

LARGE SCALE 'RAT'

Using a Zimo decoder and Surface Mounted LEDs, **MIKE WILD** sets out to give Heljan's latest 'O' gauge diesel a suite of individually controlled lighting functions as well as a full set of sounds.

INSTALLING DIGITAL SOUND decoders is always rewarding, no matter what the scale.

For this issue's project we selected Heljan's latest 'O' gauge ready-to-run diesel locomotive – the Class 25/3 (HM138) – as the basis, though the basic principles can be applied to the majority of this manufacturer's twin motor diesel locomotives.

The idea was to show how sound can be installed while also enhancing the model's functionality to include separate control of the head and tail lights, cab lights, roof fan and the addition of lighting behind the control desk to simulate the light of dials in the cab. Making this type of lighting configuration change is tricky in a 'OO' gauge locomotive due to its size, but with an 'O' gauge model there is more space available to accommodate the additional circuit and components that we need to use.

Separating the head and tail lights is a great way of introducing more realism to operation of a locomotive. On the real railway locomotives would only have tail lights illuminated when running light, so in most model circumstances when a locomotive is coupled to a train there should be no rear lights switched on.

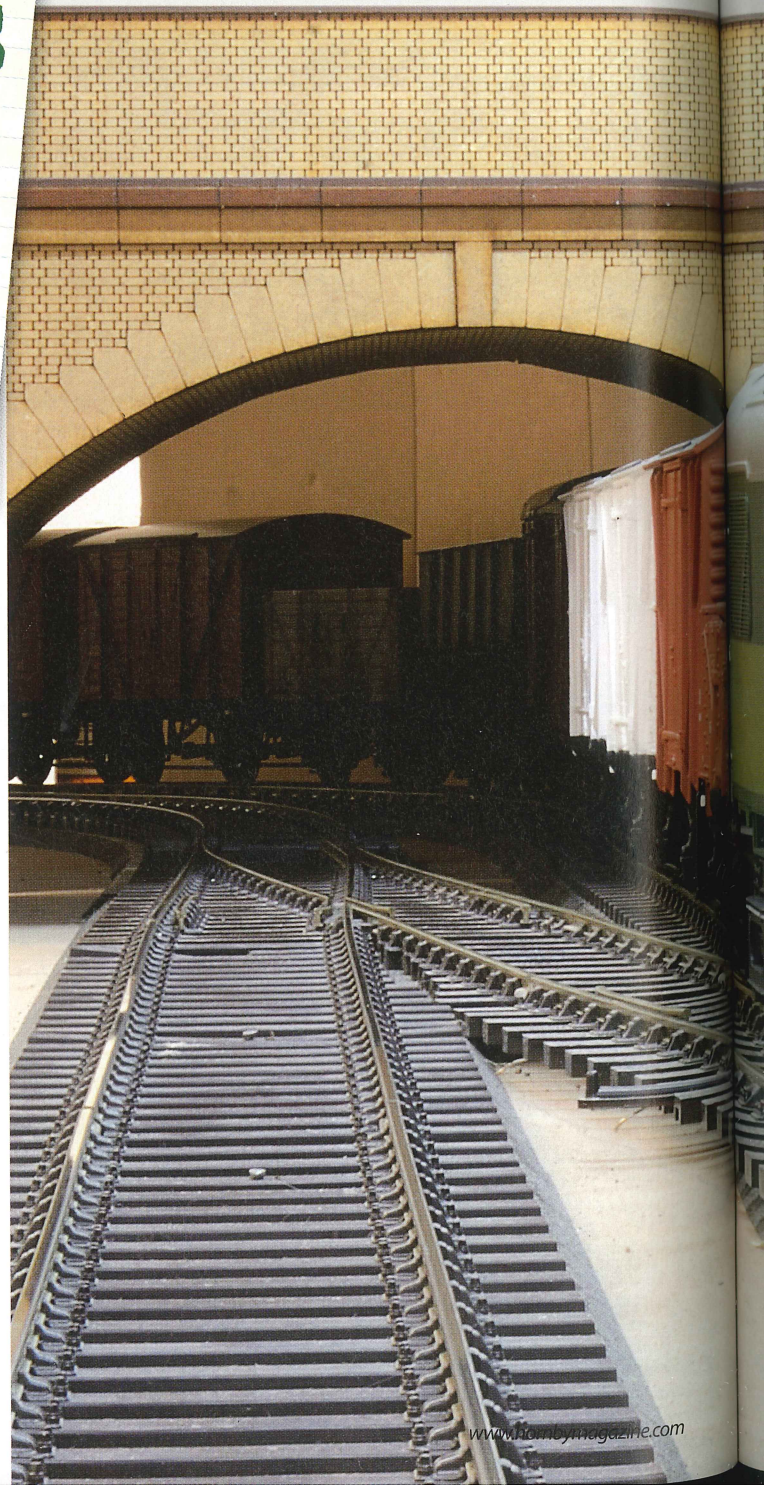
Ready-to-run models generally overlook this important lighting standard, but by using Function Outputs (FO) 1 and 2 from the MX696KS decoder board for the tail lights we can make it so that pressing F0 on the controller only lights the headcode panels and the addition of pressing F21 lights the tail lights. Due to the way the sound project has been designed on the ZS25ASL Active Drive file we are using from Digitrains, F21 is directional so long as the control wires (purple and green) are connected the right way around »

