MML -
London St Pancras to Bedford

Release Version 1.0

1 Route Information

1.1 Background

The Midland Main Line was built in stages between the 1830s and the 1870s, eventually becoming the Midland Railway.

The route serves a large number of communities in North London, the Home Counties and East Midlands. It carries significant volumes of long distance and local passenger services, and key freight traffic.

The route for Train Simulator covers the 55 mile Thameslink section from London St. Pancras via Luton Airport to Bedford along the Midland Mainline.

1.2 St. Pancras Station

Designed by William Barlow in 1863, situated on the Euston Road in the London Borough of Camden, St. Pancras station opened in 1868. Serving as the southern terminus for the Midland Railway between London, the East Midlands and Yorkshire, the station's arched roof was the largest single span roof in the world. It is situated next to the Great Northern Railway's Kings Cross station.

The red brick Gothic front façade completed in 1876, today a Grade 1 listed structure, served as the Midland Grand Hotel. In 1935 the hotel was closed. Then known as the St. Pancras Chambers, the building was used as railway offices until 1985.

The station was heavily damaged in the WWII blitz, however, LMS Railway engineers soon had the site fully operational. Planned demolition and amalgamation with Kings Cross station in the 1960s were quashed after strong public opposition and the backing of Sir John Betjeman to save the station.

Today the restored station has 15 platforms, a shopping centre and a bus station, and is served by London Underground's King's Cross St. Pancras tube station. Train services continue to serve lines to the Midlands with services being operated by East Midlands Trains. It is also the terminus of HS1 used by Eurostar services to mainland Europe via the Channel Tunnel, with services direct to Paris, Brussels and limited services to Avignon. Southeastern operates over HS1 from dedicated platforms, with destinations across Kent using Class 395 trains.

Thameslink Services between Bedford and Brighton operate via the below ground platforms A and B.

1.3 Bedford Station

The original station was built by the Midland Railway in 1859 on its line to the Great Northern at Hitchin.

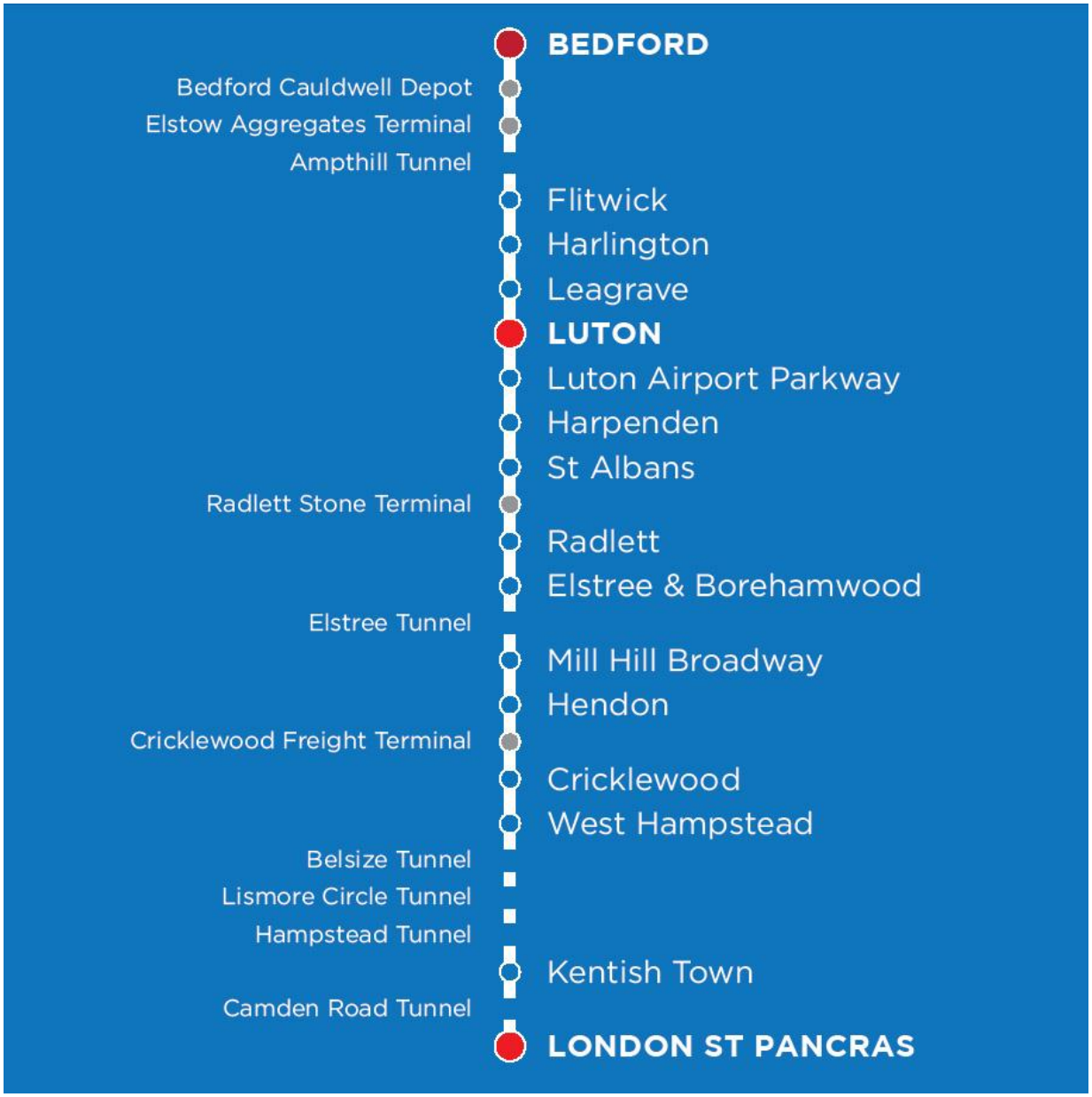
The LNWR also had a station on its line between Bletchley and Cambridge. The Midland crossed it on the level and there was a serious collision when an LNWR train passed a red signal. Following this accident, the Midland Railway built a flyover in 1885.

