



London Faversham High Speed

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1 Route Information

1.1 High Speed 1

After the opening of the Channel Tunnel in 1994, high speed Eurostar trains running directly to and from the European continent could only run at a maximum speed of 160 km/h (100 mph) on existing lines between London, Waterloo and the Channel Tunnel. Sharing the lines with local traffic limited the number of services that could be run, and jeopardised service reliability. As a result Parliament authorised the building of a dedicated high speed line, legally passing the Channel Tunnel Rail Link Act 1996.

Plans were originally started by British Rail in the early 1970s for a route passing through Tonbridge, however considerable environmental and social opposition saw this scheme cancelled, along with plans for the Channel Tunnel itself.

A further scheme for the Channel Tunnel Rail Link proposed a tunnel approaching London from the south-east to an underground terminus in the vicinity of Kings Cross station. However governmental changes to the plans, involving urban regeneration in east London, led to a change of route, with the approach from the east. This opened the possibility of reusing the underused St. Pancras station as the terminus, with access via the North London Line that crosses the throat of the station. This was rejected in 1994 as being environmentally damaging and too difficult to construct. However, the idea of using St. Pancras station as the core of the new terminus was retained and the scheme amended to being linked by 20 kilometres (12 miles) of specially built tunnels to Dagenham via Stratford.

London and Continental Railways (LCR), a consortium comprising of the National Express Group, Virgin Group, S. G. Warburg & Co, Bechtel and London Electric, was chosen by the UK government in 1996 to build the line, reconstruct St. Pancras station as its terminus and to take over the British share of the Eurostar operation. On 14 November 2006, LCR adopted High Speed 1 as the brand name for the completed railway. Official legislation, documentation and line-side signage, however, have continued to refer to "CTRL".

1.1.1 St. Pancras International 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 and 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.

1.1.2 Ebbsfleet International Station

Opened in November 2007, Ebbsfleet is 10 miles outside of Greater London and only 5 miles from the busy M25, allowing easy access for over 10 million commuters. It serves as a junction from HS1 on to the domestic north Kent lines via Springhead Junction.

During the London Summer Olympics and Paralympics of 2012, held in Stratford, the Olympic Javelin shuttle services were operated by Southeastern Trains over HS1. The service ran for the duration of the games between London, St. Pancras and Ebbsfleet at the rate of twelve trains per hour.

1.2 Chatham Main Line

Originally built by the South Eastern Railway (SER) and London, Chatham and Dover Railway (LCDR) between London and Dover, the line between Strood and Faversham was opened early in 1858. The LCDR joined with its rival, the SER, in January 1899 to form the South Eastern and Chatham Railway (SE&CR), giving LCDR services access into London Victoria.

The original line from London through to Medway was opened by the London and Greenwich Railway from 1833 running a minimal service between London Bridge and Strood. The section after Hoo Junction shared the tunnels between Higham and Strood with the Thames & Medway Canal Company, with the single track running along the canal tow path and timber props. The canal was primarily used to transport hops between the rivers Medway and Thames, but due to their seasonal nature traffic was low. The railway and canal was eventually brought out by the SER when the canal was finally drained, infilled and the railway laid as double track.

The LCDR line between Strood and Faversham opened in two stages. The Chatham to Faversham section was first, opening on 25 January 1858. It served Chatham, Rainham (Kent), Sittingbourne, Teynham and Faversham. The second section opened on 29 March of the same year between Strood and Chatham, with the lines from Strood station to the bridge sharing SER metals. The SER lines ran into a separate terminus at Rochester, named Chatham Central. Shortly after, the LCDR opened a new station at New Brompton. This was to become known as Gillingham in October of 1912.

In 1923, railway grouping saw the LC&DR become part of the Southern Railway. Having adopted the 750V DC third rail system as their traction power source, the line was one of the first to receive the system in 1939, ahead of the 1955 BR modernisation plan. As part of the plan, the track between Rainham in Kent and Newington was widened to 4 lines in 1959.

