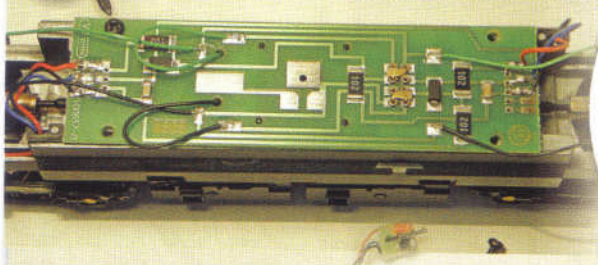
HIGH VOLUME THRASH

In his second article describing the fitment of DCC sound to a Class 37, **PAUL CHETTER** adapts the chassis to accommodate larger speakers and modifies the locomotive to improve its performance.

With the installation complete, the reassembled Class 37/4 is ready to make the right noises.

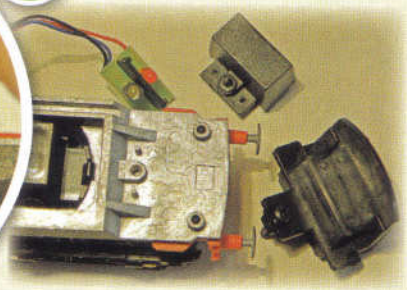
STEP BY STEP INSTALLING 28MM HI BASS SPEAKERS IN A VITRAINS CLASS 37

1 The first step in fitting the 28mm speakers is to begin dismantling the chassis. Remove the four screws which secure the printed circuit to the top of the chassis first.

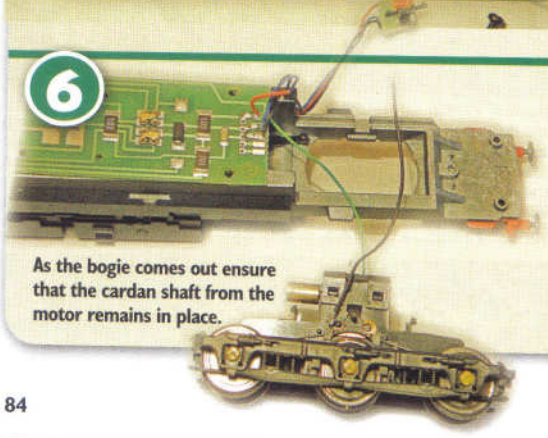


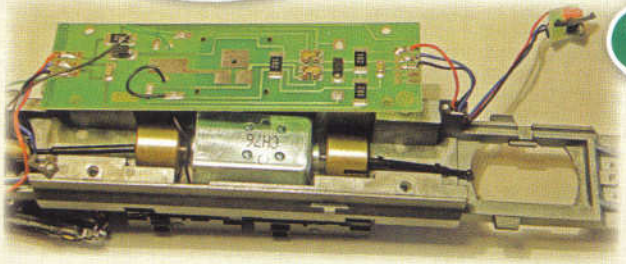
2 Next the single crosshead screw which hold the cab interior needs to be removed next to also release the light enclosure.

3 With the interior and light enclosure removed the chassis will now look like this.



6 As the bogie comes out ensure that the cardan shaft from the motor remains in place.

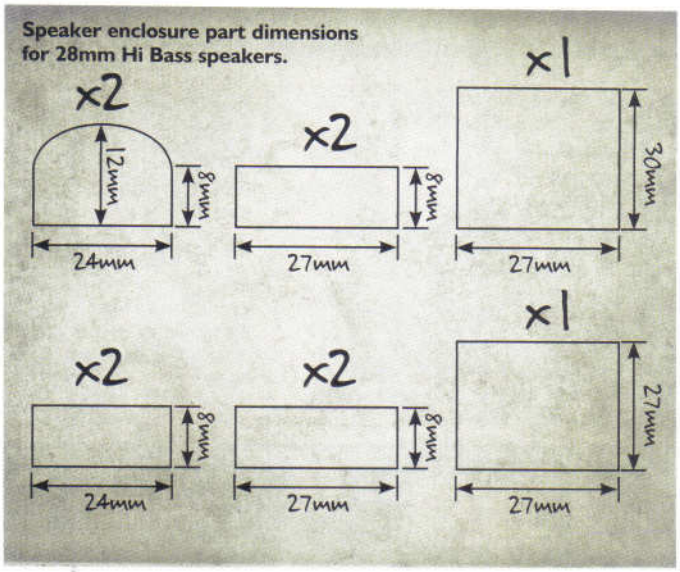




7 The circuit board can now be lifted off the motor enclosure, but be careful as the motor wires will remain connected to the board.

