

LONDON TO BRIGHTON



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1 Route Information

1.1 History

The London and Brighton Railway (L&BR) emerged as the successful scheme from six route proposals prior to July 1837. The most direct of the routes proposed ran via Redhill and Haywards Heath and was surveyed in 1829, upon commission by The Surrey, Sussex, Hants, Wilts & Somerset Railway. This was dropped until 1835 when, following prolonged campaigns by supporters, it was recommended by the Parliamentary Committee of Enquiry that it be built, even though it was the most difficult and expensive. Parliament passed an Act in July 1837 authorising capital of £2.4million for construction of a line to Brighton emerging from the London and Croydon Railway (L&CR) at Norwood, using the existing L&CR lines from Norwood to London Bridge. The Act also insisted that the line between Norwood Junction and Redhill should share its track with the South Eastern Railway (SER - later the South Eastern & Chatham Railway - or SE&CR) main line to Dover which resulted in sixty years of disputes between the two companies.

The difficult terrain of the North Downs, Wealden Ridge and South Downs required substantial earthworks, including Britain's largest cutting at Merstham, five tunnels, several embankments and the 96 foot (29.3m) high, 1,475 foot (450m) long Ouse Valley Viaduct near Balcombe. Opened in two stages, the first section opened on 12 July 1841, serving Norwood Junction to Haywards Heath. The final section from Haywards Heath into Brighton opened on 21 September 1841.

Following a further Act of Parliament on 27 July 1846, The London, Brighton and South Coast Railway (LB&SCR) was formed from the amalgamation of The London and Croydon Railway (L&CR), The London and Brighton Railway (L&BR), The Brighton and Chichester Railway (B&CR), The Brighton Lewes and Hastings Railway and The Croydon and Epsom Railway.

Between 1858 and 1860 the LB&SCR joined with the London, Chatham and Dover Railway (LC&DR), the Great Western Railway (GWR) and the London & North Western Railway (LNWR) to form the Victoria Station & Pimlico Railway Company, which included the construction of a new bridge over the River Thames at Battersea and an important new terminus in the west end of London at Victoria. This project was connected with the West London Extension Joint Railway, a joint railway financed by the LB&SCR, L&SWR, GWR, and the LNWR, allowing freight transfers between the companies as well as some cross-London passenger trains. This line was opened in 1863, and the LB&SCR operated passenger trains between Clapham Junction and Kensington.

Following the acquisition of the West End of London and Crystal Palace Railway, a new 'cut-off' main line between Windmill Bridge Junction (Norwood) and Balham was constructed during 1861 and 1862 which shortened the route from East Croydon to Victoria. At the same time, the LB&SCR was co-operating with the LC&DR to create the South London Line between London Bridge and Victoria.

To alleviate the frequent disputes with the SER from the sharing of the busy section between Croydon and Redhill, the LB&SCR built an avoiding line between Coulsdon North and Earlswood. Opened on 8 November 1899 (1 April 1900 for passenger traffic), and owned by the LB&SCR the section became known as the *Quarry Line* and is still used today by fast trains avoiding Redhill.

1.1.1 Brighton Station

The Brighton terminus of the line serves the coastal city of Brighton and Hove. Originally built in 1840 by the London & Brighton Railway, it connects Shoreham-by-Sea in the west, the county town of Lewes in the east and of course London, 51 miles to the north. The

L&BR also built a goods station, locomotive works and depot at the location. Being only half a mile from, and 70 feet above the sea, considerable ground excavation was required in order to create a reasonable gradient from Patcham Tunnel into the station complex.

The three storey station was designed in 1839 in an Italianate style and incorporated the head office of the L&BR. The original building still exists but has long since been obscured by and amalgamated into later additions. In 1846 the station was extended for the line to Hastings in the east when the L&BR merged with the Brighton, Lewes and Hastings Railway to become the London, Brighton and South Coast Railway.