TOOLS

- » Soldering iron
- » Solder
- » Wire strippers
- » Insulation tape
- » Black tack
- » Craft knife
- » Pin vice and 2mm drill bit

SOUND FUNCTIONS

F0	Lights on/off
F1	Sound on/off
F2	Brakes
F3	Single horn low
F4	High-low horn
F5	Light engine mode
F6	Engine idle/coasting
F7	Speed lock
F8	Engine 'on'
F9	Flange squeal
F10	Single horn high
F11	Low-high horn
F12	Spirax valves
F13	Wagon buffering
F14	Combined pump
F15	Roof fan
F16	Station announcement
F17	Guard's whistle
F18	Door open/close
F19	Fade all sounds
F20	Shunting mode
F21	Tail lights, directional
F22	Cab lights, directional
F23	Detonators
F24	
F25	
F26	
F27	Volume down
F28	Volume up



DIGITAL CONTROL

GO ONLINE!
VISIT WWW.HORNBYMAGAZINE.COM
TO SEE THIS IN ACTION

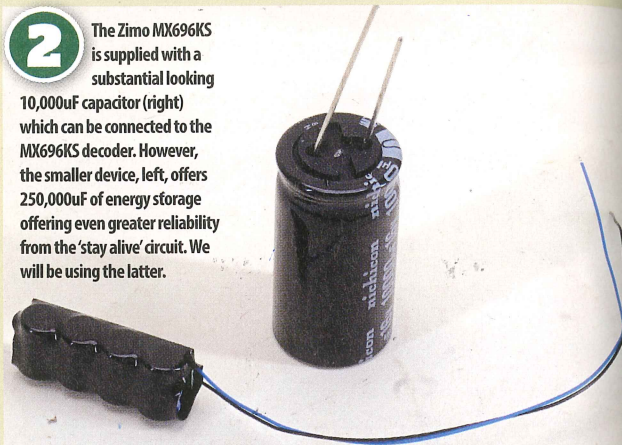
Newly equipped with a full suite of lights plus digital sound, cabside numbers and a driver, Class 25/3 D7627 heads a goods into the loop on Hornby Magazine's 'O' gauge test track.



1 Heljan's new 'O' gauge Class 25/3 is the subject for this installation. Using a Zimo MX696KS decoder, 'stay alive' capacitor unit and Kytes Lights Surface Mount LEDs (SMDs) it will have a full range of sound and lighting functions installed.