IN HM45, I described the fitment of 23mm square speakers to a ViTrains Class 37 in a way which avoided alterations to the base model altogether. This modification is a development of that approach which aims to house the largest speakers practicable as the larger the size of the speaker the better the overall final sound can be. As well as requiring the construction of suitable enclosures to obtain the best performance from the speakers, some small modifications to the chassis are required.

Although the alterations are not particularly major, undertaking them will invalidate your warranty. It is always wise, especially if you plan to modify your model, to ensure it runs correctly before you commence any type of surgery.



Begin by opening up the locomotive as shown in HM45. The chassis modification would be possible without any dismantling, but you would need to be careful not to damage other parts when sawing and filing. You should have some method in place to remove the waste metal and prevent it from contaminating other parts of the locomotive, especially the drive shafts and bogies, otherwise premature parts failure may occur. I decided it was easier and safer to remove all the parts from the chassis. This would allow me to get the metalworking completed in isolation.

Only basic tools are required both for disassembly and chassis modifications - a fine toothed hacksaw, a small flat file, a small flat bladed screwdriver and a crosshead screwdriver. One slightly more specialist item, a soldering iron, is needed too.

Taking it all apart

The circuit board is held in place by a couple of crosshead screws. I've shown these being removed, but because they also hold the motor in place, I recommend keeping the board in place for now.

At each end is a small assembly which represents the cab interior and an enclosure for the external lighting LEDs. These are retained by a small crosshead screw which need to be removed. The assemblies can now be lifted clear, but be careful to avoid damaging the wires attached to the LEDs' small circuit board.

You will now have unhindered access to the bogie attachments, but before removing them you need to disconnect two wires for each bogie. Also, mark the chassis and bogie to ensure you replace them correctly on reassembly later.

There are two wires, one black and one green, leading from the pick ups in each of the bogies. These are soldered to the circuit board (see Step 4). Note their positions. I usually take digital photographs for later reference. Carefully de-solder the wires from the board. Each bogie is held in place by two moulded plastic clips, in a 'front and back' longitudinal orientation.

Using a small flat screwdriver, gently lever the clip at the buffer end (the more accessible of the two) so it can pass through the hole in which the bogie swivels in service.

Ease the bogie away from the chassis in a downward motion and put it safely to one side. Ensure the black plastic cardan shaft does not fall out as it will now be loose. Repeat this operation for the other bogie. It should resemble Step 6.

Remove the two screws holding the circuit board and motor in place and the two plastic clips which hold the wires to the chassis. The board and motor are still attached to each other by wires, so gently ease them both from the chassis. Recover the cardan shafts and then unclip and remove the plastic fuel tanks. Remove the bufferbeam assemblies from both ends by removing two crosshead screws from each.

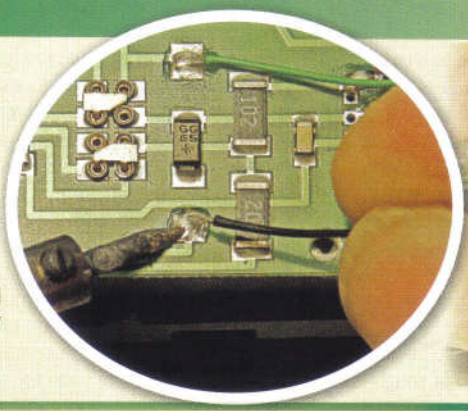
You will now have the chassis completely separated from the rest of the locomotive, and modification can begin. Step 11 shows the small amount of metal that needs to be removed from four corners of the chassis shoulders. It would be possible to grind this away, but I used a junior hacksaw to make two cuts at each corner to remove most of the metal required, and finished it off with a small file. The metal is easy to work. Clean up the chassis, paint the raw edges if you wish, and prepare for reassembly.

Reassembly

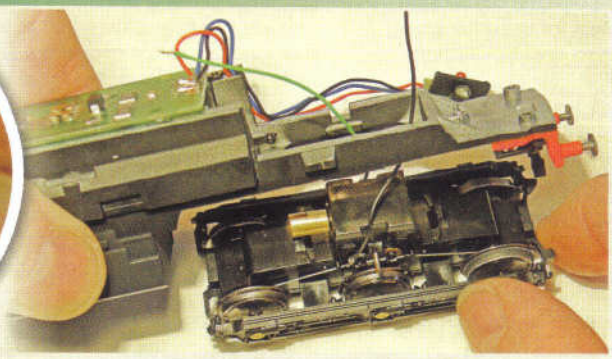
This is mostly the reverse of the above, but there are some special points worth noting for trouble-free assembly.

