

TRAIN DRAWGEAR (WITH A SOUPCON OF BRAKING)

Another complex subject, so I will only scratch the surface and direct you to look at the likes of Wikipedia and RMWeb if you want to know more.

From the Big Four period to today’s railway, the coupling and braking systems have, unsurprisingly, developed alongside all the other technology.

Passenger stock

I’ve seen a record stating that the first air-braked passenger train on BR didn’t run until 1966, but some air-braked passenger stock ran much earlier, for example the LNER (GE section) commuter trains used the Westinghouse-pump system. The Westinghouse system was patented 150 years ago in 1868! In fact, although much passenger stock was vacuum braked there was still plenty that were dual-piped to deal with mixed rakes across more than just the LNER.

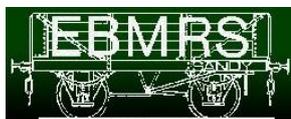
Freight stock

Unfitted - handbrake only, no train brake linked to the vehicle, but may carry through pipes for the train brake. Painted grey in BR period.

Fitted - Train brake connected with the vehicle brake, may be dual-braked or carry a through pipe for the alternative brake system. Painted bauxite in BR period.

For the main part our club layouts are post-war steam, and in that era basically all through-braked freight stock was vacuum-braked. That makes it a little easier for us! BR started experiments with freight vehicles in 1962 leading to regular air-braked freights from 1972, but vacuum-braked stock lasted into the 1990s. The dedicated 1930s ICI hoppers working from the Peak District were possibly the last vacuum-braked stock in regular use, lasting until 1999. If you look at any 1970s/1980s Combined Volume you will see markers denoting which locos were air-braked, vacuum-braked or dual-braked. Trains of that period could be either or mixed brake types, and you should (if you want accuracy) research carefully, to make sure you allocate the correctly braked individual locomotive to your train types. Equally the various diesel and electric types could only work in multiple with others using the same systems, as per the following table. The Clayton class 17 is an interesting example, as one third of the class was sub-contracted and they used a different coupling system!

Coupling code	System	Class of locomotives
★ Blue Star	Electro-pneumatic	Type 1 BTH 15, Clayton 17 (D8588- D8616), EE 20, Type 2 NB 21 (Nos D6138-6157), Sulzer 24, 25, 26 & 27, Brush 31/1 Type 3 Sulzer 33, EE 37, Type 4 EE 40, Peaks 44, 45 & 46 Electro-diesel 73 (under diesel power only).
● Red Circle	Electro-magnetic	Type 1 Paxman 16 Type 2 NB 21, Co-Bo 28, NB 29, Brush 31/0.
● Green Circle		Type 4, some Brush 47.
■ Orange Square	Diesel hydraulic - 1st use	Type 2 NB 22 (D6300 - 6305) Type 4 D600 Warship
	Symbol re-used	Type 4 EE 50
◆ Red Diamond		Type 1 17 (D8500-D8587) Clayton LMS twins (nos 10000/10001)
◇ White Diamond	Symbol re-used	Type 5 ‘Grid’ 56, ‘Bone’ 58



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▲ Yellow Triangle	Diesel hydraulic	Type 2 NB 22 (D6306 - 6357) Type 4 Warship 42 & 43
	Diesel hydraulic	Type 3 Hymek 35
	SR EMU System	Type 3 Sulzer 33/1 Electro-Diesel 73 EMU Mk1 Electric Multiple Units, 442
	AC electric locomotives	Classes 87 and some 86s.
	Within own class	Classes 60 and 43 (InterCity 125)
■ Blue Square		DMU Most units with mechanical transmission
★ Orange Star		DMU Most units with hydraulic transmission
◆ Yellow Diamond		DMU Derby Lightweight (mechanical transmission)
▲ Red Triangle		DMU Derby Lightweight (hydraulic transmission)
○ White Circle		DMU 126 Ayrshire
	BSI system	Most 2 nd Generation DMU
	Dellner	Examples classes Voyager 220, 221, Pendolino 390
	Scharfenberg	Examples classes 175, 180

That's an extraordinarily brief touch on the subject of braking, but it links in with what couples to what.

Drawgear

In basic terms, if a vehicle has its couplings connected with a sprung drawbar it means the tractive force from the locomotive is more evenly distributed along the train - this is referred to as continuous. Discontinuous is simple couplings not connected by a drawbar.