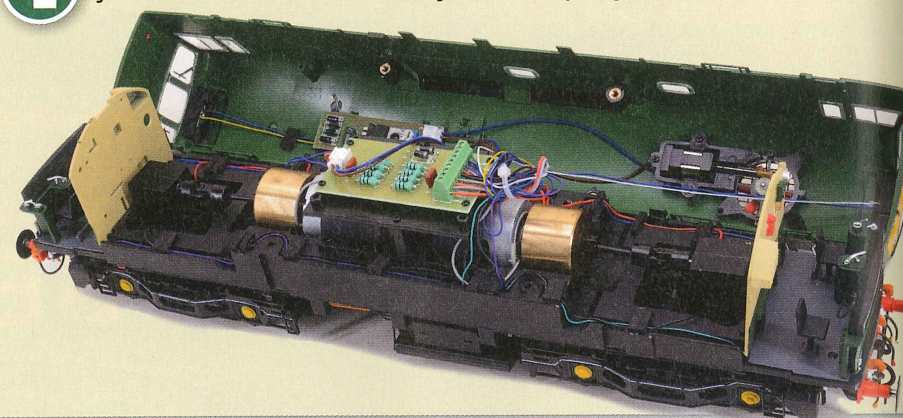
2 The Zimo MX696KS is supplied with a substantial looking 10,000uF capacitor (right) which can be connected to the MX696KS decoder. However, the smaller device, left, offers 250,000uF of energy storage offering even greater reliability from the 'stay alive' circuit. We will be using the latter.



3 The Class 25 body is secured to the chassis with four crosshead screws located at the inner end of each bogie. Once these have been removed the body lifts clear, but be aware of the wiring to the roof for the fan and lighting.



4 Inside the locomotive the twin motors, control board and wiring are all dear to see. What isn't so dear at this stage is that the cab lights are wired into the same circuit as the headcode lights which makes separating them more difficult.



in the terminals for FO1 and FO2.

Heljan's wiring for the Class 25 cab interior lights means that they are switched as standard by FO on a DCC handset. This is because they are mounted on the rear of the headcode lighting circuit board which makes them difficult to separate. To 'turn off' the original cab lights on our model we blanked off the Light Emitting Diodes (LEDs) with Black Tack (high strength semi-permanent adhesive with similar properties to Blu Tack) and then added our own Surface Mounted LEDs (SMDs) from Kytes Lights. These require a resistor to be added to the black lead which is in turn connected back to the common positive feed on the decoder circuit board while the white wire from the SMD is connected back to the relevant FO terminal on the decoder baseplate. In this case FO3 and FO4 are used for the cab lights which, again, alternate with the direction of travel using button F22 to turn them on and off.

Another revision to the wiring was to make the roof fan switchable on its own. Through the assistance of Digitrains and the sound project author Paul Chetter we were able to remap the button which controls

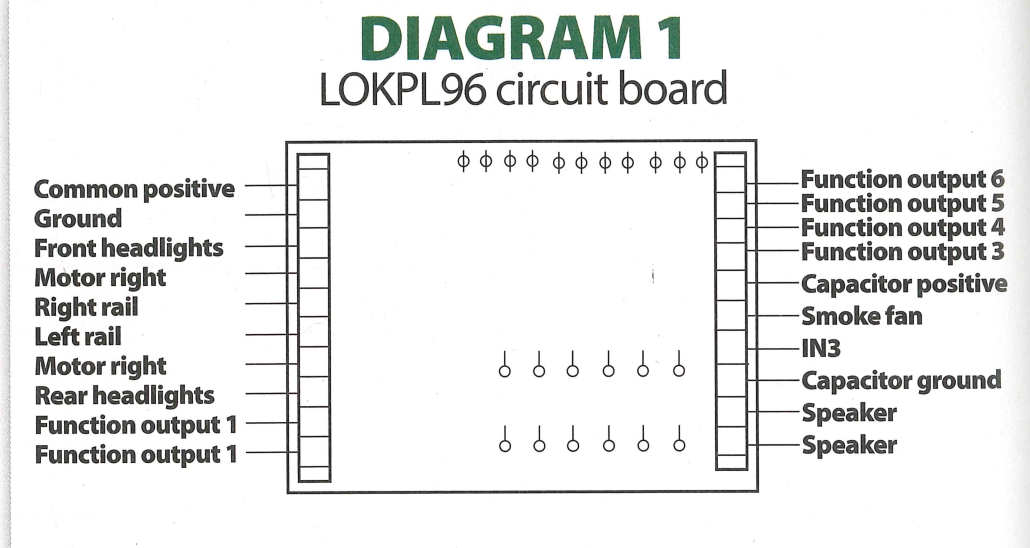


Diagram 1 – MX696KS baseplate connections for Heljan Class 25/3. Visit www.zimo.at for full wiring diagrams for the MX696 series decoders.