The extension to St Pancras opened in 1868. At this time the station was substantially altered, with the replacement of a level crossing by the Queen's Park over bridge. In 1890 fast lines were added to the west to allow expresses to bypass the station.

The current station was built in 1978.The station was moved about 110 yards (100 m) north, the slow lines were realigned to the west next to the 1890 fast lines, to which platforms were added.

The track layout around the station is set for significant changes as Network Rail aims to make operations easier and faster, in conjunction with electrification northward to Sheffield and westward to Bletchley and Oxford. The majority of the work will be north of the station.

1.4 Route Map



2 Class 319 Electric Multiple Unit

2.1 Class 319

The British Rail Class 319 dual-voltage electric multiple-unit (EMU) trains were built by BREL, York, in two batches in 1987–88 and 1990. The trains were introduced for new north-south cross-London services from Bedford to Brighton, and since privatisation these services have been operated by Thameslink and First Capital Connect, the former franchise having been merged with the Great Northern section of the former WAGN franchise to form the latter train operating company on 1 April 2006 as a result of re-franchising. Class 319 units have dual-power pick-up, from either 25 kV alternating current (AC) overhead lines for services north of London, or 750 V direct current (DC) third rail to the south. However, some units were used only on outer suburban services in South London.

In the 1980s, there were plans for a rail service that would link Bedford and Brighton. These services would become the first route for many years to cross London from north to south. These services were branded Thameslink by Network SouthEast, which operated the services.

Before the Thameslink service became operational in 1988, stations along the Midland Main Line north of London were served by Class 317 electric multiple units, introduced in 1981. This required the electrification (using 25 kV AC overhead wires) of the line between Bedford and London St. Pancras and the branch to Moorgate. This service was therefore known colloquially as the "Bed-Pan" service. Key destinations included Bedford, Luton, St Albans, Moorgate, and London St. Pancras.

As the Thameslink service was to use a route with 25 kV AC OHLE north of Farringdon and along the branch to Moorgate, and 750 V DC third-rail electrification south of Farringdon, the Class 319 trains were built with dual-voltage capabilities, making them very versatile. They were also required to have Emergency end doors in the cabs, due to the twin single bore layout of Smithfield tunnel preventing normal train evacuation.

