

DECODING THE 21-PIN DECODER MAZE

EQUIPMENT GUIDE

Technology is constantly evolving, and this is certainly true of Digital Command Control (DCC) motor control decoders.

MARK CHIVERS surveys a selection of recent 21-pin examples in our latest Equipment Guide.

IT IS AMAZING to think how quickly the hobby has embraced digital technology. Cast your mind back a few years and the prevalent decoder socket type was an 8-pin example, while decoder options were limited and often quite expensive. Fast forward to today and we have four-pin, six-pin, eight-pin, Next18, 21-pin, PluX22 and more options available, at prices to suit all pockets. Not only that, as new models are developed so too is the sophisticated onboard technology required to operate them with digital control in mind. To fully appreciate



For our latest Equipment Guide six of the best 21-pin locomotive decoders from the £15-£25 range were tested side by side to establish which was best using Dapol, DJ Models and Bachmann locomotives in 'OO' gauge.



some of the capabilities of the lighting systems and other onboard accessories, equally capable digital decoders are required.

Recent 'OO' gauge releases from Bachmann, Dapol and Realtrack Models have expanded the envelope in terms of what is required to operate elements such as independent lighting which may include directional/independent head and tail lamps, cab lights, halo lighting, day/night modes, headcode illumination, parking lights at both ends and more.

One solution to the increased requirement for functionality was the adoption of the 21-pin MTC direct plug decoder, developed by ESU for Marklin and Trix products – hence MTC. It offered more functionality, particularly for sound-equipped models which were proving popular at the time. Bachmann was the first British outline manufacturer to adopt the new decoder type for its 'OO' gauge Branchline models with both Digital Command Control (DCC) ready/DCC onboard and DCC sound-fitted examples appearing. Hornby also subsequently adopted the 21-pin decoder for its DCC sound-fitted 'OO' models fitted with ESU sound decoder with other manufacturers following suit for some of their 'OO' models too.

As a result, decoder manufacturers including DCC Concepts, ESU, Lenz, Zimo and more have developed expanding ranges of compatible 21MTC decoders, although the specification has changed slightly from the original concept. Often referred to as 21MTC interface or

NEM660 decoders, they include additional functionality without the need for extra wires – such as a series of full functions together, in some cases, with logic level functions, which require further amplification – and may require the decoder to be put in MTC mode. This is usually as simple as a quick Configuration Variable (CV) value change. Some 21MTC decoders are supplied ready to go.

Of course, no wires results in simpler and cleaner digital installations beneath a locomotive or multiple unit bodyshell, leaving extra space for digital sound speakers or extra accessories such as operating roof fans or smoke generators.

Close inspection of any 21-pin decoder will actually reveal 22 holes, one of which acts as an index point. This blank hole needs to match with the 'missing' pin on the 21MTC socket within the locomotive. Usually the decoder is placed with the connector facing up, but occasionally the decoder may need to be placed upside down – such as the case with Dapol's original batch of 'OO' gauge Class 73 electro-diesel models. It is important to double-check the orientation and ensure the decoder is correctly lined up, so as not to damage or weaken the socket pins.

Whilst not exhaustive, the following Equipment Guide offers a snapshot of recently issued 21-pin examples, primarily focused on value for money, power ratings, size, function outputs and more. **16mm**

BACHMANN 36-557



- Price: £21.95
- Cat No: 36-557
- Function Outputs: 4 (+2 logic)
- Size: 24.5mm x 15mm x 4.5mm
- Rating: 0.9A

INTRODUCED in late 2017, Bachmann's latest iteration of its four-function 21-pin digital decoder now features four full function outputs together with two logic outputs. So as not to be confused with the previous offering which carries the same reference number (Cat No. 36-557), this new version is supplied in a see-through blister pack with blue backing card and the decoder itself has a blue Printed Circuit Board (PCB), as opposed to the previous green example.

Rated at 0.9A continuous load, this latest version is derived from the well-respected ESU family. The specification is impressive boasting 250mA function rating per output (500mA total load), RailCom, RailCom Plus, Back EMF load compensation, two-digit and four-digit addresses, lighting effects and is suited to all motor types including coreless examples.

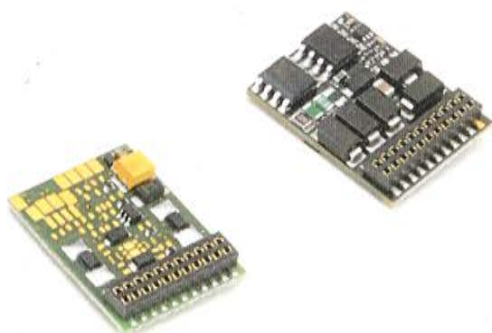
As supplied, Bachmann's decoder is set so that eight functions can be selected - Function 0 (F0) operates directional lighting, F1 and F2 control the aux 1 and aux 2 function outputs, F3 selects shunting speed, which reduces the motor speed while depressed, and F4 disengages the acceleration/deceleration momentum rate. F5 and F6 operate the additional logic function outputs on the 21MTC connector (aux 3 and aux 4) which can be utilised for additional lighting functions.

