Class 411/412 Electric Multiple Unit

![AP logo]

Contents

How to Install

1) Locate where you have downloaded this pack and unzip it. Information on how to do this can be found *here*.
2) Go to the location where you have extracted the files from the .zip file.
3) Now find the .exe file called 'Class 411-412 EMU Pack'. Double-click this file.
4) Follow the steps and by the end of the process, the main part of this pack will have installed.
5) If you intend to use any of the included scenarios, make sure you have the freely available extra stock pack and relevant payware add-on packs listed on the product page installed so the scenarios function as intended.
6) To ensure the cab environment sounds as intended in this pack, please make sure that 'EFX' is ticked within your in-game Audio settings.

AP

Technical Information

Manufacturer	British Rail Eastleigh
Years built	1956 - 1963
Number built	135
Traction motors	4 x EE507
Maximum speed	90 mph (145 km/h)
Coupling type	Buckeye
Length	19.75 m per car
Height	3.81 m
Width	2.81 m
Weight	157.4 t

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Liveries

All liveries are provided with weathered variants. These are designated with W1, W2 or W3 suffixes in the scenario editor. W1 being the cleanest and W3 the dirtiest. A W4 variant is supplied for 'Ex-Network SouthEast' variants to represent the filthy fronts they had towards the end of their lives with Connex South Eastern. All Quick Drive consists use the W2 variant except for the '(Weathered)' options which use W4.

BR Blue/Grey:

      with BR logo - *BR B/G*
      with BR logo and NSE side logo - *Ex-BR B/G (NSE1)*
      with BR logo and NSE side and front logo - *Ex-BR B/G (NSE2)*

London and South East:

     with BR logo - *LSE1*

     with BR logo and NSE side logo - *Ex-LSE1 (NSE1)*

     with BR logo and NSE side and front logo - *Ex-LSE1 (NSE2)*

     with BR logo and 1066 Electrics logo - *LSE1 (1066)*

     with BR logo, 1066 and NSE side logo - *Ex-LSE1 (1066/NSE1)*

     with BR logo, 1066 and NSE side and front logo - *Ex-LSE1 (1066/NSE2)*

London and South East Revised:

    with BR logo - *LSE2*

    with BR logo and NSE side logo - *Ex-LSE2 (NSE1)*

    with BR logo and NSE side and front logo - *Ex-LSE2 (NSE2)*

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Network SouthEast:

      with front and side logo - *NSE1(1)*

      with front and side logo and Kent Coast logo - *NSE1(1/KC)*

      with front and side logo and Solent & Wessex logo - *NSE1(1/SW)*

      with side logo - *NSE1(2)*

      with side logo and Kent Coast logo - *NSE1(2/KC)*

      with side logo and Solent & Wessex logo - *NSE1(2/SW)*

      without any logos - *Ex-NSE1*

      with South West Trains logo - *Ex-NSE1 (SWT1)*

      with revised South West Trains logo - *Ex-NSE1 (SWT2)*

Ex-Network SouthEast (Orange Cant Rail) - *Ex-NSE2*

Network SouthEast (Orange Cant Rail & Black Front 1):

with logo - *NSE3*

without logo - *Ex-NSE3*

Ex-Network SouthEast (Orange Cant Rail & Black Front 2):

  without logo - *Ex-NSE4*

  with revised South West Trains logo - *Ex-NSE4 (SWT2)*

Connex - *CX1*

Connex Revised:

with logo - *CX2*

without logo - *Ex-CX2*

BR Green

Ex-Network SouthEast (Stagecoach Blue/White) - *Ex-NSE (Blue/White)*

South West Trains - *SWT1*

South West Trains (Black Front) - *SWT2*
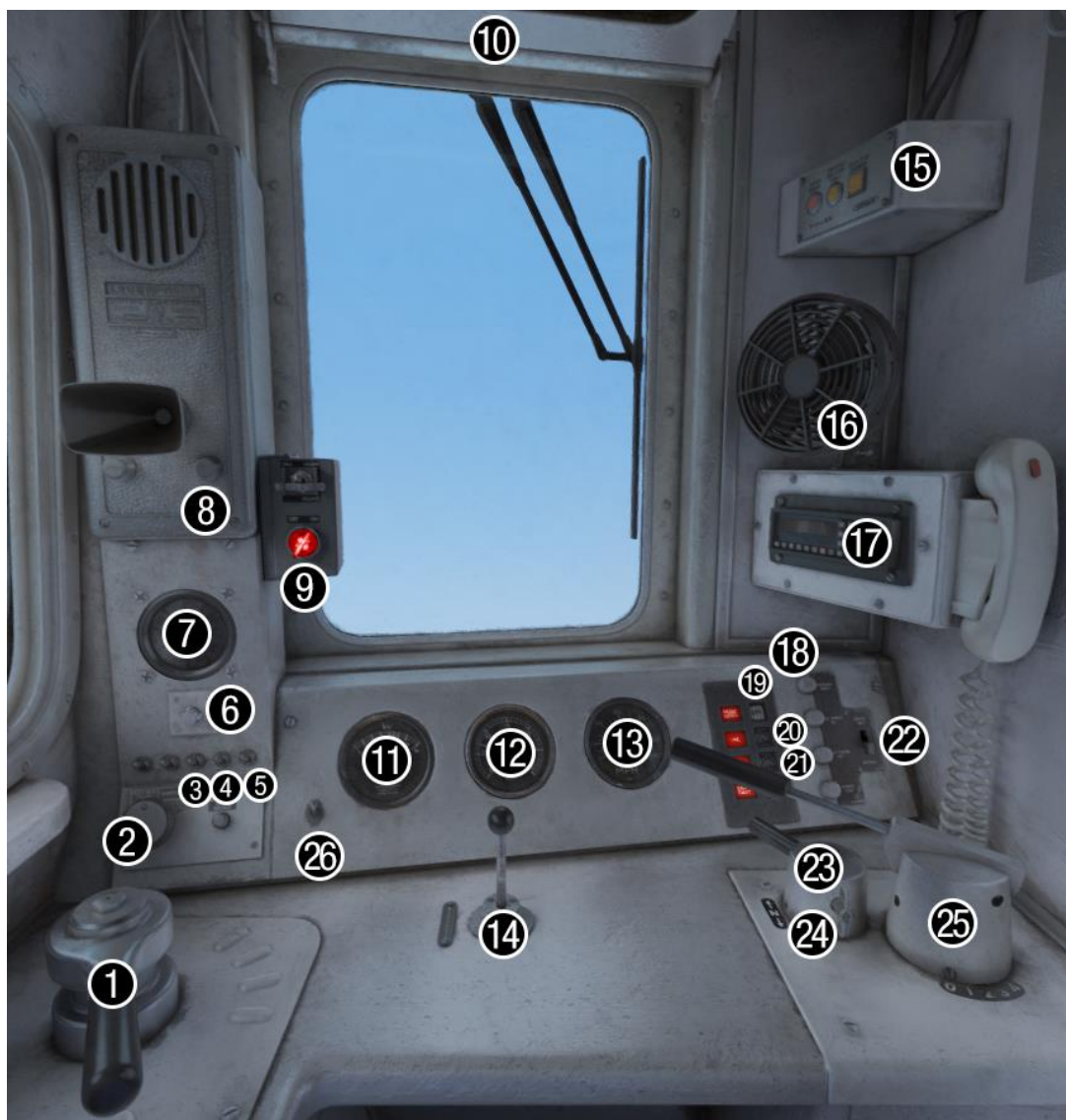

South Eastern Trains - *SET1*

## South Eastern Trains (Black Front) - *SET2*

Cab Guide

Driver's Side

1 - Brake handle
2 - Windscreen wiper switch
3 - Meter lights switch
4 - Cab lights switch
5 - Route indicator switch
6 - AWS reset button
7 - AWS sunflower
8 - Loudaphone call button
9 - Driver's Reminder Appliance (DRA)
10 - Visor
11 - Brake pipe & main reservoir pressure gauge
12 - Brake cylinder pressure gauge
13 - Speedometer