Two sub-classes of Class 319 units were originally built. Over the years, units have been refurbished, creating five sub-classes, of which four still exist.

2.2 Design & Specification

TOPS Number	Class 319
Formation	4-car: DTSO+MSO+TSO+DTSO
Unit Weight	140.3tonnes
Vehicle Length	260ft 10in (79.52m)
Vehicle Width	9ft 3in (2.82m)
Body Construction	Steel body
Power Collection	750v DC 3rd Rail 25kv AC OHE / 750v DC 3rd Rail
Vehicle Power	1,326hp (990kW)
Design Speed	100mph (161km/h)
Coupling Type	Tightlock
Brake Type	Air
Seating	152 Standard

Class 319 DTSO

Class 319 TSOL

3 Creating a Class 319 Train Set

3.1 Scenario Editor (If Creating New Scenarios)

To get the Class 319 ready for selection in a scenario that is not located on the Midland Main Line route, 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:
   DTG/BedPanLine
4. The Class 319 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 319 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 be 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: **UUUUUUVVVVVd**

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

Example: 31938677983p *(where "p" is for St Pancras)*

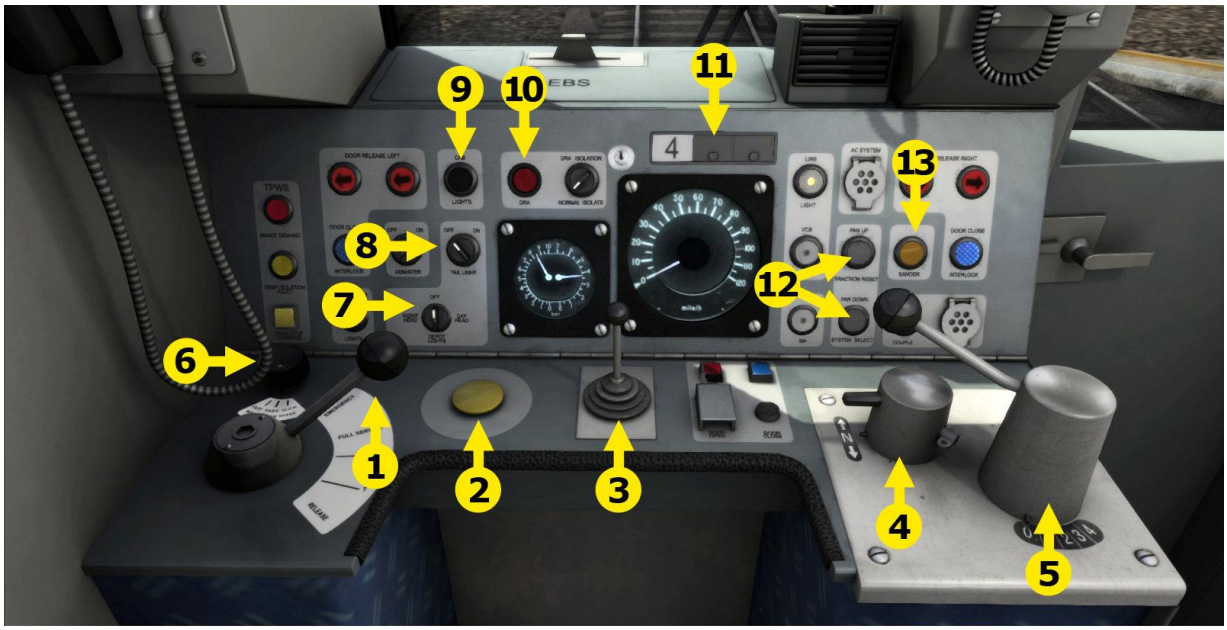
So the above value results in unit 319386, with vehicle number 77983, displaying "St Pancras" as the destination.