The main types of coupling are as follows:

- Buckeye (Gould) type: comprising knuckle-shaped hooks which interlock in a horizontal plane. Used on passenger stock and was standard on the L.N.E.R. and Pullman coaches, also later S.R. vehicles.
In model form, Kadee and Dapol (N scale), I think, are the only couplings that resemble a buckeye.
- 3-link: used on unfitted freight stock.
Easily made, or available commercially.
- Instantan: a form of 3-link coupling with a 'triangular' central link, permitting a long and a short coupled position. Used on fitted and unfitted freight stock.
Available commercially.
- Screw type: comprising two forged links coupled by an adjustable screw thread. Used on fitted freight stock and passenger coaches (exclusively by the G.W.R. and L.M.S.).
Available commercially.



Class 04 showing screw coupling and vacuum pipe, Mark 1 coach showing buckeye coupling in the 'rest' position.

So, on to the main thrust of this piece - how you might deal with coupling of stock on the model railway.

Your choice of coupling will depend on how much or little effort you want to put into it, how much shunting of stock, whether you want hands-free, how close-coupled the vehicles might be and how sharp your layout curves are. Some couplings won't operate for shunting if curves are below a certain radius, e.g. Alex Jackson, at about 4'. If you want your stock to be coupled more closely, as per the prototype, you'll need to consider again the sharpest curves on the layout so there's enough coupling length to avoid derauling the stock; too short, and the buffers will clash and help the wheels ride up over the track. Sprung buffers on your stock will help some, but model railway track geometry is such that when shunting across reverse curves such as a crossover it could still result in locking buffers.

Most coupling types are really variations on a theme, but how many named variants are you aware of? For OO gauge I've got to 18 (yes, eighteen!), and that's without counting the variants within brands such as Kadee, of which there's dozens. I'm going to ignore specialist couplings for the RTR units such as Voyagers and Pendolinos.

Ready-to-Run Tension-Lock

I'm pretty sure you're all familiar with the traditional and ubiquitous Hornby-style tension-lock coupling, for which there's basically the screw-fit and NEM pocket types from Hornby themselves.



And then there's Bachmann - mainly a variation on the Hornby theme, but... there's 9 of them:

- NEM fitting: long cranked, short straight, long straight, DMU cranked, DMU straight, large loop
- Screw fitting: mini-loop long, mini-loop short, large loop



Bachmann DMU

Dapol OO Gauge

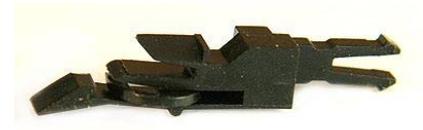
2 types, their standard screw-fit version and NEM pocket version, both similar to Hornby/Bachmann

PECO OO Gauge

Screw-fit

Ready-to-Run-ish Other

Hornby provide a NEM fitting close-coupler for coaches, which I believe was inherited from Roco when they were bought out.



Farish - N Gauge

3 types, 'standard' coupling, and NEM short and NEM standard



Dapol N gauge

Standard couplings are provided as short and long variants, much cheaper than the following items!

Dapol produce a system called Easi-Fit magnetic couplings to fit NEM pockets, to aid shunting. They look similar to a buckeye coupler, and retail at £7.18 a pair! Available in short, medium and long variants.



Peco N Gauge

ELC system, using an electromagnet to uncouple.

Keen

A specialist coupling system that allows closer coupling of coaches but is flexible to expand the coupling on curves to avoid buffer lock.

Kadee

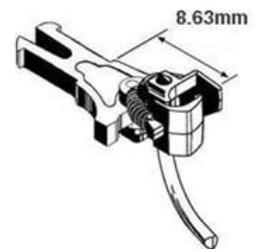
A minefield of couplings! In fact, so many variations I hardly know where to begin.

I'll simply list 4 types for UK NEM pocket, numbers 17 to 20, short to long fit.

An interesting comparison to a prototype buckeye coupling.

New to me (though available for a few years) is a product from Precimodels of Switzerland which links a micro-actuator to a Kadee and is controllable via a DCC system to couple or uncouple anywhere on a layout.