Replace the motor using the internal mouldings of the chassis to correctly locate it. Fit and screw down the circuit board, ensuring the motor is properly positioned and held firmly in place.

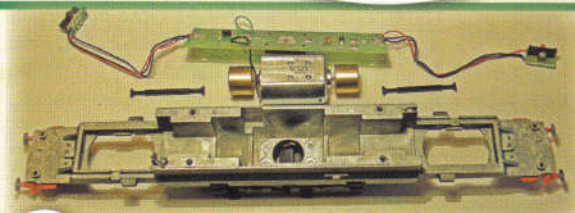
You may re-attach the buffer assemblies at this point, but I suggest you leave that until the bogies are fitted. »



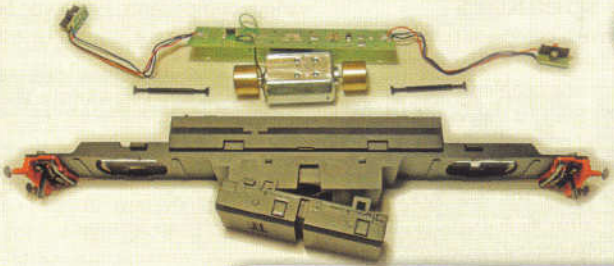
4 The two wires which connect the bogies to the circuit board also need to be released. Heat the solder with a soldering iron and pull the wire away from its tab.



5 The bogie pins can now be released using a flatblade screw driver to allow them to be lowered through the base of the chassis.



8 Now lift the motor out of the chassis with the circuit board taking care to ensure that no wires are snagged or caught.

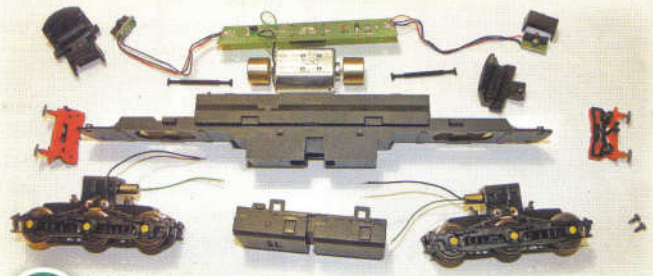


9 The final part of the strip down is to unclip the plastic battery box from the metal chassis.

PLEASE TURN FOR STEPS 10-21

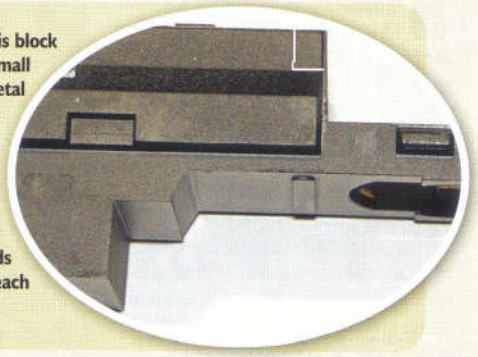
STEP BY STEP

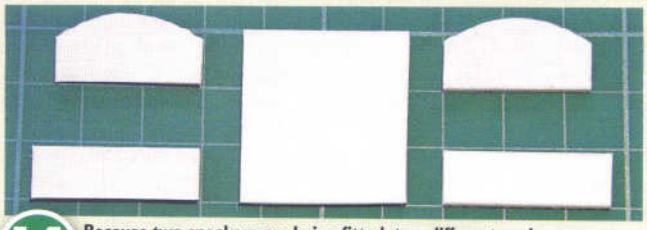
INSTALLING 28MM HI BASS SPEAKERS IN A VITRAINS CLASS 37



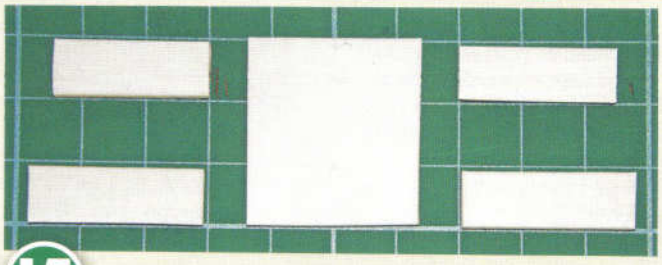
10 With all the components removed you will have a collection of parts like this. Note the orientation of the bogies and wire positions and record each stage on a digital camera as you work for later reference.

11 The chassis block needs a small area of metal removing from each corner to allow the 28mm Hi Bass speaker to fit. This area is marked in white on this image and needs to be repeated for each corner.