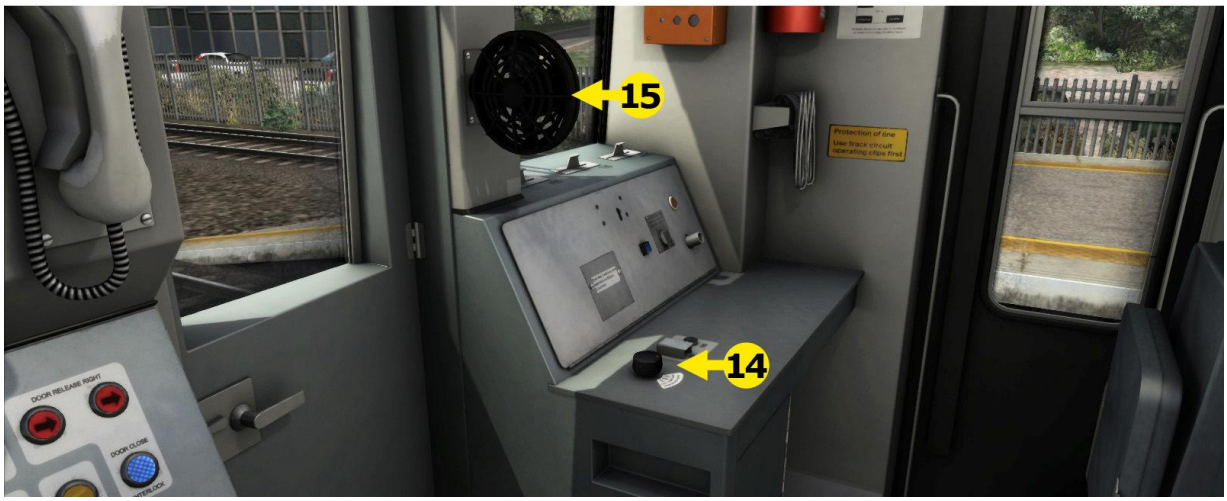
3.3 Destination List

a	Brighton via Gatwick Airport	**j**	London Blackfriars	**s**	Sevenoaks
b	Brighton	**k**	Kentish Town	**t**	Thameslink
c	City Thameslink	**l**	Luton	**u**	Sutton
d	Bedford	**m**	Moorgate	**v**	Victoria
e	London Bridge	**n**	Norwood Junction	**w**	Sutton via Wimbledon
f	Farringdon	**o**	Orpington via Herne Hill	**x**	Special
g	Gatwick Airport	**p**	St Pancras	**y**	Empty to Depot
h	Herne Hill	**q**	St Albans City	**z**	Not in Service
i	Horsham	**r**	Three bridges	**#**	blank

4 Driving the Class 319

4.1 Cab Controls





Main console			
1	Train Brake (; & ')	9	Cab Light Switch (L)
2	AWS Reset (Q)	10	DRA
3	Horn (Space)	11	Car Set Reminder (R)
4	Reverser Lever (W & S)	12	Pantograph Up/Down (P)
5	Throttle Lever (A & D)	13	Sander (X)
6	Wiper Control Switch - Left Window (V)	14	Wiper Control Switch - Right Window
7	Exterior Lights (H & Shift+H)	15	Driver's Fan
8	Exterior Lights	-	Vigilance Reset (Q)