See <https://precimodels.com/en/8-products/1-dcc-uncouplers>. It looks impressive to me, and is featured on Bournemouth West in the December issue of BRM.



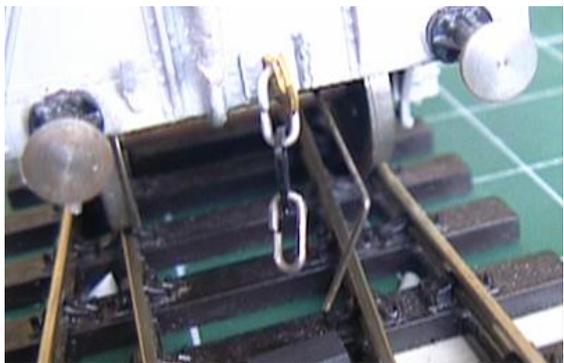
Prototype-styled couplings

	3 link	Instanter	Screw
Dapol O gauge	Sprung		Sprung
Peco O gaug	Yes	Yes	
Peco OO gauge	Yes	Yes	Yes
Smiths	Yes	Yes	Yes
Ambis Engineering	Fret	Fret	Fret, 2 types

Specialist couplings

Whilst I do not have all the details for these coupling types, I've included them regardless for comparison and further investigation should you wish to do so.

The Lincs Auto Coupler

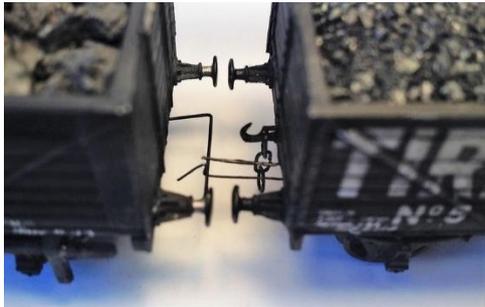
Supplier	Richard Tarpey, 16 White Heather Square, Billingborough, Sleaford, Lincs. NG34 0QP	
Supplied	Fret of 5 pairs	
Description	An inter-linking counter balanced hook mounted on a skewed pivot.	
Operation	The hook engages with its twin on the opposite vehicle. As the vehicles come together the hooks depress and pass one behind the other and remain engaged whilst pushing and pulling. Uncoupling device: Strategically sited permanent or electro-magnets at all sites where uncoupling is required. The magnet depresses the hooks allowing the vehicles to separate. Does not do delayed uncoupling	
Fitting & Modifications	A mounting plate may be required to locate the pivot flush with the bottom of the bufferbeam. The coupling has to be fitted to all stock. Locomotives may have a fixed coupling. A tool to assist soldering the hook to the pivot is available.	
Compatibility	This system is compatible with 3 link or screw couplings, non-magnetic links are recommended.	
Minimum operating radius	Recommended 4 feet. Smaller radii may be used but will increase the overhang of the hook from the vehicle. This will be limited to the appearance of the gap between vehicles. Buffer locking will be a limiting factor to track geometry. Provided that the hook crosses the centreline of the vehicle it is tolerant of location	
Modellers' observations	<p><i>I've just been experimenting with DG's O gauge couplings and decided against them. The etchings are basically the same as the 4mm scale version but thicker. As a result they protrude from below wagon headstocks if they are set far enough forwards to work. The phosphor bronze wire supplied is extremely thin and easily bent out of shape. The holes in the etching for the loop are oversized, so the loop tends to wobble about, the list of snags goes on. I used to use these several years ago for EM gauge and liked them, but I think now that I was deluded! I'm going to give Spratt and Winkles a trial. I know they don't look very prototypical but they do work, from what I remember, and reliability counts for a lot with me</i></p>	