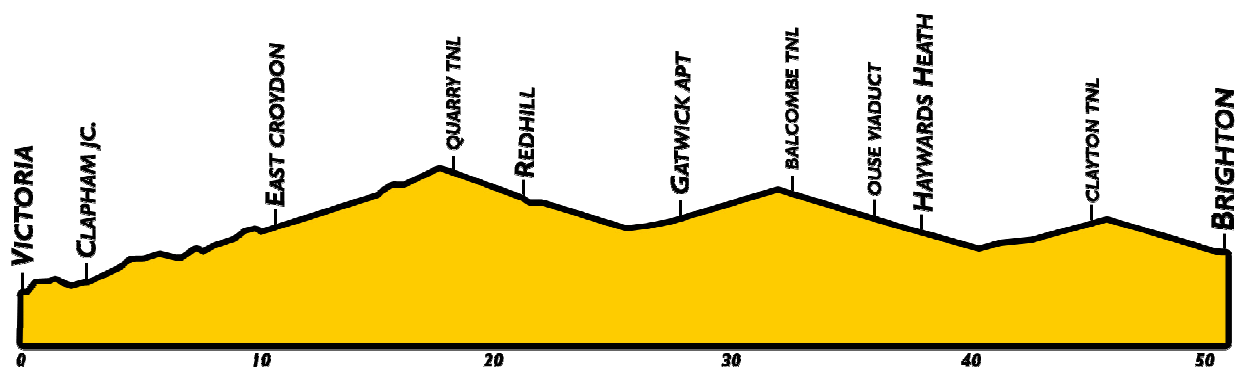
1.1.2 Electrification

The line was the first UK main line to be electrified throughout with the London Bridge to South Croydon section being converted in 1920 to a high-tension, single phase overhead system. In 1929 the post-grouping Southern Railway had opted to standardise to the former London and South Western Railways 600V DC third-rail system across all of their lines. Coudsdon South to Three Bridges was electrified in 1932 with the final leg from Three Bridges into Brighton being completed in 1933. The line voltage was later increased to 750V DC at which it remains to this day. Traction current is supplied from the Lewisham, Selhurst and Brighton electrical control rooms.

1.1.3 Line Features

Opened in July 1841 at a cost of £38,500, the balustraded Ouse Valley Viaduct, also known as Balcombe Viaduct, is 96 feet (29 m) high. The crossing is carried on 37 semi-circular arches. To reduce the number of bricks required, each pier contains a Jack arch with a semi-circular soffit. Ornamental square open towers adorn the ends of the crossing. The construction was of 11 million bricks imported from Holland with stone classing from Newcastle-Upon-Tyne. The structure is a Grade II listed building and was restored in 1996 with grants both from the Railway Heritage Trust and English Heritage using matching stone imported from France to ensure a close match with the existing balustrades and pavilions.

Clayton Tunnel is the longest of the 6 tunnels on the route at 1 mile 499 yards (2065 metres) long. It features a gothic tunnel portal at the north end which was built in 1841, with the cottage added in 1849. The exact origins of the Grade II listed building remain a mystery. Among some of the popular theories are that it was a monument to the six thousand men who dug beneath 270 feet of chalk for three years, or simply a folly by the local landowner who would only allow a tunnel through his property as long as it had a grand entrance.



1.2 Rolling Stock

The line has seen many distinct periods of rolling stock operation to Brighton. A full line up of steam haulage was provided right through to it's withdrawal in 1967, despite the electrification of the route 30 years before.

The UK's first Pullman coaches were introduced by the LB&SCR in 1875. In December 1881 they introduced the first all Pullman service, *Pullman Limited*, between London Victoria and Brighton. This was the first all-Pullman train in the UK. This tradition was continued in 1908 with the introduction of the steam hauled *Southern Belle* until the introduction of the 5BEL electric service in 1933. In 1934 this service was renamed the *Brighton Belle* until its final withdrawal in 1972.

The modern route represented here is serviced by the class 377 'Electrostar'. The route is also serviced by classes 319, 455 and 442 among others.



2 Class 377 'Electrostar' Electric Multiple Unit

2.1 Class 377

The Class 377 third-rail DC 4 car electric multiple units began service during 2002. Built by Bombardier in Derby, England, they are a member of the 'Electrostar' train family, the most numerous EMU built in post-privatisation Britain. Due to their high power consumption major upgrades were carried out to the 750V DC third-rail power system used on the Southern region. The trains are used extensively on services in south London and on rural commuter services throughout Sussex and Kent where they replaced the aging 4CIG and 4VEP slam-door stock. The Class 377 trains feature external CCTV, a disabled seating area, and toilets in both intermediate coaches. Dual voltage units are fitted with a high speed pantograph to allow operation under 25kV lines as well as the native third rail shoes.