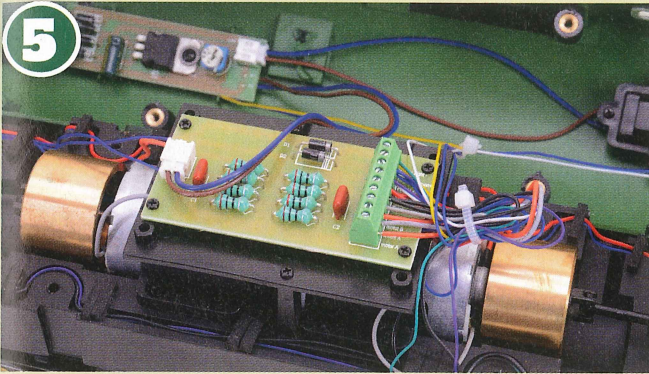
FO5 so that on pressing F15 on our handset, the fan would run at the same time as the fan noise being played from the decoder.

We could have left the project there, but we had one more use for SMDs in the Class 25 – cab control desk lighting. This was a little trickier to install due to the space available, but we were able to drill holes through the control

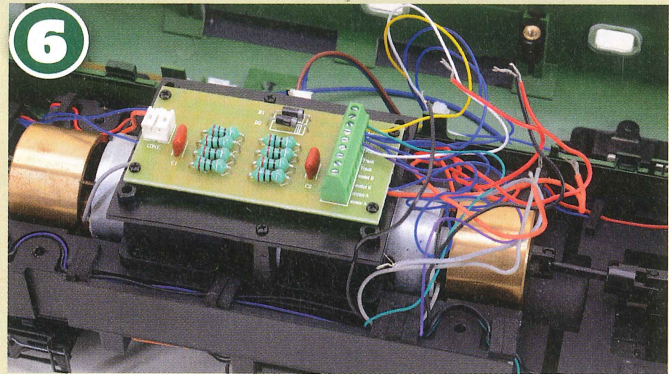
desk to allow light to pass through and position an SMD on the front bulkhead behind the desk. The rear of the cab desk and the gauge apertures were then painted white and the rear was sealed to stop light escaping using a piece of white plasticard to reflect more of the light back through the gauges. Connections for this were made to the headlight terminals on the

decoder baseplate so that the gauge lights came on with the headcode lights. The black wires from each end were joined to a resistor and, in turn, to the common positive feed entering the tail light circuit boards at each end to avoid another pair of wires running the length of the locomotive.

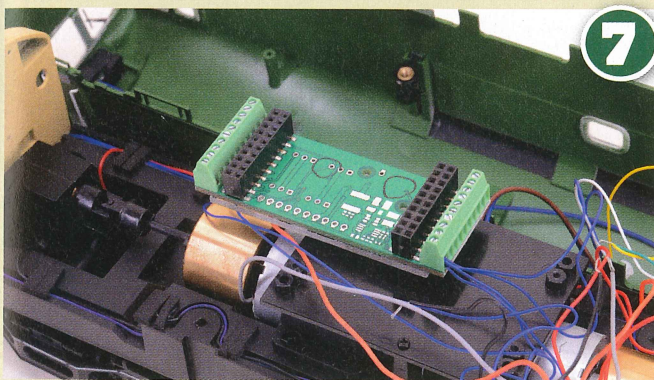
Building up the operational functions of the Class 25 has been a



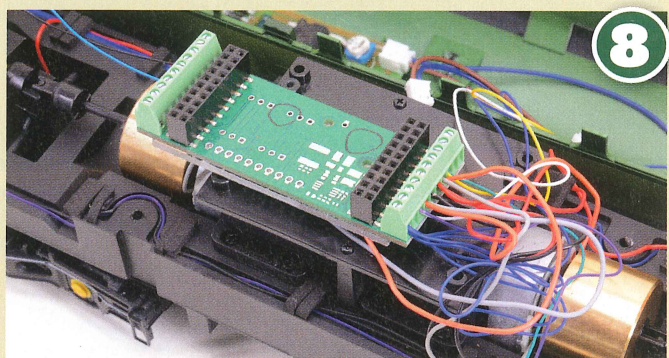
A central circuit board takes care of power distribution from the pick-ups to the motors, lights and roof fan. To change the 25 to work with DCC, this circuit board needs to be removed and replaced by a decoder - the Zimo MX696KS in this case.