14 - Horn
15 - Train Protection Warning System (TPWS)
16 - Fan
17 - Cab Secure Radio (CSR)
18 - Overload reset button
19 - Brake supply indicator
20 - Line light indicator
21 - Motor generator (MG) indicator
22 - Series only/normal switch
23 - Reverser
24 - Master key
25 - Power handle
26 - Headlight switch

Headcode Roller Blind & Non-driver's Side
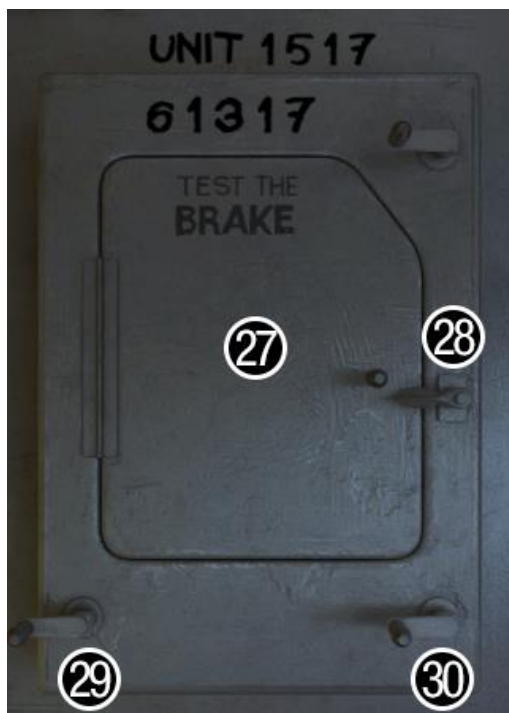
27 - Headcode blind box door
28 - Headcode blind box lock
29 - Headcode blind crank (2nd digit)
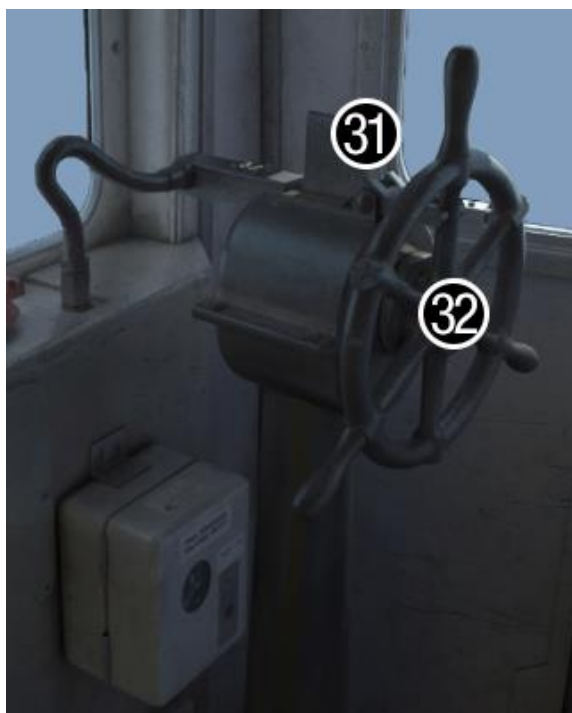
30 - Headcode blind crank (1st digit)
31 - Handbrake lock
32 - Handbrake