2.2 Design & Specification

TOPS Number	Class 377
Formation	4-car: DMCO+MSO+PTSO+DMCO
Unit Weight	173.6 tonnes (35-48 tonnes per vehicle)
Vehicle Length	66ft 11in (20.4m)
Vehicle Width	9ft 2in (2.8m)
Body Construction	Aluminium body with steel ends
Power Collection	750v DC 3rd Rail
Vehicle Power	2,000HP (1,500kW)
Design Speed	100 MPH (161km/h)
Coupling Type	Dellner
Brake Types	Air
Seating	242 Standard

2.3 Class 377 Consist Formations

Class	Consist	Number Range
377/1	DMOC - TOSL - MOSL - DMOC	377101 - 377164
377/2	DMOC - MOSL - PTOSL (Low) - DMOC	377201 - 377215
377/3	DMOC - TOSL - DMOC	377301 - 377328
377/4	DMOC - TOSL - MOSL - DMOC	377401 - 377475

The pantograph well should be at the centre of the formation.

3 and 4 car formations are often used on local and branch stopping services.

7, 8, 9 and 10 car formations are used on off-peak fast services.

8 and 12 car formations are commonly seen on peak time fast and express service.

Class 377 DMOC Southern



Class 377 MOSL Southern



Class 377 PTOSL Southern High
Class 377 PTOSL Southern Low



Class 377 TOSL Southern



3 Creating a Class 377 train set

3.1 Scenario Editor (if creating new scenarios)

To get the Class 377 ready for selection in a scenario that is not located on the London to Brighton Main Line, you will need to enable it in the object set filters, which will add it to the rolling stock browser list.

Follow these steps:

1. Enter the Scenario Editor. (Note: If a route is locked it will need to be unlocked first before you can enter the Scenario Editor. Unlock by clicking the padlock icon in the bottom right of the screen).
2. Click the Object Set Filter button (the small blue cube on the middle left panel).
3. In the new window which opens on the right hand side, select the following:
RSC / BrightonMainLine
4. The Class 377 vehicles will now appear in the list of rolling stock.
5. You may need to repeat this process on other routes or scenarios where you wish the Class 377 to be available.

3.2 Assigning Destinations and Numbers

For developers wishing to make use of the units in their own scenarios and routes, it is possible to customise the Destination Display during creation of a scenario. This allows the train to correctly display an appropriate destination.

In order to display a specific destination, the correct value must entered into the vehicle properties window. This number consists of a 12 digit value containing both a letter and numbers.

The 12 digit value is arranged like so: **dVVVVVUUUUUU**

d = the Destination code (See the Destination List below)
VVVVV = the Vehicle number displayed on the side of the coach
UUUUUU = the Unit number displayed on the front of the driving vehicle

Example : d78580377101 (*where "d" is for Clapham Junction*)

So the above value results in unit 377101, with vehicle number 78580, displaying "Clapham Junction" as the destination

3.2.1 Destination List

a	Brighton	j	Hastings	s	Reigate
b	Bognor Regis	k	Haywards Heath	t	Southampton
c	Caterham	l	Horsham	u	South Croydon
d	Clapham Junction	m	Hove	v	Tattenham Corner
e	Coulsdon Town	n	Littlehampton	w	Tonbridge
f	Eastbourne	o	London Victoria	x	West Croydon
g	East Croydon	p	London Bridge	y	Not in service
h	Gatwick Airport	q	Portsmouth	z	Special
i	Guildford	r	Redhill		

4 Driving the Class 377

4.1 Cab Controls



Main console

- 1 Master key
- 2 Reverser
- 3 Combined throttle and brake
- 4 Emergency brake
- 5 Brake pressure gauges
- 6 Speedometer
- 7 Cruise control speed

- 8 Cruise Control
- 9 AWS flower
- 10 AWS Reset
- 11 Windscreen wipers
- 12 Horn
- 13 Depot whistle
- 14 Sander
- 15 Cab light