The wiring is colour coded in the Class 25. Blue are common positive feeds for the lighting functions, red and black are track connections, orange and grey are motor feeds while yellow, purple, green and white are all light functions. Undo them carefully and keep track of which is which.



The Zimo MX696KS comes as a baseplate and decoder. The decoder will only work when correctly aligned with the pen marks on the baseplate. All wiring connections are made to the baseplate - here we have started by adding the blue common positive wires for the lighting functions.



The orange wire from motor one and the grey wire from motor two need to be joined together and connected to the motor right connection on the baseplate while the grey wire from motor one and orange wire from motor two need to be connected to the motor left terminal. This ensures that both motors run in the same direction. The red and black track pick-up wires have also been connected here.

DIAGRAM 2 Speaker wiring in series

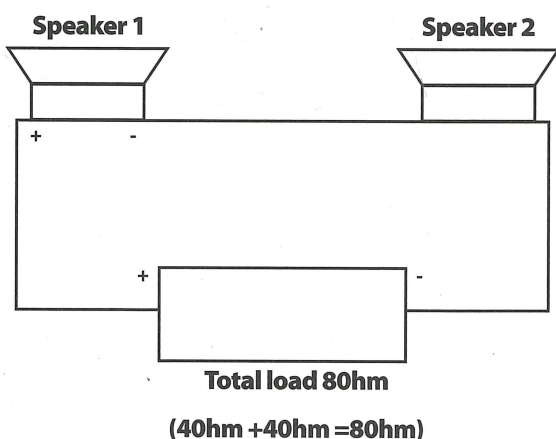


Diagram 2 - Series speaker wiring

challenging but rewarding project which has been finished off with the addition of a ModelU 3D printed diesel locomotive driver (Cat No. 1105) for the No. 1 end cab and a set of cabside numbers made up from Fox Transfers individual

letters and numbers for 7mm scale (sheet FRH7005). The result is a fully functioning locomotive with high value lighting and a brilliant sound output too.

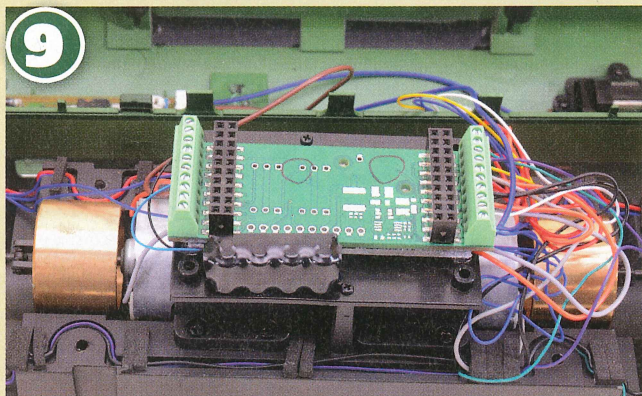
Follow the step by step guide to see the full installation process. www.hornbymagazine.com



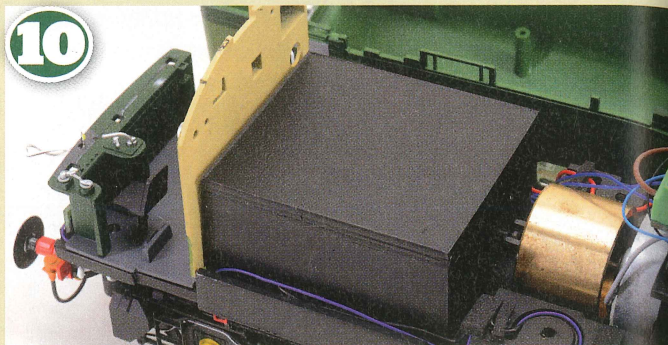
The cab desk lights are effective once the inside of the openings are painted white to reflect the light more evenly.