1.2.1 Faversham Station

Serving the ancient sea port town of Faversham, situated 49 miles (78 km) from London St Pancras, Faversham station was originally built in 1858 by the East Kent Railway (EKR) as part of the line between Canterbury and the SER station at Strood. The company was later merged with the LC&DR and the site was rebuilt in 1898. It is this station which is now Grade II listed.

Faversham engine shed (73E), also listed Grade II, has fallen into ruin in the junction with the Whitstable and Canterbury lines to the east of the station. The brick built signal box dates from 1959 when electrification was completed.

In 2009 preparatory works were carried out for services to London St Pancras via Ebbsfleet International from 13 December. The Chatham Main Line east of Faversham was re-signalled during 2011, with signaling transferred to the Gillingham power box, resulting in the decommissioning of the Faversham signal box.

2 Class 395 Electric Multiple Unit

2.1 Class 395

The Class 395 is a dual-voltage electric multiple unit (EMU) built for high-speed commuter services on High Speed 1 and across selected routes on the integrated Kent franchise.

The 6-car units were built in Japan by Hitachi and capable of running at a maximum speed of 140 mph (225 km/h) under 25kV AC overhead electrification on High Speed 1, and 100 mph (161 km/h) on 750V DC third rail supply on domestic lines.

Southeastern operated train services between London St Pancras, Stratford International and Ebbsfleet International for the London 2012 Olympics and Paralympics using Class 395s. The service was officially known as the 'Olympic Javelin Shuttle' with all units having the 'Javelin' branding beside the cab doors. Since the conclusion of the events this branding has been removed and is reflected in our representation of the train.

2.2 Design & Specification

TOPS Number	Class 395
Formation	DPTSO(A)-MSO-MSO-MSO-MSO-DPTSO(B)
Unit Weight	268.5 tonnes
Vehicle Length	101.3m (332 ft 4 in)
Vehicle Width	2.81m (9 ft 2 in)
Body Construction	Aluminium
Power Collection	25kV AC overhead electrification 750V DC third rail
Design Speed	High Speed 1: 225 km/h (140 mph) Network Rail: 160 km/h (99 mph)
Brake Types	Electropneumatic
Seating	340 seats + 12 tip up



2.3 Driving the Class 395

2.3.1 Cab Controls



Cab Controls (Contd.)

1	Reverser	10	TVM430 in-cab signaling display
2	Throttle and brake	11	Driver Reminder Appliance
3	Emergency brake	12	AWS flower
4	DC third rail power	13	AWS reset
5	CTRL overhead power	14	Wiper speed control
6	Pantograph up\shoes down	15	Horn
7	Pantograph down\shoes up	16	Headlights
8	Line voltage indicator	17	Sander
9	Speedometer	18	Cab light

2.3.2 Additional Controls

Keyboard Assignments (Underlined = default value)

Cycle Headlights (Tails, <u>Off</u> , Markers, Day, Night)	H / Shift + H
Toggle Blind	U
Toggle Emergency Brake Plunger	Backspace
Directional Lever (Reverse, <u>Neutral</u> , Forward)	W / S
AWS Reset Button Press	Q
Sander Button Press	X
Horn	Space
Combined Power / Brake	A / D
Pantograph Up / Shoes Down	P
Pantograph Down / Shoes Up	Shift + P
Switch to DC Power Mode	I
Switch to CTRL Power Mode	O
Reset Vigilance Device (DSD)	Numpad Enter
Signal Buzzer	C
Cab Light	L
Cycle Wiper Speed (<u>0</u> , 10, 40, 60)	W / Shift + W
Open / Close Coupler Hatch	B
Toggle Driver's Reminder Appliance (DRA)	K
Open / Close Passenger Doors	T

2.3.3 Driving

To move the Class 395 Electric Multiple Unit:

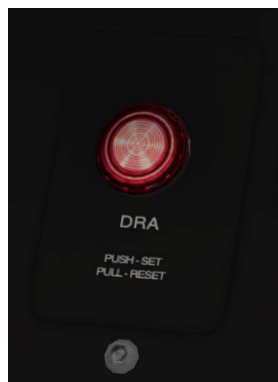
1. Move the **directional lever** into **neutral**.
2. Select the correct power mode for the track type. Press the **DC** button for 3rd rail power, or press **CTRL** for overhead wires on the HS1 line. The speedometer will switch between mph and km/h automatically.
Note: If the mode is already selected, nothing will happen. Otherwise the **Line Volts** light will extinguish and the **MCB / VCB** light will illuminate to indicate the circuit breakers have tripped.
3. Press the **Pan Up / Shoes Down** button to raise the pantograph / lower the 3rd rail shoes. The **Line Volts** light should illuminate soon after. If not, ensure you have selected the correct power mode.
4. When the **Line Volts** light is illuminated, press **Pan Up / Shoes Down** again, and the **MCB / VCB** light should turn off to indicate the circuit breakers are closed.
5. Make sure the signal ahead is showing a proceed aspect. If it is, turn off the **Driver's Reminder Appliance**, otherwise wait until a proceed aspect is shown.
6. Check **Door Interlock** lights are illuminated. If not, the brakes will remain fully applied if doors are open.
7. Move the **directional lever** into **forward**.
8. Move the **combined power / brake** handle into a power notch to start moving.

To stop the Class 395 Electric Multiple Unit during regular service:

- Move the **combined power / brake** handle between MIN and MAX brake positions, applying as much brake as necessary to ensure passenger comfort.
- On approaching a station where no platform starting signal is present and the last signal displayed a cautionary aspect, press the **DRA** button in to remind that the next signal may be at a stopping aspect.
- On stopping at a signal showing a stop aspect, press the DRA button in to prevent power accidentally being applied before the signal clears.
- Emergency braking can be instigated in a number of ways. The unit will automatically apply the emergency brake in response to various safety systems:
- Moving the **combined power / brake** handle into the E position. This position is spring loaded and emergency braking will apply until the emergency alarm is reset.
- Pressing an **emergency plunger** located on the front panel or the second man's panel. The plunger will remain pressed and the emergency brake will remain applied until the plunger is reset and the emergency alarm is reset. Passing over a TPWS grid when over speed, or a TPWS grid protecting a signal at a stop aspect.
- Failing to respond to an AWS alarm after a few seconds.
- Failing to reset the vigilance device.
- Over speeding in a TVM block.
- Passing into a non-permissive TVM block with the 000E aspect displayed in cab.

2.3.4 Driver Reminder Appliance (DRA)

The class 395 is equipped with a Driver Reminder Appliance (DRA). This is a manual switch which, when set, prevents the driver from applying power to move their train. It should be set when stopping at a station and unset when moving off – but only after confirming a proceed signal aspect.



- To set the DRA, click the DRA plunger at the top of the console to the left of the TVM430 display or press the K key on your keyboard. The plunger will glow red when set.

- To unset the DRA, click the plunger again or press the K key on your keyboard. The plunger will no longer glow red.



2.4 Troubleshooting

The Class 395 Electric Multiple Unit has a number of safety systems in place to prevent the unit from moving unintentionally. If the vehicle won't move, check the following:

NOTE: If the Class 395 consist is placed on track without power and the route has not been specifically setup to support the Class 395, then this light may illuminate incorrectly. In this case, check that the track has either 3rd rail or overhead wires. The Class 395 is designed to work on any route with electrification, but for the full experience, the route must be setup with Class 395 specific track properties.