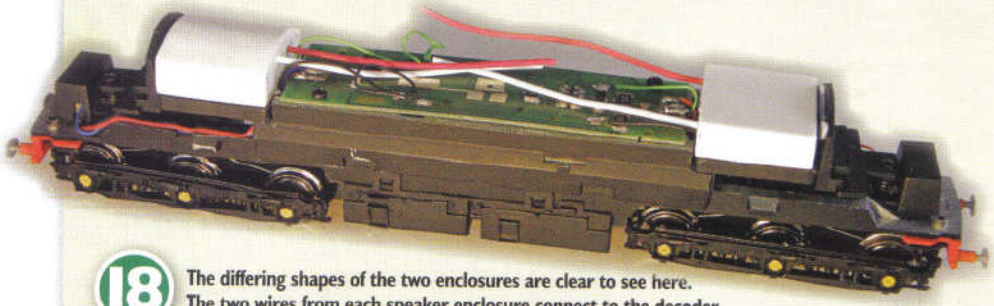




14 Because two speakers are being fitted, two different enclosures are required each made from 1.5mm plasticard. This set of parts – made to the dimensions in the diagram on page x – create the enclosure for the non-fan end of the locomotive. Assemble with liquid plastic cement.



15 The fan end of the locomotive requires a flat topped speaker enclosure. These are the parts, again cut from 1.5mm plasticard.



18 The differing shapes of the two enclosures are clear to see here. The two wires from each speaker enclosure connect to the decoder.

19 To create a 'Stay Alive' package for the Class 37 four 100uF capacitors have been joined together in parallel.

Push one end of a cardan shaft into the end of one of the brass flywheels. Note that there are slots in the flywheel to accommodate the pins on the shaft. Make sure it is fully 'home'.

Introduce the bogie, feeding the wires through the chassis first. Ensure that as you engage the bogie clips the cardan shaft mates correctly. Repeat for the other bogie. If you have not done so already, attach the bufferbeam assemblies.

Refit the LEDs, their housings and the cab interior assemblies and finally solder the black and green wires to the circuit board. If you have refitted the bogies to the chassis in the right order, the wires will be on the correct side of the board. If not they will be crossed.

Tidy up the wires and make sure there is no chance of wires accidentally contacting any moving parts. Use BluTak, tape or glue if necessary.

Fitting the speakers

You should now have a complete running chassis that looks like Step 17. Test it first using DC power for any problems before adding the decoder. Step 18 shows the eventual position and orientation the speaker will adopt when finally fitted. There will be sufficient clearance for the speakers to operate normally.

There are two more enclosure designs for this version. These are built from 1.5 mm styrene sheet. As before, I have designed the largest capacity possible. The design shapes and dimensions are shown on page 87. The flat-topped enclosure will sit under the roof fan, from which you will need to snip off the four tiny locating pins.

Having carefully soldered wires to them, fit your speakers to the enclosures, feeding the wires through holes drilled in the ends. If there are any small gaps, seal them completely.

Mount the completed speaker assemblies on the chassis, the flat-topped enclosure at the roof fan end. To fix the enclosures in place I used a couple of small ball shaped pads of BluTak at the inner ends of the speakers and a thin strip of it to hold them to the cab's rear bulkheads.

When the body is refitted, the BluTak will deform to allow the enclosure to fit snugly whilst still preventing vibration between the various components. However, before refitting the body, there is a little more work to do.

Fitting the decoder

Having already ensured the locomotive works as expected on DC, remove the blanking plug from the 8-pin decoder socket.

The MX645 sound decoder is one of the latest generation from Zimo. This example was from a batch specially produced by Zimo for Digitrains. It was loaded with the Digitrainsounds Class 37/4 sound project which really rattles the windows if given its head. The decoder includes both special hardware to allow simple connection of inexpensive capacitors and software to make best use of them.

Zimo has offered such a system for several years, though not always fully integrated as now. In more recent times, Lenz has introduced an excellent but much more expensive module for use on some of its decoders, and ESU has recently announced a similar module for its soon to be released V4.0 range of decoders.

There has been some debate on forums recently about the virtues of 'stay alive'

WHAT WE USED

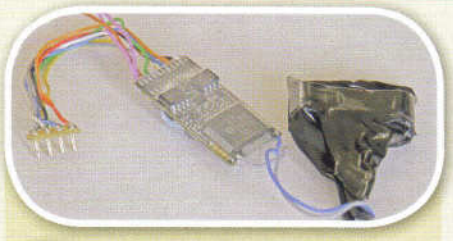
Product	Cat No.	Manufacturer	Price
Class 37/4	V2033	ViTrains	£75.00
Sound decoder	MX645	www.zimo.at	£74.00
28mm Hi Bass speaker	8ohm 2W	www.digitrains.co.uk	£6.76

12 Use a fine tooth junior hacksaw to make a horizontal and vertical cut to remove the unwanted areas of metal to create cuts like this.