The decoder enables you to dim the overall brightness of lights as well as choose from a selection of lighting effects. Function mapping is supported, so functions can be moved to alternative buttons, while RailCom Plus offers bi-directional communication with a compatible DCC system, such as Bachmann's Dynamis Ultima.

On test, our decoder sample worked well with a selection of models demonstrating its additional light function capability to good effect too. It was simply a case of plug-in and off you go. For the price it offers great value and functionality.

USEFUL LINKS

Bachmann	www.bachmann.co.uk
Dapol	www.dapol.co.uk
DCC Concepts	www.DCCconcepts.com
ESU	www.esu.eu
Hatton's	www.hattons.com
Lenz	www.digital-plus.de
Zimo	www.zimo.at



DAPOL IMPERIUM 1

DAPOL'S new six-function 21-pin MTC decoder appeared in early 2018 answering a need for additional functionality for its own 'OO' gauge Class 68, as well as the new wave of models which feature increasingly demanding digital circuitry.

Whilst billed as a six-function decoder, it provides four full power outputs and two logic outputs and straight from the box our sample worked as intended when placed in Dapol's 'OO' Class 68 without having to be reprogrammed, displaying independent head and tail illumination and the additional halo lighting. The Imperium 1 adopts the ESU implementation of standards for the 21MTC interface to match equivalent sound decoders from ESU, as well as Zimo

- Price: £22.95
- Cat No: Imperium 1
- Function Outputs: 4+2 logic
- Size: 17.5mm x 16mm x 4mm
- Rating: 1.0A (2.0A peak)



products. In non-MTC mode, the four main functions will operate.

With a 1.0A continuous rating (2.0A peak), it is suitable for most 'OO' gauge models as well as Dapol's smaller 'O' gauge locomotives such

as the Class 08, 'Terrier', 'Pannier' and 'Jinty'. Each function output is rated at 100mA, while functions can be remapped to operate on alternative buttons. It also offers Back EMF, lighting effects, standard

and advanced speed setting options, advanced consisting, a useful decoder lock and more. Railcom is not supported, but the decoder does come with a ten-year guarantee – plus it is one of the smallest decoders within this guide. Again, it is supplied unwrapped, so it is worth checking clearances on the chassis ahead of any reassembly.

Whilst on test, our sample of the 21-pin Imperium 1 offered impressively smooth, quiet motor control with excellent functionality and proved a consistent and reliable performer in a selection of 'OO' models, representing excellent value for money. Clearly developed for Dapol's own products, it is equally at home in other manufacturers' models too. A detailed manual would be valuable, though.

DCC CONCEPTS ZEN 218

DCC Concepts' Zen range of digital decoders includes this Zen218 six-function decoder with 21MTC interface plus an 8-pin NEM652 plug-in JST socket, offering a versatile decoder suitable for either orientation.

Recently upgraded to six functions from four, it is rated at 0.75A continuous power – 1.1A peak, making it suitable for most (but not necessarily all) 'OO' gauge models and comes shrink-wrapped. If you have some older Heljan models, for example, it would be wise to check the power draw before installing.

Amongst the specification, the Zen218 offers six 100mA full lighting/accessory functions,



- Price: £22.96 ● Cat No: Z218
- Function Outputs: 6
- Size: 22mm x 16.5mm x 4mm
- Rating: 0.75A (1.1A peak)

lighting effects, Back EMF, short and long addressing, advanced consisting and it comes with a separate 'stay-alive' capacitor, which

can be soldered to the decoder via the attached blue and black wires.

Lighting effects include a fluorescent flicker, useful for

modern style locomotives and units, and firebox flicker too.

Acceleration, deceleration and maximum speed can be determined through CVs 2, 3, 4, 5 and 6 (0-255 range) or extended speed table.

As a 21-pin decoder, six functions are available when plugged into the socket, while as an 8-pin decoder, three wires will need to be connected to use aux 2, 3 and 4. However, it did prove more awkward to activate the functions for aux 3 and aux 4 on our sample. That said, motor control was very good, offering consistent, smooth and quiet drive and the flicker lighting effect is particularly effective.