Dingham

Supplier	www.dingham.co.uk	
Supplied	Fret of parts to fit 20 vehicles, £12.00	
Description	Electromagnetic operation with latching mechanism, with the ability to uncouple vehicles at will in a moving train	
Operation	<p>The hinged loop and latch mechanism means that, once uncoupled, it stays uncoupled until the operator wants to couple up again. This means that only one electromagnet is required for a fan of sidings.</p> <p>As a train is propelled over the electromagnet, wagons can be uncoupled at will whilst the train is on the move. No more having to stop over the magnet and then perform an un-prototypical back and forth shuffle to uncouple.</p>	
Fitting & Modifications	Mounts through the existing coupler slot on the buffer beam, or a hole can be drilled in the beam and hidden behind one of the drawgear endplates supplied on the etch. The vertical adjustment almost takes care of itself by virtue of its fitting in the existing coupler slot. In any case, the coupler is fairly tolerant of deviations from the ideal height. Longitudinally, the coupler is self-jigging for stock with buffer lengths of 1ft 6in (unfitted wagons) or 1ft 8½in (most locos, fitted wagons and many coaches).	
Compatibility	Fully compatible with scale 3-link and screw couplings	
Minimum operating radius	3'	
Other Comments	It is self-jigging in assembly and is virtually 100% reliable in operation. when stock is put back in the box, the only vulnerable part of the coupler - the loop - flips upwards out of the way and is protected by the buffers. Unobtrusive - the latched hook is only slightly larger than the prototype. The loop is etched as thinly as possible consistent with adequate strength.	
Modellers' observations	<p><i>Issues? "I can't get them to work on bogie freight vehicles"</i></p>	

BURFORD

Supplier	N/A - home-made. See https://www.scalefour.org/forum/viewtopic.php?f=126&t=6069	
Supplied	N/A	
Description	This simple home-made auto-coupling consists of a hook and loop, in which the hook is fixed and the pivoted loop rises to couple or uncouple	
Operation	The bar of the loop slides up the sloping face of an opposing hook and drops over the top of the hook to couple. The loop also includes a magnetic dropper, which swings down when it is over an operating magnet, thus raising the loop to uncouple.	
Fitting & Modifications	See pdf file in link above. Permanent magnets cannot be used	
Compatibility	Does not appear to be compatible with 3-link	

Minimum operating radius	Works to 2'9"
Modellers' observations	

DG Couplings

Supplier	www.wizardmodels.ltd
Supplied	Fret for 8 vehicles, £3.00 to £6.30 dependant on scale.
Description	Delayed action loop & latch mechanism
Operation	Using an electromagnet to lift the loop as vehicles are propelled.
Fitting & Modifications	Nominally fits to a paddle below the floor behind the buffer beam, but I've read of people fitting to bogies too.
Compatibility	Doesn't seem suited to 3-links
Minimum operating radius	Not stated in articles I've seen
Other Comments	Five versions of the same basic design to suit 2mm to 7mmscales Suggested can use the 3mm scale version for 4mm scale if curves are generous.
Modellers' observations	<i>Latches can get sticky in a humid show atmosphere - watch out for wet punters coming through the door on a rainy day!</i> 

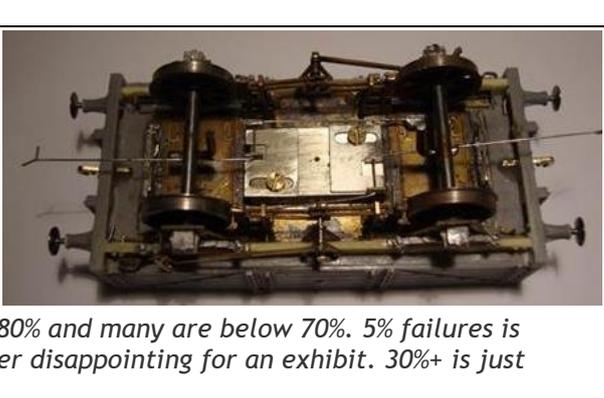
Sprat & Winkle

Supplier	www.wizardmodels.ltd
Supplied	Frets of 8, 40 and 22 couplings for 2mm, 4mm and 7mm scales, £3 to £12.
Description	Paddled hood and loop.
Operation	Uses iron 3 link loops for the magnet (electric or fixed) to raise the hook. Requires a 'shuffle' to uncouple.
Fitting & Modifications	Requires a wire loop fitted to the buffer beam, and the operating hook needs a slot cut in the bufferbeam.
Compatibility	Uses 3 links, but some buffer paraphernalia may need to be omitted.
Minimum operating radius	