- **Line Volts** is not illuminated.
 - Ensure the correct power mode is selected and press the **Pan Up / Shoes Down** button. This light should now illuminate
- **MCB / VCB** is illuminated
 - If **Line Volts** is illuminated, press the **Pan Up / Shoes Down** button to close the circuit breakers. This light should now extinguish
- **DRA** light is illuminated
 - Toggle the **DRA** button so the light is not illuminated to allow the vehicle to apply power.
- **Directional Lever**
 - The directional lever must be in the Forward or Reverse position.
- **Vigilance Alarm** is active
 - Cancel the **Vigilance Alarm** by pressing the **Vigilance Reset** key (simulates re-depressing the Driver's Safety Device pedal)
- **Emergency Alarm** is active
 - Check both emergency brake plungers are reset to their normal position.
 - Deactivate the vigilance alarm if active.
 - Move the combined power / brake to the emergency position and release to deactivate the emergency alarm.
- **Combined power / brake** handle is in a power notch
 - Move the combined power / brake handle to notch 0 to reset the handle.
 - NOTE: If the handle is in a power notch when an interlock (e.g. DRA) is tripped preventing power from being applied, then no power will be applied when the interlock is reset until the combined power / brake handle is reset
- **Door Interlock** lights are not illuminated
 - If the door interlock lights are not illuminated (in the tripped state), then the doors must be closed before brakes can be released.

2.5 Creating a Class 395 train set

2.5.1 Scenario Editor (creating new scenarios)

To get the Class 395 ready for selection in a scenario that is not located on London Faversham High Speed, 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 / KentHighSpeed
4. The Class 395 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 395 to be available.



2.5.2 Class 395 Consist Formations

Class 395 Train Set is made up of the following consist:

DPTSO(A)+MSO(A)+MSO(B)+MSO(C)+MSO(D)+DPTSO(B)

Unit Numbers are 395001 through to 395029

Individual Vehicle Numbers are:

DPTSO(A) : 390x1 running in 10s from 39011 through to 39291

MSO(A) : 390x2 running in 10s from 39012 through to 39292

MSO(B) : 390x3 running in 10s from 39013 through to 39293

MSO(C) : 390x4 running in 10s from 39014 through to 39294

MSO(D) : 390x5 running in 10s from 39015 through to 39295

DPTSO(B) : 390x6 running in 10s from 39016 through to 39296



2.5.3 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: **dVVVVVVUUUUU**

- d** = the Destination code (See the Destination List below)
- VVVVVV** = the Unit number displayed on the side of the coach
- UUUUU** = the Vehicle number displayed on the driving vehicle

Example : a39500139011 (*where "a" is for St Pancras International*)

So the above value results in unit 39500139011, with vehicle number 39011, displaying "St Pancras International" as the destination

2.5.3.1 Destination List

a	St Pancras International	j	Sittingbourne	s	Sandwich
b	Stratford International	k	Faversham	t	Ramsgate
c	Ebbsfleet International	l	Ashford International	u	Not in use
d	Gravesend	m	Broadstairs	v	Not in use
e	Strood	n	Canterbury West	w	Not in use
f	Rochester	o	Dover Priory	x	Not in use
g	Gillingham	p	Folkestone Central	y	Not in use
h	Chatham	q	Maidstone West	z	Not in use
i	Rainham	r	Margate		



2.6 Scenarios

2.6.1 Class 395 Driver Training: Driving the Class 395

Learn to drive the Class 395.

- **Date** 29/01/2013
- **Duration** 20 minutes
- **Start Location** Faversham

2.6.2 Class 395 Driver Training: TVM Signalling

Learn to use TVM signalling.

- **Date** 10/03/2013
- **Duration** 15 minutes
- **Start Location** Ebbsfleet International

2.6.3 Far Horizons

Drive a full run from St Pancras to Faversham.

- **Date** 24/04/2013
- **Duration** 70 minutes
- **Start Location** St Pancras International

2.6.4 Frost Fall

Drive the 395 from St Pancras, making your way towards Faversham. It is winter and a snow storm is on the way which may disrupt your journey.