DCC 21-PIN DECODER COMPARISON

DECODER:	36-557	10321-01	ZEN 218	MX638D	IMPERIUM 1	DCR-21PIN
Manufacturer:	Bachmann	Lenz	DCC Concepts	Zimo	Dapol	Hatton's
Continuous motor current (max):	0.9A	1.0A	0.75A	1.0A	1.0A	1.1A
Motor stall current:	-	1.6A	1.1A	1.5A	2.0A	1.6A
Function current (per output):	200mA	500mA (500mA total)	100mA	800mA total	100mA	200mA
Dimensions (mm):	24.5 x 15 x 4.5	20.5 x 15.5 x 4	22 x 16 x 4	20.5 x 15 x 4	17.5 x 16 x 4	17.5 x 15.5 x 3.5
Connection:	Direct plug	Direct plug	Direct plug	Direct plug	Direct plug	Direct plug
Decoder reset:	CV8=8	CV8=8 or CV8=33	CV8=8	CV8=8	CV8=4	CV8=8
Locomotive addresses:	1-9999	1-9999	1-9999	1-10239	1-9999	1-9999
Speed steps:	14/28/128	14/27/28/128	14/28/128	14/28/128	14/28/128	14/28/128
Full function outputs:	4	5	6	6	4	4
Logic level outputs:	2	x	x	2	2	x
Advanced consisting:	✓	✓	✓	✓	✓	✓
Decoder lock:	-	x	✓	✓	✓	✓
Energy storage:	x	x	✓	x	x	x
Supports Railcom/Railcom Plus:	✓	✓	x	✓	x	x
Short addressing:	✓	✓	✓	✓	✓	✓
Long addressing:	✓	✓	✓	✓	✓	✓
Analogue DC operation:	✓	✓	✓	✓	✓	✓
Directional lighting (F0):	✓	✓	✓	✓	✓	✓
Lighting effects:	✓	✓	✓	✓	✓	✓
Supports auto signal/controlled stopping (ABC etc):	✓	✓	x	✓	x	x
Three-point and full speed curve:	✓	✓	✓	✓	✓	✓
Service Mode programming:	✓	✓	✓	✓	✓	✓
Operations Mode programming:	✓	✓	✓	✓	✓	✓
Load compensation (Back EMF):	✓	✓	✓	✓	✓	✓
Updateable:	✓	-	x	✓	-	x
Price:	£21.95	£32.25	£22.96	£20.00	£22.95	£15.00

HATTON'S 21-PIN DIRECT

HATTON'S bespoke budget four-function 21-pin DCC decoder has been in the range for some time now, offering a 1.1A continuous motor rating (1.6A peak), together with four 200mA rated function outputs.

In terms of overall size, this is one of the smaller 21-pin double-sided decoders available and measures just 22mm x 16mm x 4mm and also comes shrink-wrapped. Features include two-digit and four-digit addressing (1-9999), self-adjusting Back EMF, function mapping, brake on DC, light effects, silent drive and more. Despite its budget price, Back EMF can be set to switch off at certain speeds which may benefit double-headed consists and functions can be remapped to alternative buttons.

- **Price:** £15
- **Cat No:** DCR-21PIN-Direct
- **Function Outputs:** 4
- **Size:** 17.5mm x 16mm x 3.5mm
- **Rating:** 1.1A (1.6A peak)



RailCom is not featured and while the decoder is NMRA compliant, the retailer's website

suggests it is incompatible with Hornby's Elite and Select systems, although during our tests using

an Elite it appeared to work fine and performed well. Light effects include single flash, double flash and firebox flicker. Functions three and four (aux1/aux2) can be set as directional functions or set to be on all the time and the function outputs will operate additional accessories such as a smoke unit, provided it is within the 200mA rating of the function output.

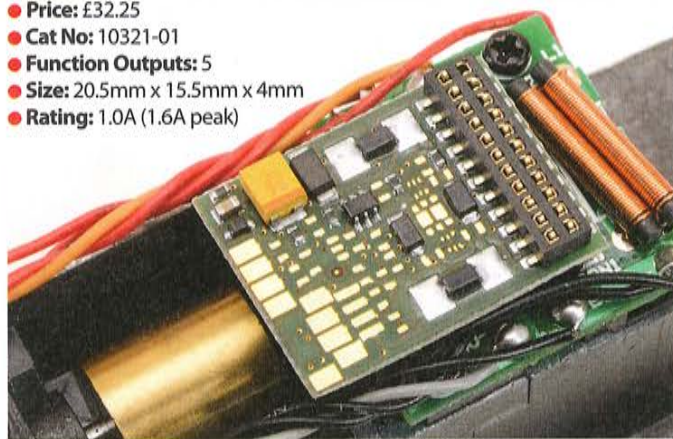
Given that the list of accessible CV values is a little more limited than some of the fully specified decoders, smooth and quiet running is possible, and it is programmable on the main running line as well as the programming track. As a budget decoder the Hatton's 21-pin example is an accomplished offering and delivers a good value specification for the price.