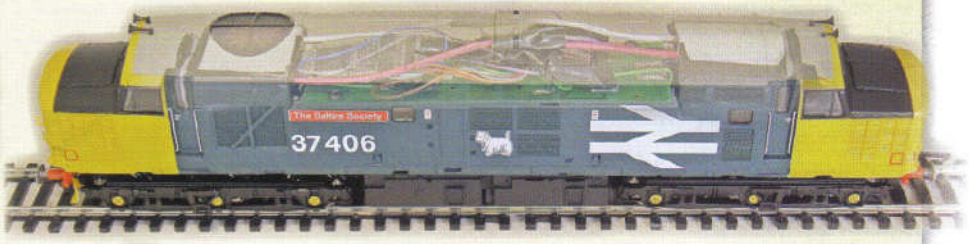
13 With the material removed the 28mm speaker will now fit easily into the available space. The chassis can now be reassembled using the notes in the main text – essentially the reverse of the process detailed here.

16 Feed the speaker wires through a pair of 2mm diameter holes in one side of the speaker enclosure and fix the speaker in place with Blu tak.

17 The whole assembly can then be fitted into the reassembled chassis and held in place with Blu Tak.



20 The two tabs on the decoder are used to connect the capacitors to the chip, being careful to minimise heat when soldering.



21 The finished installation fits neatly inside the bodyshell of the ViTrains Class 37. The next part of the project is to develop the sound file for that characteristic growl. This will be detailed in HM47.

technology. Some hold the view that it papers over the symptoms of poor track laying, wiring and maintenance. I would always advocate best practice in both wiring and cleanliness of track and locomotives - but the sceptics overlook other benefits beyond the ability to run on less than scrupulously clean track. 'Stay alive' capacitors are connected to and controlled by the DCC decoder and act like small rechargeable batteries. I briefly mentioned last time that there is one downside of this; that the charging of capacitors can cause a surge in current drawn when the layout is powered up. This effect, known as 'in-rush current' is multiplied by the number of capacitor equipped locomotives on the tracks. This can be severe enough for your DCC system to detect a non-existent short and shut down to protect itself. This is not a useful feature at all. Additional circuitry is needed to control the charging to avoid this eventuality and this is now being added to new ranges of decoders as part of the basic design.

In addition to the high-end makes mentioned above, some of DCC Concepts' soon to be released non-sound decoders have this feature too. The net effect of the system is to provide enough power to bridge any temporary breaks in electrical contact with the track but it can be used in a more sophisticated way. Lenz and ESU have a system that allows the DCC signal to be read by the decoder, even on dirty track. Zimo use a technique called 'Smart Stopping'.

Although not widely advertised, this feature is always active so long as a 'stay alive' capacitor is fitted. Unlike the Lenz and ESU systems, 'Smart Stopping' is designed to prevent the locomotive from coming to a complete stop on a dirty or otherwise electrically dead section of track. Essentially, when you instruct your locomotive to stop, the decoder will check for available track power until the locomotive comes to a full stop. If power is lost during deceleration, the decoder automatically keeps the motor running by using the capacitor's available energy. It will continue at the speed step in use until track power is detected again. The decoder then recharges the capacitor and continues to slow the locomotive to a halt. This will happen on each power interruption, but is so quick it will normally go completely unnoticed in operation.

When the locomotive comes to a halt, the decoder continues checking for power and if it is lost moves the locomotive again in the same direction and at the lowest speed step until power is restored. The operator will not usually notice anything since dirty track sections are usually extremely short. 'Smart stopping' ensures that the decoder remains powered and the capacitor fully charged until you are ready to drive off again.

This ability of Zimo decoders to continuously check for track power and manage a 'stay alive' capacitor to smooth out power to the motor also allows the world class slow-speed running that Zimo users value.

Having checked the space available, I used four 100uF capacitors wired together in parallel and soldered to the wires already provided on the MX645 and indicated in the instruction manual. The capacitors are polarity sensitive so it is important to connect the Grey (negative) wire from the decoder to the shorter (negative) wires from the capacitors. The decoder's Blue (positive) wire should connect to the longer (positive) capacitor wire.

I insulated all exposed wires, installed the speakers and capacitors and plugged in the decoder. A final scrutiny that all was OK preceded a first DCC test run and sound check. The body was then finally reassembled, and the detailing parts included with the model were fitted.

NEXT ISSUE

I'll explain how to build a diesel sound project in ZSP including a way to get your Zimo decoder to simulate how a real Class 37 locomotive would sound in service.