5 Class 66 Diesel locomotive

5.1 Class 66

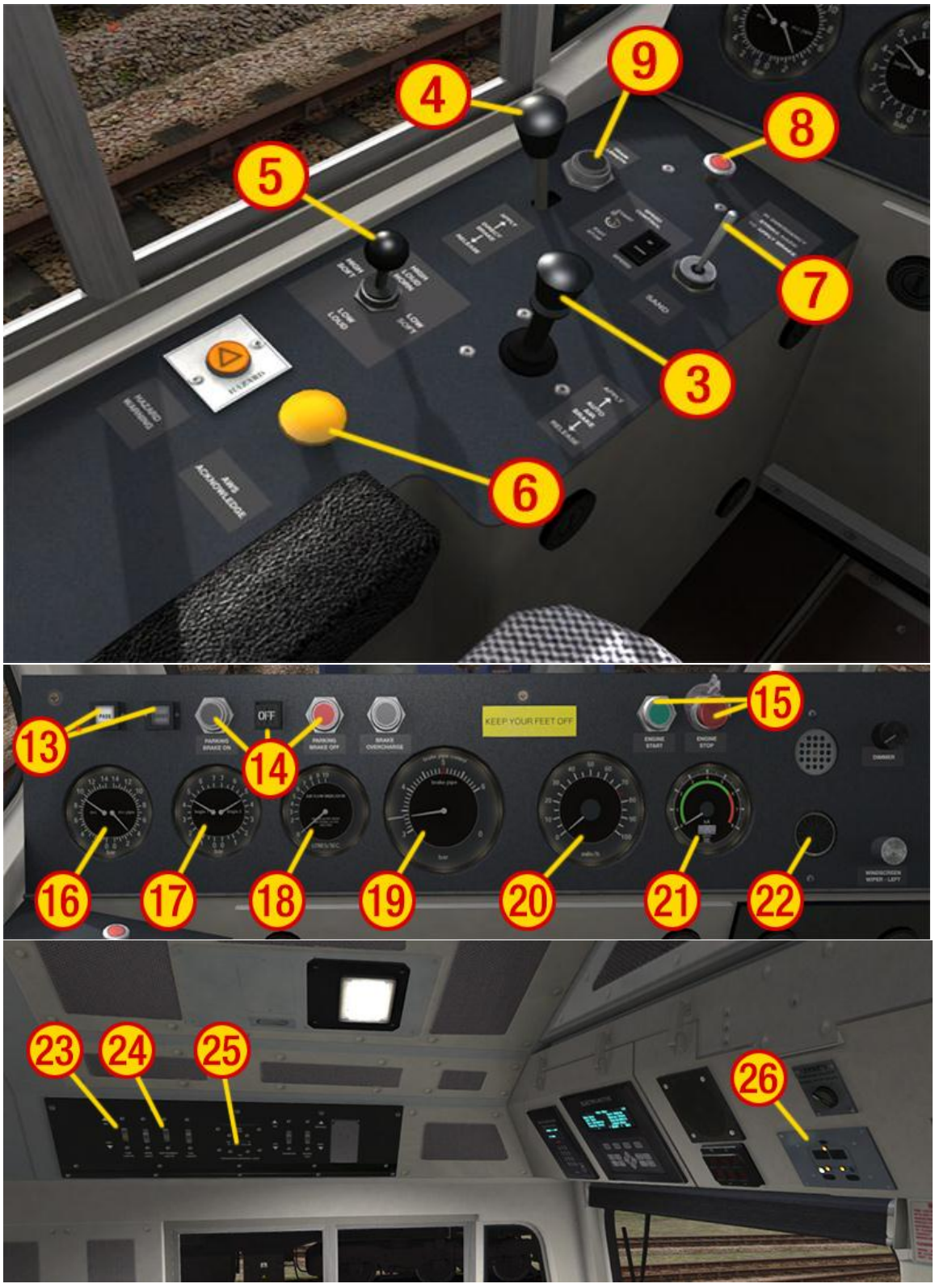
5.2 Design & Specification

TOPS Number	Class 66
Wheel Arrangement	Co-Co
Weight	126tonnes
Length	70'1/2" (21.34m)
Width13ft 7in (4.14m)	8ft 8¼in (2.65m)
Bogie Wheel Base	13ft 7in (4.15m)
Bogie Pivot Centres	43ft 6in (13.25m)
Wheel Diameter	3ft 6in (1.06m)
Minimum Curvature	4 chains (80.46m)
Engine Type	GM 12N-710G3B-EC
Engine Output	3,300hp (2,460kW)
Power at Rails	3,000hp (2,238kW)
Maximum Tractive Effort	92,000lb (409kN)
Continuous Tractive Effort	58,390lb (260kN)
Design Speed	87.5mph (141km/h)
Maximum Permitted Speed	75mph (121km/h)
Brake Type	Air, Westinghouse PBL3
Braking Force	68tonnes
Traction Alternator	GM EMD AR8
Traction Motors	GM EMD D43TR
Number of Traction Motors	6