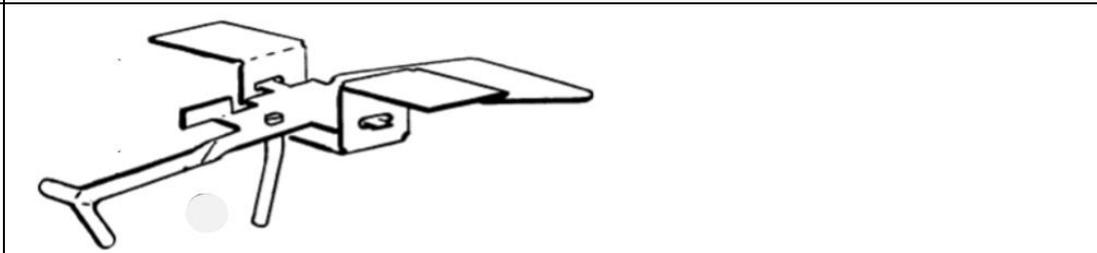
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Modellers' observations	<i>Don't like the un-prototypical shuffle to uncouple.</i>	
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Alex Jackson

Supplier	Home made	
Supplied	N/A	
Description	Wire & simple hook	
Operation		
Fitting & Modifications		
Compatibility		
Minimum operating radius	4'	
Other Comments	See http://www.mmrs.co.uk/technical-articles/alex-jackson-coupling/ www.palatinemodels.co.uk for support items	
Modellers' observations	<p>Has a good reputation, but is also disliked for the accuracy required to set up and maintain.</p> <p><i>I've never seen a layout exhibited on which AJs were highly reliable during prolonged shunting. The best approach about 95% success rate (that's a fraction of coupling operations, not of stock that behaves well). Most seem to be below 80% and many are below 70%. 5% failures is possibly OK for a home layout but rather disappointing for an exhibit. 30%+ is just terrible!</i></p>	

Yeovil

Supplier	Not currently in production	
Supplied		
Description	Based on, and aims to improve reliability of, the Alex Jackson principles	
Operation		
Fitting & Modifications		
Compatibility		
Minimum operating radius		
Modellers' observations		



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Fleetwood Shaw

Supplier	Manufactured & distributed by: Leslie Hubble Limited, 29 Frog Island, Leicester, LE3 5A
Supplied	No details
Description	
Operation	
Fitting & Modifications	
Compatibility	
Minimum operating radius	
Modellers' observations	<i>'Horrible old....much more reliable now fitted with Sprat & Winkles.'</i>

B&B

Supplier	24 LAYSTON PARK ROYSTON HERTFORDSHIRE SG8 9D
Supplied	
Description	
Operation	
Fitting & Modifications	
Compatibility	
Minimum operating radius	
Other Comments	http://www.gauge0guild.com/manual/04_D4_2_1_8.pdf http://www.rmweb.co.uk/community/index.php?/topic/35118-n-gauge-bb-couplings-construction/
Modellers' observations	<i>We tried the similar to DGJ B&B couplings on Ramchester but found the mounting plates on these were too short Being a relative novice to modelling in N gauge I couldn't believe how difficult it is to assemble B&B couplings from the N Gauge Society. The first one took me the best part of 2 hours and the second one went in the bin</i>

WINTERLEY COUPLINGS



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Supplier	http://www.winterleyproducts.co.uk/www.winterleyproducts.co.uk/Welcome.html
Supplied	
Description	Designed to replace a Bachmann coupling in 4mm
Operation	Video in operation - https://www.youtube.com/watch?v=4Kwgl2eEFo8&feature=youtu.be
Fitting & Modifications	Kit or scratch built stock present no problem as the couplings fit to the floor with some packing. Fixing is with 10BA bolts supplied. A jig is supplied to ensure the level and length on the fixed loop is standard. Vehicles with long buffer shanks need some adjustment to the hook; this is covered in the instructions. A little soldering is required, mainly to strengthen bends in the etches.
Compatibility	Can still use 3 link
Minimum operating radius	The gap allows for coupling/uncoupling on curves.
Modellers' observations	My own view, having read the notes on their website, is that this looks a fiddly version to use! Alan. 

OTHER POSSIBILITIES

For fixed rakes of stock one may consider a simple wire hook on one end of a vehicle and a wire loop on the other, any home-made arrangement can be made to work and can be made to suit your own layout's geometry. I've seen one person espouse the benefits of coupling with magnets, but, for the record, knotted string and elastic bands are not recommended.