- 16 Guard communication
- 17 Notice board light

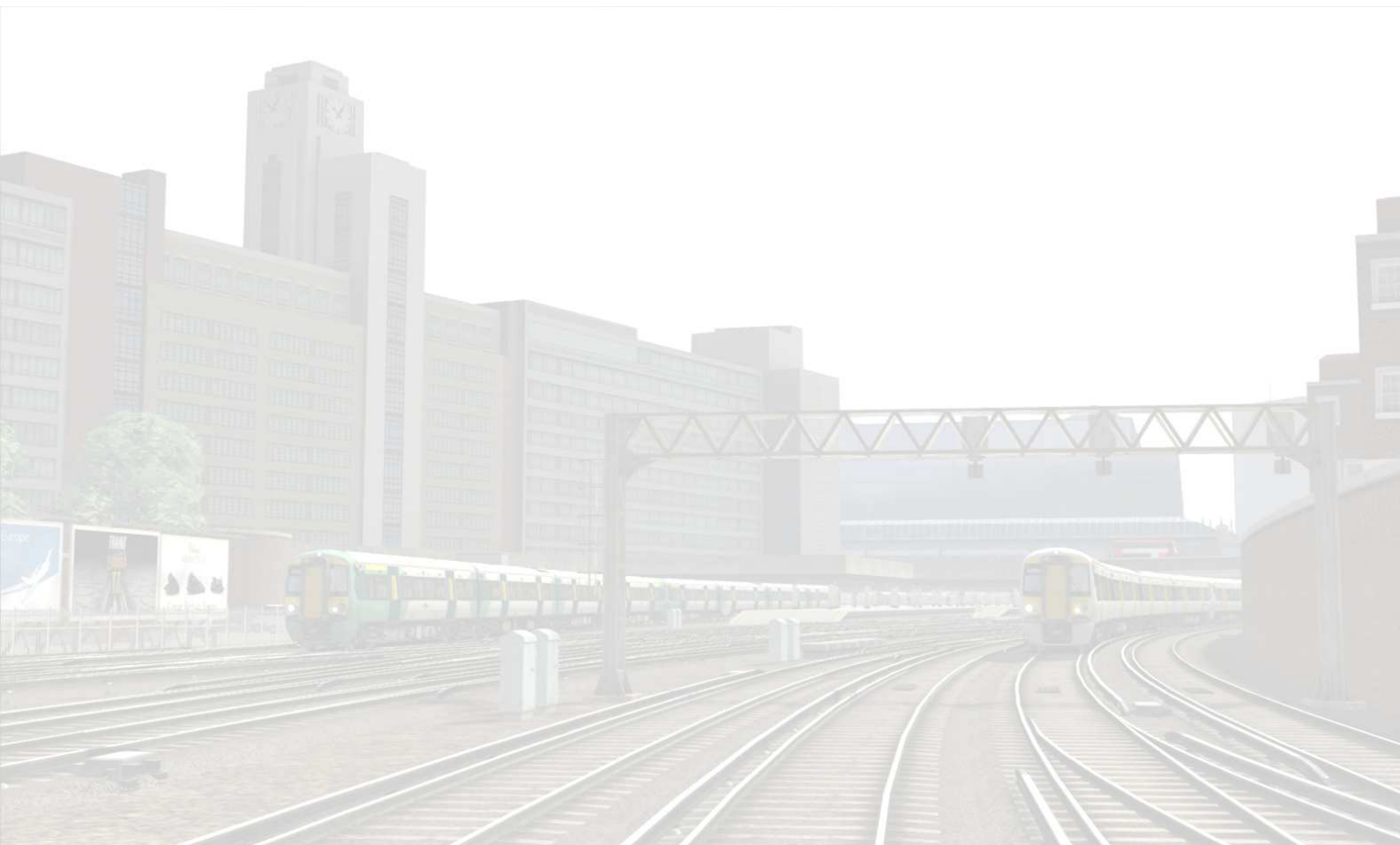
Side panel

- 18 3rd Rail Shoe controls
- 19 Pantograph controls
- 20 Headlights
- 21 Taillights
- 22 Blinds

4.2 Additional Controls

The following additional keys can be used with the Class 377 units.