- **Date** 15/01/2013
- **Duration** 60 minutes
- **Start Location** St Pancras International

2.6.5 There and Back Again

Drive from Ebbsfleet to St Pancras, including the return journey.

- **Date** 07/08/2013
- **Duration** 45 minutes
- **Start Location** Ebbsfleet

2.6.6 Into Darkness

Drive an evening service from Faversham to St Pancras. The traffic ahead of you might slow you down. Can you make it to all of your stops on time?

- **Date** 10/11/2013
- **Duration** 75 minutes
- **Start Location** Faversham

3 Class 375 'Electrostar' Electric Multiple Unit

3.1 Class 375

The Class 375 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.

3.2 Design & Specification

TOPS Number	Class 375
Formation	4-car: DMCO+MSO+TSO+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



Driving the Class 375

3.2.1 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 | 3 rd Rail Shoe controls |
| 19 | Pantograph controls |
| 20 | Headlights |
| 21 | Taillights |
| 22 | Blinds |

3.2.2 Additional Controls

The following additional keys can be used with the Class 375 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



3.3 Creating a Class 375 train set

3.3.1 Scenario Editor (if creating new scenarios)

To get the Class 375 ready for selection in a scenario that is not located on London Faversham High Speed, you will need to enable it in the object set filters, which will add it to the rolling stock browser list.

Follow these steps:

6. 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).
7. Click the Object Set Filter button (the small blue cube on the middle left panel).
8. In the new window which opens on the right hand side, select the following:
RSC / KentHighSpeed
9. The Class 375 vehicles will now appear in the list of rolling stock.
10. You may need to repeat this process on other routes or scenarios where you wish the Class 375 to be available.

3.3.2 Class 375 Consist Formations

Class	Consist	Number Range
375/3	DMOC - TOSL - DMOC	375301 - 375310
375/6	DMOC - PTOSL - MSOL - DMOC	375601 - 375630
375/7	DMOC - TOSL - MOSL - DMOC	375701 - 375715
375/8	DMOC - TOSL - MOSL - DMOC	375801 - 375830
375/9	DMOC - TOSL - MOSL - DMOC	375901 - 375927

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.

The following liveries are available in the London Faversham High Speed package. A comprehensive collection of pre-built in each livery are also available in the scenario editor.

Class 375 SE-White



Class 375 SE-WhiteGrey



Class 375 SE-Blue



Class 375 SE-BlueStripe



3.3.3 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: **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 : j78580375701 (*where "j" is for Faversham*)

So the above value results in unit 375701, with vehicle number 78580, displaying "Faversham" as the destination

3.3.3.1 Destination List

a	London Victoria via Mainstone East	j	Faversham	s	Rochester
b	London Victoria via Bromley South	k	Folkestone Central	t	Sevenoaks
c	Cannon Street	l	Gillingham	u	Sheerness on Sea
d	Charing Cross	m	Hastings	v	Sittingbourne
e	Ashford International	n	London Bridge	w	Strood
f	Canterbury East	o	Margate	x	Tonbridge
g	Canterbury West	p	Orpington	y	Ramsgate / Dover P Divides at Faversham
h	Dartford	q	Paddock Wood	z	Sorry, Not in Use
i	Dover Priory via Chatham	r	Ramsgate via Chatham		

4 Operation

4.1 TVM

4.1.1 Introduction

TVM (Transmission Voie-Machine or track-to-train transmission) is a form of in-cab signalling originally deployed in France and used on high-speed railway lines. At high speeds it is not possible for a driver to accurately see colour-light based railway signals along the track-side. Signalling information is instead transmitted to the train and displayed as part of the train controls. The driver is shown the safe operating speed, displayed in kilometres per hour. The TVM-430 system transmits more information than traditional signalling would allow, including gradient profiles and information about the state of signalling blocks further ahead. This high degree of automation does not remove the train from driver control, although there are safeguards that can safely bring the train to a stop in the event of driver error.