WHAT WE USED

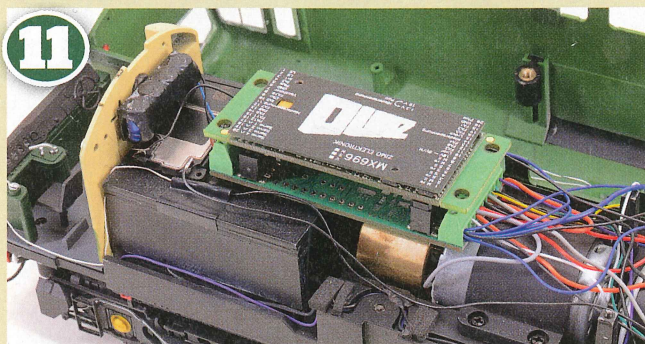
PRODUCT	SUPPLIER	CAT NO.
Class 25 ActiveDrive sound file	www.digitrains.co.uk	ZS25ASL
Zimo MX696KS large scale decoder	www.digitrains.co.uk	MX696KS
250,000uF 'stay alive' capacitor pack	www.digitrains.co.uk	860009
40hm twin speaker, 55mm x 24mm x 7mm	www.digitrains.co.uk	5235
Large iPhone speaker	www.roads-and-rails.co.uk	n/a
Black decoder wire	www.digitrains.co.uk	1216
7mm scale diesel locomotive numbers	www.fox-transfers.co.uk	FRH7005
BR seated driver	www.modelu3d.co.uk	1105



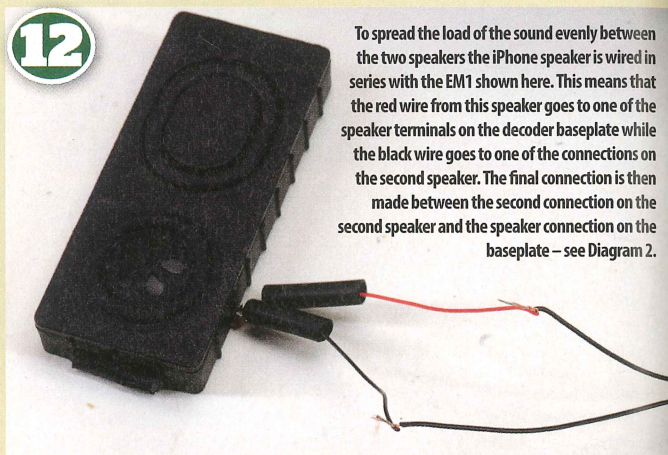
The capacitor wires are trimmed to length and the blue is then connected to the capacitor positive terminal and the black wire to the ground on the same side of the baseplate.



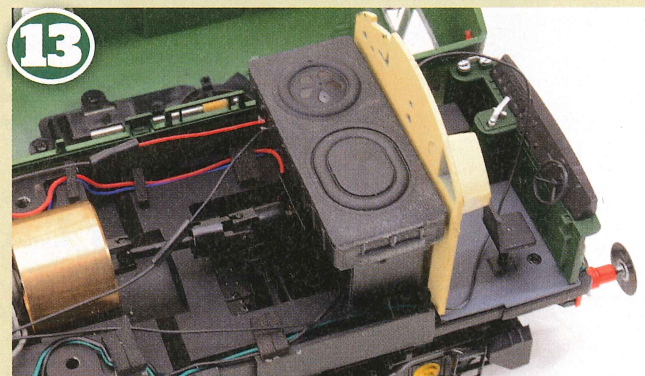
Following a test fit of the body, we found that the decoder was too tall to stand on the original PCB stand in the centre of the locomotive. To provide a stable base for the decoder and one of the speakers we built a 55mm long, 15mm tall and 44mm wide plasticard platform using layers of 1.5mm plasticard to support the new internal fittings.