Keystroke		Feature
Shift	+ D	Brake Hold. This can also be activated by pressing the button on the end of the brake/throttle control (3)
Shift	+ P	Raise the 3 rd rail shoes. Also activated by pressing the blue button on the upper left panel (18)
Ctrl	+ P	Lower the 3 rd rail shoes. Also activated by pressing the yellow button on the upper left panel (18)
	L	Cab Light
	B	Depot Whistle
	C	Guard communication (16)
Shift	+ Numpad Enter	Toggle the Driver Vigilance Device. This is an audio only device so has no visual prompt. By default this feature is turned off.
	Numpad Enter	Acknowledge a Driver Vigilance alert



5 Scenarios

5.1 LB The Electrostar

It is your first day on the London to Brighton Main Line and you are being shadowed by a veteran driver. As you drive the unit into Victoria station, he will offer driving tips and information.

- **Date** **10th July 2012**
- **Duration** **15 Minutes**
- **Start Location** **Preston Park Sidings**

5.2 LB Burst Pipes

A landslide caused by a burst water main has occurred north of South Croydon station. All trains have been disrupted and there is currently no service between East Croydon and Gatwick Airport.

- **Date** **17th September 2012**
- **Duration** **15 Minutes**
- **Start Location** **London Victoria Station**

5.3 LB Capital Commuter

Drive the semi-fast service from Brighton to London Victoria.

- **Date** **7th August 2012**
- **Duration** **60 Minutes**
- **Start Location** **Brighton Station**

5.4 LB City Express

Drive the fast service between Brighton and London Victoria.

- **Date** **20th August 2012**
- **Duration** **50 Minutes**
- **Start Location** **Brighton Station**

5.5 LB Express Preparation

Empty stock move from Brighton Depot, heading into the main station ready for departure to London.

- **Date** **19th August 2012**
- **Duration** **15 Minutes**
- **Start Location** **Brighton Traction Maintenance Depot**

5.6 LB Landslide Victory

Drive a 377 to Three Bridges on an Altered Service after a Landslide

- **Date** **10th December 2012**
- **Duration** **45 Minutes**
- **Start Location** **London Victoria Station**

5.7 LB League Cup Special

Take Football Supporters to watch their match against Brighton on a football special.

- **Date** **21st September 2012**
- **Duration** **60 Minutes**
- **Start Location** **Clapham Junction Station**

5.8 LB Purley Plougher

Service bound for Milton Keynes, which usually starts at South Croydon, however due to the weather they are running it out of Purley to aid in keeping the line free of snow. The service will run as far as Clapham Junction before a driver train.

- **Date** **13th January 2012**
- **Duration** **30 Minutes**
- **Start Location** **Purley Station**

5.9 LB Seaside Express

Drive the fast service between London Victoria and Brighton.

- **Date** **17th October 2012**
- **Duration** **50 Minutes**
- **Start Location** **London Victoria Station**

5.10 LB Smitham Snoozer

Drive a 377 completing a stopping service to Smitham during the late evening.

- **Date** **3rd March 2012**
- **Duration** **50 Minutes**
- **Start Location** **London Victoria Station**

5.11 LB South Down Splitter

Drive a 377 from London Victoria to Three Bridges, leaving 4 cars at Redhill.

- **Date** **16th February 2012**
- **Duration** **40 Minutes**
- **Start Location** **London Victoria Station**

5.12 LB Southern Connection

Drive a class 377 from Haywards Heath to London, joining a service at Redhill

- **Date** **8th September 2010**
- **Duration** **60 Minutes**
- **Start Location** **Haywards Heath Platform 4**

5.13 Southern Belle

The London and Brighton Railway built a passenger station, goods station, locomotive depot and railway works on a difficult site on the northern edge of Brighton in 1840. The station provides fast and frequent connections to Gatwick Airport and London Victoria, as well via the Thameslink route through Central London to Bedford.

- **Date** **6th June 2012**
- **Start Location** **Brighton Station**

5.14 The Queen Vic

Named after nearby Victoria Street and not Queen Victoria, it is the second busiest railway terminus in London (and the UK) and includes an air terminal for passengers travelling by train to Gatwick Airport.

- **Date** **7th June 2012**
- **Start Location** **London Victoria Station**

5.15 World Traveller

The station, originally named Gatwick, was built in September 1891 to serve a Racecourse. The facilities included passing loops and sidings without impeding the Brighton Main Line. Train services today are provided by Southern, First Capital Connect and First Great Western. When viewed from the air the station building has a British Rail logo etched on the roof.