Auxiliary Cupboard

33 - Auxiliary cupboard lock
34 - Auxiliary cupboard handle
35 - Ammeter
36 - EP brake MCB
37 - AWS/TPWS MCB
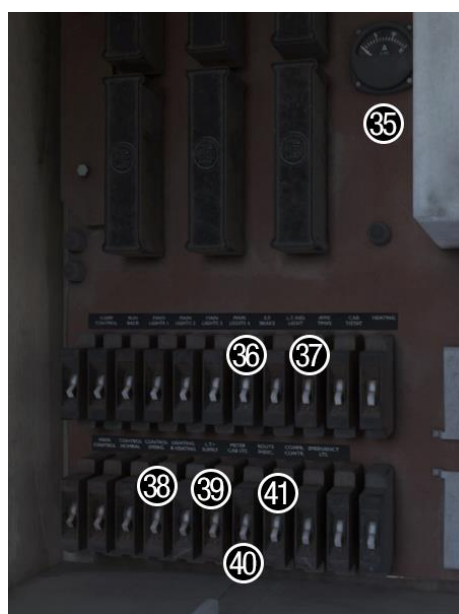
38 - Lighting & heating MCB
39 - Meter cab lights MCB
40 - Route indicator MCB
41 - Compressor control MCB

Vestibule

42 - Emergency cupboard door   44 - Cab to vestibule door
43 - Paddle

Mini Auxiliary Cupboard

45 - Auxiliary Isolation Switch (AIS) TRIP
46 - Auxiliary Isolation Switch (AIS) CLOSE

Keyboard Controls

Non-standard keyboard controls are listed below:

P -	Auxiliary Isolation Switch (AIS) CLOSE
Ctrl+P -	Auxiliary Isolation Switch (AIS) TRIP
Backspace -	Brake handle (EMERGENCY)
Ctrl+' -	Brake handle (LAP/60%)
L -	Cab lights switch ON/OFF
Y -	Driver's Reminder Appliance (DRA) ON/OFF
Ctrl+1 -	Headcode blind (1st digit) DOWN
Ctrl+2 -	Headcode blind (1st digit) UP
Ctrl+3 -	Headcode blind (2nd digit) DOWN
Ctrl+4 -	Headcode blind (2nd digit) UP
H -	Headlight switch ON/OFF
Space -	Horn (low tone)
B -	Horn (high tone)
Shift+H -	Horn factor UP
Ctrl+H -	Horn factor DOWN
C -	Loudaphone call button
I -	Meter lights switch ON/OFF
J -	Route indicator light switch ON/OFF
Shift+W -	Master key IN/OUT
Shift+M -	Motor factor UP
Ctrl+M -	Motor factor DOWN
O -	Saloon lighting OFF/ON
Ctrl+Numpad Enter -	Visual aids ON/OFF
V -	Wiper (driver) switch LEFT
Shift+V -	Wiper (driver) switch RIGHT
N -	Wiper (offside) switch LEFT
Shift+N -	Wiper (offside) switch RIGHT

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Features

Cab Variants

From refurbishment in the 1980s to their withdrawal in 2005, the cab did not change much apart from seat moquette and the addition of Driver's Reminder Appliance (DRA) and Train Protection Warning System (TPWS). Era-specific stickers are also visible in the South West Trains cab. The correct variant is automatically chosen depending on the livery you are using.

Seat Moquette

British Rail

Network SouthEast
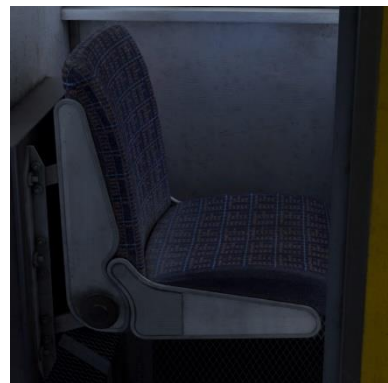
South West Trains

Driver's Reminder Appliance

Train Protection Warning System

Passenger View

A passenger view with multiple camera angles is provided for all vehicles in this pack (DMS/TBC/TS/TSRB) with both British Rail & Network SouthEast seat moquette variants.

To switch between vehicles, press **Ctrl+Left Arrow** or **Ctrl+Right Arrow**.

DMS (Driving Motor Second)

TBC (Trailer Brake Composite)

TS (Trailer Second)

TSRB (Trailer Second Restaurant Buffet)

Bogies

All four bogie types that these units have carried are represented and automatically applied depending on the class/number of your unit. The differing audio characteristics of the Commonwealth & B5(S) bogie are also simulated.

