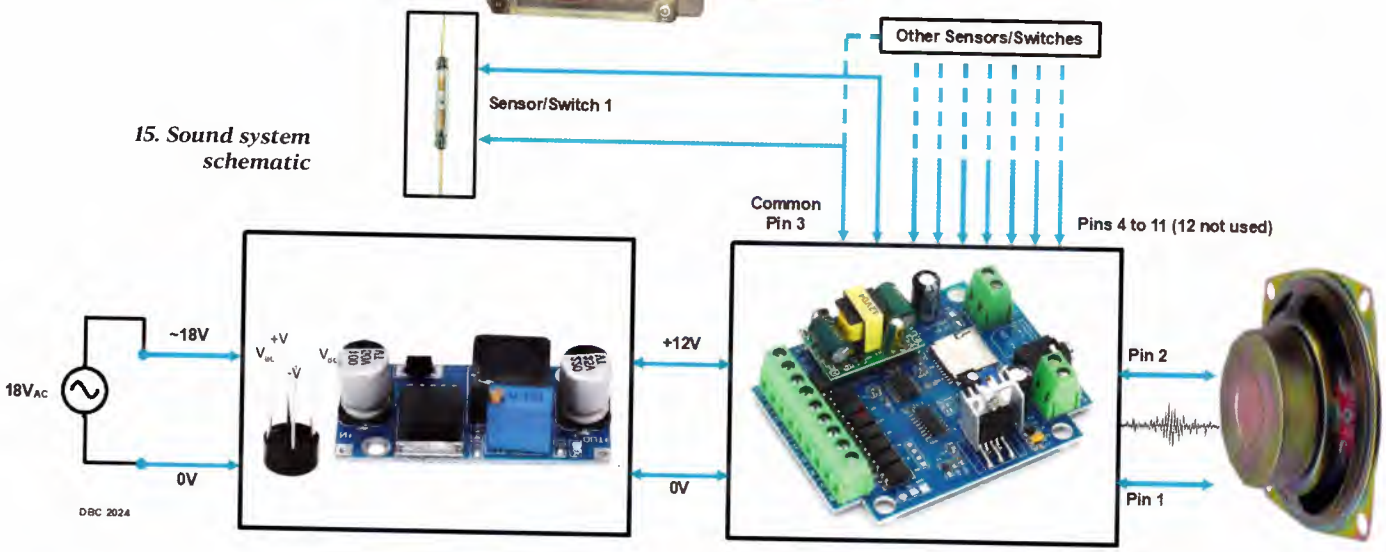
I hope the above description demonstrates that a powerful sound system is easily created for not much money. It shows that the addition of sound emanating from buildings is not complicated.

What would have been tricky a few years ago is now relatively simple and straightforward. The parts identified are easily procured and cheap. Construction is relatively fool-proof providing you take care with power supplies (hence my colour coding), and is I believe well within the capability of any model-maker. It requires no knowledge of electronics, just common sense.

The end result adds an extra dimension to the layout and is pleasing to the owner, as well as visitors and most especially children.

If any reader would like help, please contact me at sound@technorank.com.

Why not have a go!



15. Sound system schematic