- **Date** **7th June 2012**
- **Start Location** **Gatwick Airport Station**



6 Signals

6.1 Main Signal Head Aspects



Colour light signals are used for controlling running movements. They display aspects by means of red, yellow and green coloured lights.

Signal Aspect	Description	Instruction to Driver
Red light	Danger	Stop.
Single yellow light	Caution	Proceed: be prepared to stop at the next signal.
Double yellow lights	Preliminary caution	Proceed: be prepared to find the next signal displaying one yellow light.
One flashing yellow light	Preliminary caution for a diverging route	Proceed: Be prepared to find the next signal displaying one yellow light with feather junction indicator for diverging route(s).
Double flashing yellow lights	Indication of diverging route ahead of the next but one signal	Proceed: Be prepared to find the next signal displaying one flashing yellow light.
Green light	Clear	Proceed: The next signal is displaying a proceed aspect.

6.2 Theatre Type Signals

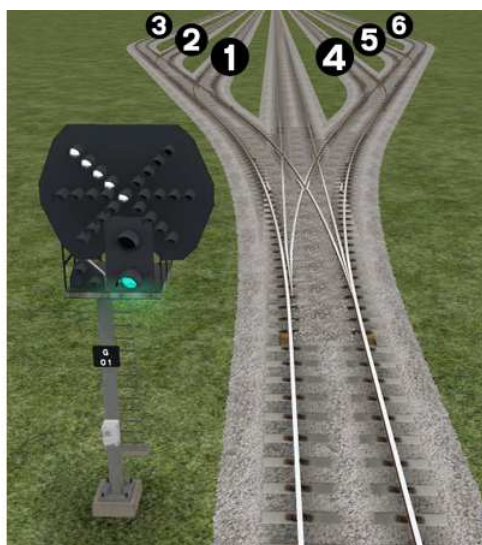


A Theatre alphanumeric route indicator indicates the route to be taken using numbers or letters (or a combination of numbers and letters).

A Theatre indicator is often used to show the arrival platform number.

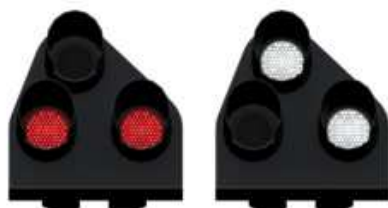
6.3 Feather Type Signals

A Feather junction indicator indicates a diverging route to be taken by the angle at which a line of five white lights is displayed. (*Position 1 shown*)



Feather Indication	Instruction to Driver
No Feather Indication	Obey main aspect, straight-ahead route is set
Position 1 indication	Obey main aspect, expect divergence to left
Position 2 indication	Obey main aspect, expect divergence to left more extreme than that for position 1
Position 3 indication	Obey main aspect, expect divergence to left more extreme than that for position 2
Position 4 indication	Obey main aspect, expect divergence to right
Position 5 indication	Obey main aspect, expect divergence to right more extreme than that for position 4
Position 6 indication	Obey main aspect, expect divergence to right more extreme than that for position 5

6.4 Ground Signals and Position Light Signals



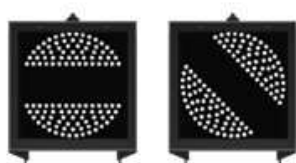
Ground Signals and Position Light Signals (PLS) display their aspects by means of the position and colour of lights. Ground Signals are always illuminated and can have miniature theatre indicators attached whereas PLS only illuminate to allow a train to pass in to an occupied section of line and are mounted as an addition to a main signal head.

Signal Aspect	Description	Instruction to Driver
Two red lights	Danger	Stop.
No aspect (located on a main aspect)		Obey main aspect.
Two white lights	Caution	The line ahead may be occupied. Proceed cautiously towards the next stop signal, stop board or buffer stops. Be prepared to stop short of any obstruction. The associated main aspect (where provided) may be passed at danger

6.5 Entering an Occupied Section of Track

During a scenario your train may be scheduled to enter a platform or section of track that is already occupied by another train or rolling stock. In this situation you should stop at the red signal protecting this section of track as normal. Once your train has stopped press the TAB key on your keyboard to request permission from the signalling centre to enter the occupied section of track. When your train movement is approved the signal will illuminate the two white lights on the position light signal if it has one.