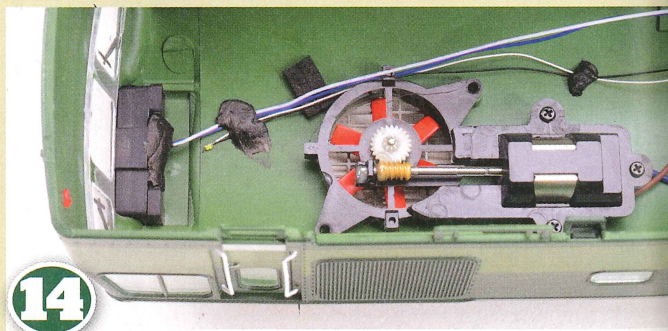
The final position of the decoder board saw it straddle the flywheel of motor two. It is fixed in place with high adhesive Black Tack. Behind, the capacitor pack is fixed to the rear of the cab bulkhead while the first of the two speakers – an iPhone speaker from Roads and Rails – has also been positioned on the rear platform.



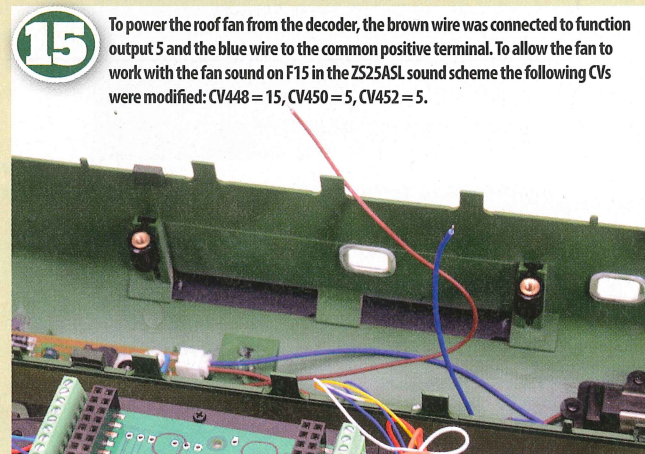
To spread the load of the sound evenly between the two speakers the iPhone speaker is wired in series with the EM1 shown here. This means that the red wire from this speaker goes to one of the speaker terminals on the decoder baseplate while the black wire goes to one of the connections on the second speaker. The final connection is then made between the second connection on the second speaker and the speaker connection on the baseplate – see Diagram 2.



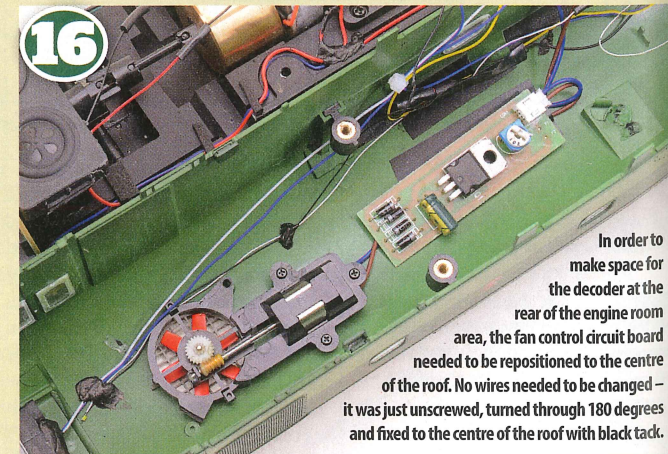
To spread the sound along the length of the locomotive the larger of the two speakers was positioned on a second platform at the front of the locomotive. By cutting off the end wings of the speaker moulding, it fitted in across the width of the Class 25 chassis.



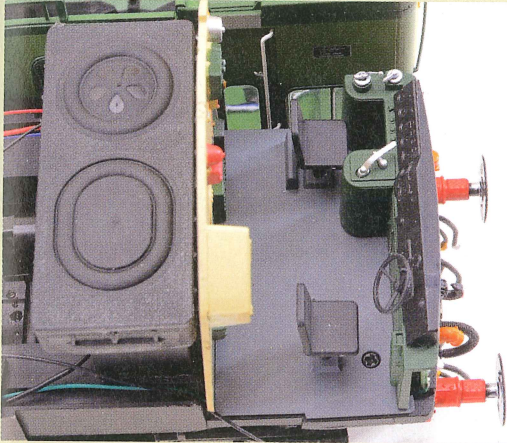
Cab lights were next on the agenda. First the original cab lights on the back of the headcode panels had to be blacked out using black tack. Next an SMD was fixed to the roof of the cab with a resistor added to the black positive wire. The positive wire was then connected back to the common positive terminal on the decoder baseplate while the white wire was connected to function output 3 for the leading cab. The process was repeated for the rear cab light with the white wire connected to function output 4.