6 Driving the Class 66

6.1 Cab Controls

1	Reverser (W & S)
2	Power Handle (A & D)
3	PBL Train Brake (; & @)
4	Locomotive Brake ([&])
5	Horn High (Space)
6	AWS Reset (Q)
7	Sander (X)
8	Emergency Brake (Backspace)
9	Train Length
10	Brake Demand
11	Left Wipers (V)
12	Right Wipers
13	Passenger / Goods Brake Mode
14	Parking Brake
15	Engine Start / Stop (Z)
16	Main Reservoir Gauge
17	Bogie Brake Cylinder Gauge
18	Air Flow Indicator
19	Brake Pipe Pressure Gauge
20	Speedometer
21	Alternator Output Gauge
22	AWS Indicator
23	Cabin Lights (L)
24	Instrument Lights
25	Headlight Switch (H & Shift+H)
26	Headlight / Tail Light Proving Panel



Note: The Train and Loco Brake levers (3&4) are not used when Train Simulator Driving Model is configured for “Simple Mode” under Game Settings. Under this setting the Throttle and Brakes are controlled together from the Throttle Lever (2).

6.2 Brake Levers

Both the Train Air Brake and Loco Air Brake levers have three functional positions:

- In the upright position they “Hold” the current brake pressure
- When pulled fully back they gradually “Release” the brakes
- When pushed fully forwards they gradually “Apply” the brakes

The Train Brake lever is centre sprung both in the cab and on the game HUD while the Loco Brake Lever is only sprung forwards for brake application and can be left resting in the “Release” position when required.

When using the Train Brake lever a target brake pressure can be selected as indicated by the outer needle on the Brake Pipe Pressure Gauge. The actual brake pressure will then gradually change to match the selected target as shown by the larger inner needle.

The rate that the brake pressure changes is dictated by the brake timing selection (“Passenger” or “Goods”) as selected and indicated on the main console (item 13 shown on the previous page). When in “Goods” brake timing mode the brake pressure changes more slowly.

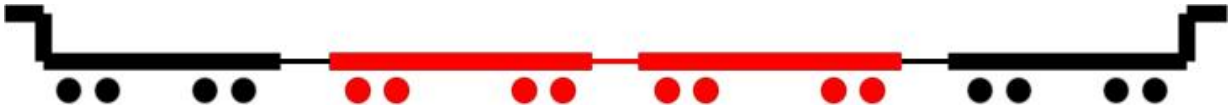
6.3 Additional Keyboard Controls

Key	Description	Key	Description
L	Toggle Cab Light	Ctrl+V	Toggle Right Wipers Switch
Ctrl+L	Toggle Instrument Lights	Space	Horn High
U	Toggle Train Length Button	Ctrl+Space	Horn High Low
Y	Toggle Passenger/Goods Brake Timing	B	Horn Low
V	Toggle Left Wipers Switch	Ctrl+B	Horn Low Soft

7 Freight Wagons

7.1 FSA Container Bogie 'Outer' Wagon

7.2 FTA Container Bogie 'Inner' Wagon



These wagons come with a selection of container cargo that can be loaded or unloaded. There are six variations per vehicle, named 1a/1b/1c & 2a/2b/2c respectively.

7.3 PCA Depressed Barrel Cement Tank

Having been transported in Presflo wagons for many years, the Associated Portland Cement Manufacturers (later Blue Circle Cement) decided to upgrade its fleet with conventional tank wagons. These were found unsatisfactory in operation until the depressed barrel design was introduced in 1969.

Using gravity to assist the air pressure discharge equipment, the design became very successful and many other cement companies have adopted the vehicles since.