You will need to be able to understand the TVM signalling for the high-speed section of the route.

4.1.2 TVM signals



These signs mark a TVM signal position and are placed approximately 950m apart between Springhead Junction and St Pancras. These are update positions which transmit line speed data to the TVM430 in cab signaling system.

4.1.3 How to read TVM

In the cab you will find a double row of square indicators. This is where target speeds for the current and subsequent blocks are displayed to the driver, in the form of numbers (in km/h) on a colour-coded background. Full line speed is indicated in white numerals on a green background, while slower aspects are indicated in white numerals on a black background and a full stop is indicated as "000" on a red background.

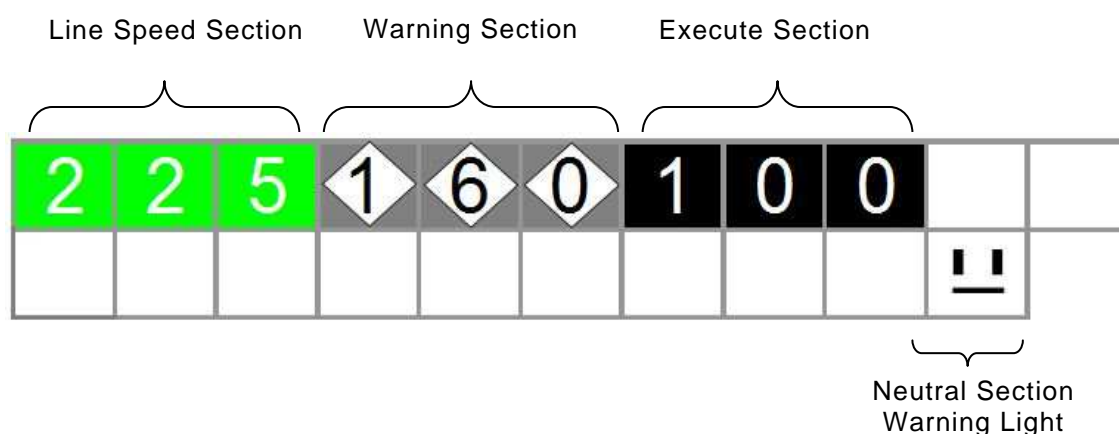


Figure 1

TVM Display showing position of numbers and example numbers. Colours are a representation but font colours are correct.

4.1.3.1 Line Speed Section

This section displays white numbers on a green background and can be either static or flashing. This section only displays the numbers 225, 200 and 160. It shows that the train may proceed to the maximum speed of the line displayed.

4.1.3.2 Warning Section

This section displays black numbers on a white diamond in a black background and will either be static or flashing. This section warns the driver what the speed is at the next signal. By example: if it is flashing 160 then you should to be doing less than 160 by the next signal. If it is a static 160 then that means at the next signal the speed limit will be 160.

4.1.3.3 Execute Section

This section displays a black background with white numbers and will be either static or flashing, telling the driver this is what you should currently be doing. A static execute function would normally appear after a static warning indication. The 000 and three solid red squares only appear in this section.

4.1.4 TVM by Example

Changes in speed limit can occur anytime regardless of where you are in a block. Speed limits can only go down at a signal.

Let us say the TVM is displaying a static 225 line speed until you pass the next signal, when it displays a flashing 225 line speed. This means that the speed past the next signal is going to display a speed less than this, so you need to be slowing down and be doing less than 225 by the next signal.

When you reach the next signal the display shows a flashing 200 warning indication. This indicates you need to continue braking to below 200 as the next signal is going to display a

lower speed. At the next signal however, you get a static 160 warning indication. This means that you need to be doing 160 by the next signal but don't necessarily have to continue decreasing speed as the next signal will display a static 160 execute indication. So you can now do a maximum of 160 until the display tells you otherwise.