To power the roof fan from the decoder, the brown wire was connected to function output 5 and the blue wire to the common positive terminal. To allow the fan to work with the fan sound on F15 in the ZS25ASL sound scheme the following CVs were modified: CV448 = 15, CV450 = 5, CV452 = 5.



In order to make space for the decoder at the rear of the engine room area, the fan control circuit board needed to be repositioned to the centre of the roof. No wires needed to be changed – it was just unscrewed, turned through 180 degrees and fixed to the centre of the roof with black tack.

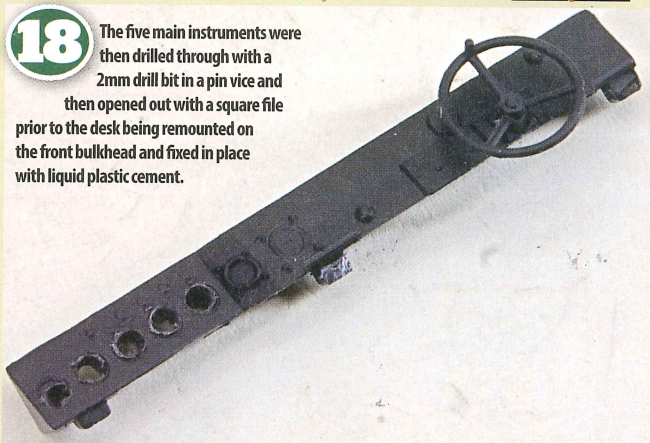


17

To add lights behind the cab desk instruments, the black upper section was carefully removed from the front bulkhead using a craft knife to lever it off its factory glue.

18

The five main instruments were then drilled through with a 2mm drill bit in a pin vice and then opened out with a square file prior to the desk being remounted on the front bulkhead and fixed in place with liquid plastic cement.



A 1mm hole was drilled through the bulkhead to allow the wires from an SMD to be fed through. The SMD was secured in place with superglue.



20

The white control wire from the SMD was then extended with a length of decoder wire with heatshrink insulation to protect the connection. It was then joined to the Front Lights connection on the MX696 baseplate so that the desk lights would come on with the headcode panel lights.



The black wire from the SMD was then connected to a 1.2k Ohm resistor which in turn was soldered to the blue common positive connection on the tail light panel below. This saved running another wire along the length of the locomotive to the decoder, but requires careful soldering.



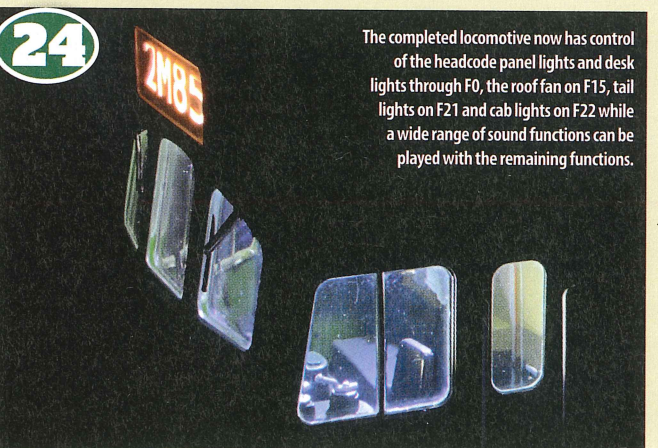
22

To provide reflection for the SMD under the black cab desk, the internal faces were painted white and a section of 1mm thick plasticard was cut to shape to fit at the back.



23

To ensure the light was leak free, black insulation tape was placed over the back of the control desk and filled at the open end with black tack. The resistor and electrical connections for the positive wire below have also been covered with insulation tape.



24

The completed locomotive now has control of the headcode panel lights and desk lights through F0, the roof fan on F15, tail lights on F21 and cab lights on F22 while a wide range of sound functions can be played with the remaining functions.