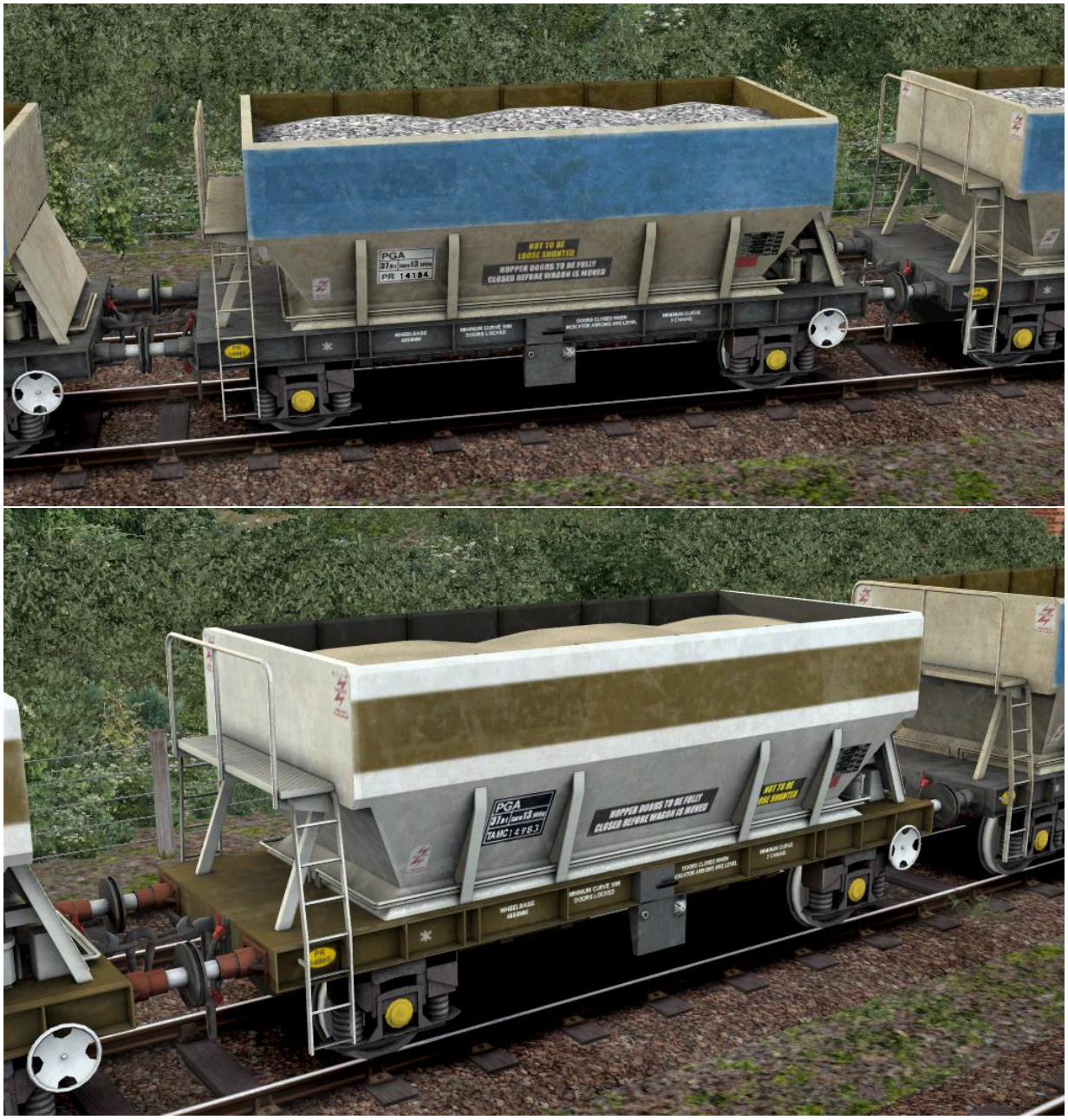
Three versions of the modern PCA wagon are featured in this pack (see below) including the hallmark bright yellow variant used by Ketton Cement up until 1995.

7.4 PGA 2-Axle Stone Hopper

The first of the 51t 2-axle hoppers arrived in 1972, replacing the previously leased MSV wagons on stone duties. With two separate companies operating their own fleets of PGA wagons, from separate manufacturers, many differences entered service in the 1970s.

These wagons remained the core vehicles for the transportation of stone product right through to the late 1980s under both Foster Yeoman and ARC, with augmentation of other fleets from ICI and later Tarmac increasing operational numbers.

While still in operation today, usage is much reduced due to the arrival of the much larger bogie hopper wagons, and greater hauling capacity of modern locomotives.



8 Scenarios

8.1 1. Right Down the Line

It is time for a full length run of the line! Start at Bedford and head down to St Pancras International. You are in the driver's seat of an 8-car, 319 express passenger service. Your duties finish at St Pancras, but this service will continue to Beckenham Junction.