Mark 4 Motor Bogie

Commonwealth Trailer Bogie

Mark 6 Motor Bogie

B5(S) Trailer Bogie

External Variations

Many of the external variations carried by these units have been modelled so as to represent each individual unit as closely as possible. These are automatically applied depending on the class/number of your unit.

Headlight (Low)

Headlight (High)

Small Headcode Box

Offside Windscreen Wiper

Draught Excluders

Window Bars

Camshaft Traction System

This pack implements the camshaft system of regulating power, which was commonly used in DC EMUs such as the class 411/412 until the 1980s. This works by progressively cutting out resistances when powering up so as to control the current going to the motors. As well as the resistances, the traction motors can be set up in two modes so as to control current: **Series** & **Parallel**.

The resistances and traction motor modes are controlled depending on which of the four power handle notches the driver selects:

0 - Traction power is OFF

1 (Shunt) - All resistances are in circuit. This provides minimal acceleration which soon decays. The traction motors are in 'Series' mode.

2 (Series) - As the unit gains speed, resistances are progressively removed from the circuit until they are all removed. As each resistance is removed, acceleration increases.

3 (Parallel) - Once the unit has gone through the steps described above, the traction motors switch to 'Parallel' mode and all resistances are placed back into the circuit. This provides a significant increase in acceleration. As speed increases, pairs of resistances are then progressively removed from the circuit for further acceleration.

4 (Weakfield) - Once the unit has gone through both the 'Series' and 'Parallel' steps, it will start to weaken the field of the traction motors, which once again, provides a further boost in acceleration. If this notch is selected before all resistances have been removed from the circuit, the resistances will be removed quicker than in the lower notches so as to aid acceleration.

In late 1988, to keep up with the recently introduced class 442s, a second weakfield notch was added to all class 412s so as to provide improved acceleration between 45 & 60 mph. This is known as the 'Greyhound' modification and has been simulated.

At any time, it is possible to halt the progression listed above by selecting a lower power handle position (except 0). For example, if you wish not to take all of the resistances out in the 'Series' notch, you can hold your current level of acceleration by placing the power handle back into the 'Shunt' notch. This is known as 'hand-notching'.

You can only decrease power by returning the power handle to 0, or OFF, and then re-applying the power to your desired notch.

Finally, moving the 'Series Only/Normal' switch to 'Series Only' will allow you to take advantage of the higher rate of acceleration in 'Notch 4' but the camshaft will not progress beyond 'Series'. This must always be used when ascending the Folkstone Harbour branch and may prove useful when providing assistance to a failed train.

Adhesion

Adhesion between a train's wheels and the rails plays a big part in allowing a train to accelerate or brake. Too little of it and the train will slip or slide. There are a myriad of factors that control the level of adhesion and we have attempted to simulate the most important of these to give a varied and realistic driving experience:

Season

Adhesion is generally good in dry conditions during summer and spring. Slightly decreased adhesion during winter to take account of the increased amount of moisture and possible ice on the rails due to cooler temperatures. Much decreased adhesion during autumn due to leaf mulch.

Weather

Adhesion decreases in wet weather, especially so when rain first starts falling before it has had a chance to clean the railhead. If rain is light, it will take longer for the railhead to be cleaned whereas heavy rain will clean it quicker, resulting in adhesion recovering sooner.

When using the drizzle weather pattern in our Sky & Weather Enhancement Pack, adhesion is particularly poor as the rain hasn't enough force to clean the railhead but still makes it sufficiently wet to worsen adhesion.

Time of Day

Adhesion will decrease somewhat after dusk as the air cools and dew is more likely to form on the railhead. This persists throughout the night until around an hour after sunrise when higher temperatures or the sun dry it out. In our simulation, this factor is reduced during summer to account for warmer temperatures, which on average result in less dew.

Tunnels

When adhesion is poor due to external factors such as weather or season, adhesion will generally improve upon entering a tunnel, which is not as susceptible to these factors. When adhesion is good during dry weather and outside of autumn, adhesion may decrease a little upon entering a tunnel due to their damp nature.