When speeds are going down there is limit on how far they can go down from certain speeds. If you have a 225 displaying then it will not drop straight to 000. It would have to count down through 225, 170, 000. The TVM can only drop to 000 from a maximum of 170. And 225 can only drop to a minimum speed of 170 so it will not go from 225 to 160.

Below the TVM display is the speedometer, where the continuously varying target speed is indicated, as well as the current speed. (Speed is measured by a redundant tachometer to a precision of 2%.) For an indication, under a 300 km/h aspect, the computer will take action only if the train exceeds 315 km/h.

4.2 Signals

4.2.1 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.

4.2.2 Theatre Type Signals



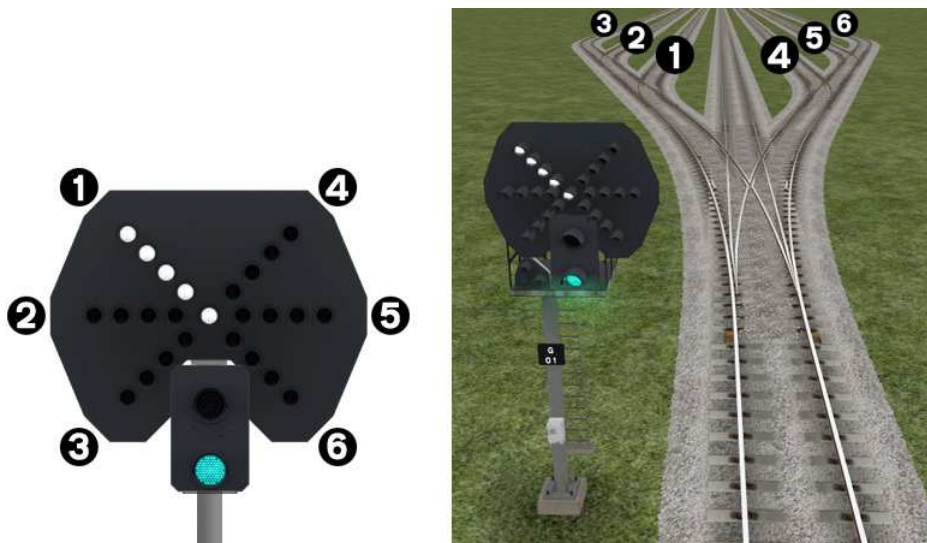
A Theatre alphanumeric route indicator indicates the route to be taken using numbers or letters (or a combination of numbers and letters).

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



4.2.3 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

4.2.4 Ground Signals and Position Light Signals



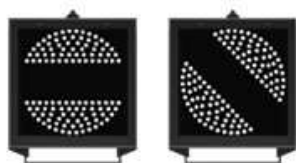
Ground Signals and Position Light Signals (PLS) display their aspects by means of the position and colour of lights. Ground Signals are always illuminated and can have miniature theatre indicators attached whereas PLS only illuminate to allow a train to pass in to an occupied section of line and are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

4.2.5 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.

4.2.6 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°.

4.3 Speed Signs

4.3.1 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.

4.3.2 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.

4.4 Safety Systems

4.4.1 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.

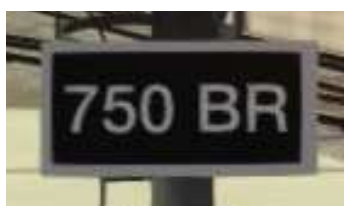
4.5 Traction Power

4.5.1 25kV AC Overhead



This sign denotes that traction power is supplied via 25kV AC overhead cables from this point forward. The train pantograph should be raised in order to proceed.

4.5.2 750V DC Third Rail



This sign denotes traction power is supplied via 750V DC third rail from this point forward. The train should deploy the third rail shoes in order to proceed.

5 Credits

RailSimulator.com would like to acknowledge the following for their invaluable input during production and testing of London Faversham High Speed.

- Beta Testing Team
- Hitachi Rail Ltd
- Staff at Hitachi Ashford Rail Depot
- London & Continental Railways