- Duration 55 Minutes
- Difficulty Easy

8.2 2. Leaving So Soon

Starting at St Pancras International, run this 319 stopping passenger service to St Albans. You will then pull into the St Albans Centre Siding where you have a 10 minute respite. This service will later go on to form the 1314 St Albans to Sutton (Surrey).

- Duration 35 Minutes
- Difficulty Easy

8.3 3. Cross Town Traffic

Drive a stopping passenger service from Luton to St Pancras on a warm October's afternoon.

- Duration 45 Minutes
- Difficulty Medium

8.4 4. Doing the Cauldwell Walk

Starting at Bedford Cauldwell Depot, head to Luton where your first scheduled pick up is. This train will then form the 2025 Luton to Sutton (Surrey) service.

- Duration 25 Minutes
- Difficulty Easy

8.5 5. Rush Hour Soul

Starting at St Albans reversing siding you will be driving this Sutton bound passenger service as far as St Pancras Thameslink station.

- Duration 25 Minutes
- Difficulty Easy

8.6 6. Cementing Relations

Starting at Luton, drive a freight train northwards as far as Bedford.

- Duration 25 Minutes
- Difficulty Easy

8.7 7. Gravel Travels

Drive a late running gravel train between Luton and St. Pancras. Rail conditions and visibility are poor and you should expect to encounter signal checks along the way.

- Duration 50 Minutes
- Difficulty Hard

9 Signals

9.1 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.

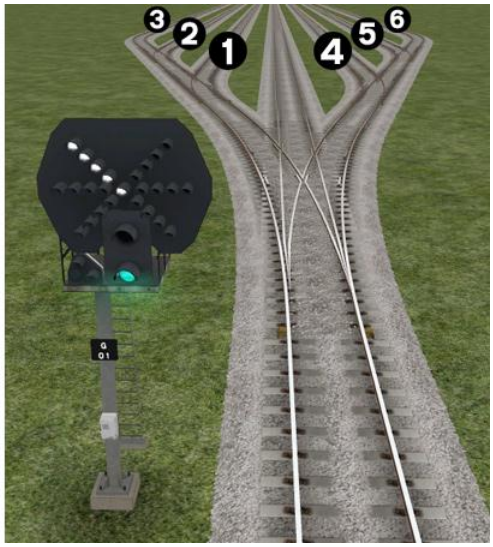
9.2 Theatre Type Signals

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.

9.3 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 below:



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.

9.4 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 into 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.

9.5 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.

9.6 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°.

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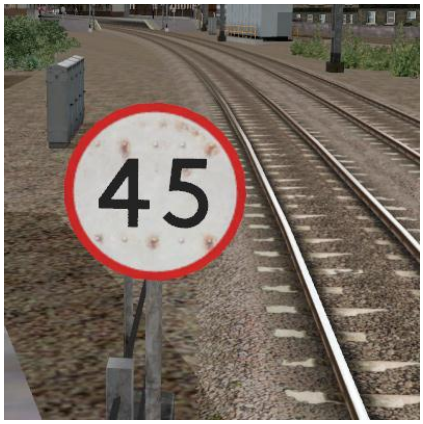
10 Speed Signs

10.1 Permissible Speed Indicators



These signs display the permissible speed in miles per hour (mph) 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.

10.2 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.

11 Safety Systems

11.1 AWS (Automatic Warning System)

AWS is provided to give train drivers in-cab warnings of; the approach to signals; reductions in permissible speed; 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.

12 Credits

As usual with all projects there is a long list of people to thank. So in no particular order here are the stars of the show.

Kevin McGowan
Danny Leach
Colin Ross
Edwin Thurston
Chris Luck
Ben Jervis
Perry Stringer
James Rutter
Adam Rose
Lewis Williams
Jeff Douglas
Peter Why
Rob Payne
Jordan Searle
Ade Adeleye
Finlay Pearston
Laura McConachie
Duncan McCafferty
Matt Eyre
Dan Barnett

We would also like to thank Dovetail Games QA Department and the Beta Testers.

Thanks for all the feedback, comments and suggestions throughout the creation, testing and completion of this project.