LENZ SILVER21+

LENZ has been a highly regarded digital player in the hobby since the late 1980s/1990s and the basis of today's NMRA DCC standards were influenced by the company's president, Bernd Lenz.

Amongst the Gold, Silver and Standard motor control decoders is the Lenz Silver 21+, a five-function 21-pin digital decoder which offers high frequency motor control, Back EMF, lighting effects, RailCom, Automatic Braking Control (ABC) capability, short and long addressing, 14/27 or 28/128 speed steps and supports all forms of programming. Each of the five onboard functions features a 500mA rating per output (500mA total load) and the decoder comes with a 1.0A continuous and 1.6A peak motor rating.

- **Price:** £32.25
- **Cat No:** 10321-01
- **Function Outputs:** 5
- **Size:** 20.5mm x 15.5mm x 4mm
- **Rating:** 1.0A (1.6A peak)



This feature-rich decoder also has the ability to operate automatic uncoupling and is suitable for use with six different motor types, which can be selected to further fine tune the model's

running characteristics. Top speed, acceleration and deceleration rates can be determined through standard CVs or extended speed table, with 0-255 speed settings available for each CV.

The Lenz Silver 21+ decoder's factory default is set so that F0 operates directional lighting, F1 and F2 operate aux 1 and 2 respectively, F3 instigates shunting speed, F4 disables acceleration and deceleration momentum and F5 operates aux 3 – effectively three functions in addition to directional lighting.

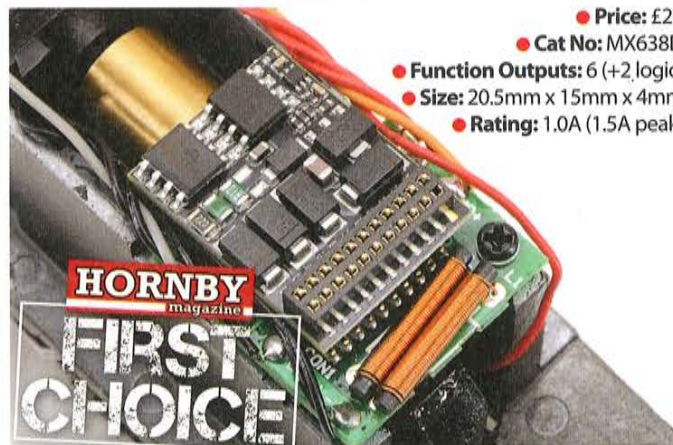
As expected, this decoder operated superbly throughout our tests, demonstrating fine control and smooth operation, with plenty of scope to hone the running characteristics even further through its supported CV settings. While the Lenz Silver 21+ is a little more expensive than some of its rivals, it is certainly the case that you get what you pay for – a quality decoder with plenty of versatility and excellent motor control.

ZIMO MX638D

ZIMO'S MX638D six-function 21-pin decoder is the latest addition to its £20 economy range.

Similar in most aspects to the popular 1.2A (2.5A peak) MX634D, the MX638D is a slightly pared down version with a motor rating of 1.0A (1.5A peak), which should be ample for most 'OO' gauge models and lacks the onboard 'stay alive' circuitry of its more expensive counterpart. However, a separate charging circuit unit, such as Zimo's SACC16, could be attached if required.

Its sleek appearance belies the technology onboard as this decoder boasts six full functions rated at 800mA total, two logic outputs (totalling eight functions in all), two-digit and four-digit addressing (1-10239), built-in thermal cut-outs, overload protection,



- **Price:** £20
- **Cat No:** MX638D
- **Function Outputs:** 6 (+2 logic)
- **Size:** 20.5mm x 15mm x 4mm
- **Rating:** 1.0A (1.5A peak)

Back EMF, 20kHz or 40kHz 'silent drive', extensive selection of light effects including fade in/fade out headlights and dimming, shunting mode, advanced consisting, automatic signal/brake distance

controlled stopping capability and it is RailCom equipped. Standard three-step and 28-step speed curves can be applied and the MX638D is suitable for all motor types including coreless examples.

As well as the impressive specification, this decoder also features Zimo's signature smooth motor drive and certainly proved quiet and controllable throughout the speed steps whilst on test. When all the factors are taken into consideration the MX638D certainly offers excellent value for money with its smooth operating characteristics, functionality, power rating and £20 price point. Looking to the future, the software can also be updated to take advantage of upgraded features too, which is an added bonus.

Incidentally, Zimo's range of motor decoders is set to expand further shortly with the addition of a new MX636D eight-function 21-pin decoder with 1.8A motor rating (2.5A peak) and two logic/servo outputs.