6.6 Repeater Signals



A banner repeater signal indicates whether the signal ahead is displaying a proceed aspect or is at danger. Modern fibre optic banner repeating signals, as shown opposite, consist of a rectangular unlit black background displaying a white circle with a black bar.

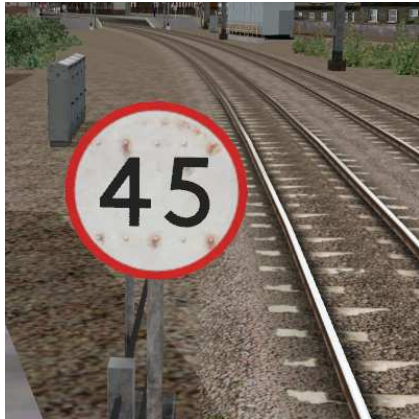
Signal Display	Instruction to Driver
Horizontal arm	Be prepared to find the related signal at danger
Arm at an upper quadrant angle of 45°	Related signal is exhibiting a proceed aspect

Repeater signals are intended to provide a driver with advance information of a signal that may be obscured on approach. A train does not need to stop at a repeater signal, only at the related signal if it is at danger.

Splitting banner signals provide two banner signal heads combined to form a splitting banner repeating signal. These are used to indicate the aspect of a signal with a feather junction indicator. If the related junction signal is displaying an illuminated feather then the lower banner head displays an arm at an upper quadrant angle of 45°. Alternatively, if the related junction signal is not displaying an illuminated feather and is indicating a straight ahead route then the higher "main" banner head displays an arm at an upper quadrant angle of 45°.

7 Speed Signs

7.1 Permissible Speed Indicators



These signs display the permissible speed in M.P.H. applicable to the section of line beyond the sign up to the commencement of any subsequent permissible speed section.

Remember to wait for the complete length of your train to pass these signs before accelerating if the permissible line speed is increasing. If the permissible line speed is decreasing then you must reduce your speed before passing these signs.

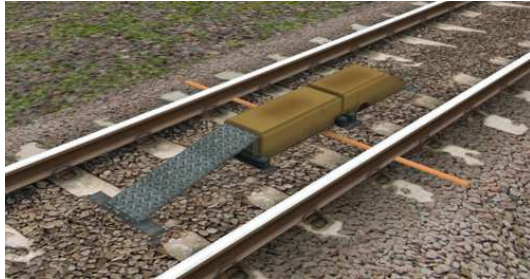
7.2 Permissible Speed Warning Indicators



These signs provide advance warning of a reduction in permissible speed ahead. Permanent AWS Ramps (Automatic Warning System) are often installed in conjunction with these signs. In these cases the driver must cancel the AWS warning when triggered on approach to these signs.

8 Safety Systems

8.1 AWS (Automatic Warning System)



AWS is provided to give train drivers in-cab warnings of the approach to signals, reductions in permissible speed and temporary/emergency speed restrictions, and to apply the brakes in the event that a driver does not acknowledge cautionary warnings given by the system.

As a train approaches a signal, it passes over AWS track equipment (magnets) which are fixed to the sleepers between the running rails. The magnets are sensed by a receiver mounted under the leading end of the train.

If the signal ahead is displaying a clear aspect (green), a bell (or an electronic ping) sounds in the driver's cab, and the AWS Sunflower indicator displays "all black". No action in respect of the AWS is required of the driver.

If the signal is displaying a caution or danger aspect (yellow, double yellow or red), a horn sounds in the driver's cab and the display shows "all black". The driver has to acknowledge the warning by pressing the "AWS Acknowledgement" push button. When the driver operates the push button, the horn is silenced and the AWS Sunflower changes to a segmented yellow and black circular display. If the driver fails to acknowledge the warning horn within a set time period, the brakes are applied automatically.

Where AWS equipment is provided on the approach to reductions in permissible speed and temporary/emergency speed restrictions, the cab equipment always operates in a manner equivalent to the approach to a signal displaying a caution or stop aspect. The driver receives a warning and has to respond to it accordingly; otherwise the brakes are applied automatically.