Wheelslip

Wheelslip is where the wheels slip due to poor adhesion. You will know this is happening as the pitch of the traction motors will suddenly increase and the speedometer needle will rise rapidly.

These units do not feature any wheelslip protection so it is up to you to control any slip. You must assess which power notch is most suitable for the conditions and balance the occurrence of wheelslip with the maximum possible rate of acceleration.

Due to the camshaft traction system, this is a careful balancing act as shutting off power and then reapplying will require you to cycle through the various stages of the camshaft again; potentially losing you valuable time. As a result, assuming the slip is not too severe, it is recommended that you wait 2 or 3 seconds before shutting off in case traction is regained. If not, you will have no choice but to shut off and carefully manage the power to try and ensure you no longer slip. The use of 'hand-notching' as described in the previous section is vital for this.

It is also worth noting that slip tricks the camshaft into thinking you are going faster than you are. As a result, it will proceed in its cycle by increasing power. If you should then regain traction, the current will be much higher than if you hadn't slipped and as a result, you could overload the motors. You will know this has happened if power cuts and you are unable to re-apply it. To obtain power again, return the power handle to 'OFF' and press the 'Overload Reset' button to the right of the speedometer.

Wheelslide

Wheelslide is where the wheels slide due to poor adhesion. It is not as likely to be encountered as wheelslip but it is vital to look out for as the result of not stopping can be catastrophic. You will know this is happening if the speedometer needle suddenly falls and you hear a change in the sound of the wheels.

As with wheelslip, there is no automatic protection in place to counter wheelslide when it occurs. It is up to you to control the brake pressure applied so as to balance the occurrence of wheelslide and maximum rate of retardation.

EP/Auto Brake

This pack implements an accurate representation of the combined EP (Electro-Pneumatic) and Auto brake. Please see below for an explanation on how to use each brake:

EP (Electro-Pneumatic)

This proportional self-lapping brake operates between 0 and 44% on the train brake handle and provides graduated release, which means you can release the brake without having to move back to release, but by simply selecting the position on the train brake handle proportional to your desired brake force. Listen out for the relays which make a clicking sound when an EP brake application/release starts and ends.

Auto

This is a fail-safe brake if the EP brake is not operational for any reason, but you may still use it in normal circumstances if you wish. This brake operates between 60% (lap) and 100% on the train brake handle so if you wish to use it, you must move the handle in one movement from 0% to 60% (lap), to avoid an EP application. Also, a keyboard shortcut is available, Ctrl+', which will automatically place the brake handle in the 60% (lap) position without causing an EP application. The main difference with this brake is that if you wish to partially release it, you must move the train brake handle to 0%, and then back to 60% (lap) as soon as you wish to hold the application.

Tread Brake Simulation

By default in Train Simulator, braking performance is constant throughout the speed range so a full brake application at 70mph will have the same level of retardation than at 10mph. This is a fairly good representation of how disc brakes work but for stock with tread brakes, like the class 411/412, this is not so realistic.

As a result, this pack has scripted brake force to simulate the relatively poor performance at high speed, and the 'bite' at lower speeds where performance increases quite significantly.

Gradients

By default in Train Simulator Classic, only gradients of 1 in 185 or steeper have a gravitational effect on a train and this is only suitably realistic on gradients of approximately 1 in 125 of steeper. This means on gradients shallower than 1 in 125, the train does not experience the gravitational forces upon it than it should.

With this information in hand, we have managed to get rid of this limitation by making the train invisibly power or brake itself to simulate the effect that gravity has where Train Simulator Classic by default doesn't do so. This is all invisible to you as the player so you won't suddenly find the power or brake handles moving without your say so, but it does mean you have to drive to the gradients of the route a lot more than before, just like a real driver, especially on mainline routes where gradients rarely reach the severity where Train Simulator Classic has them behave realistically. You will also now find that if trying to recreate real timetabled runs, your timings will much more closely match reality.

Variable Power & Brake Performance

Any train driver will tell you that especially on older stock, braking and power performance can vary quite noticeably from unit to unit, despite being within the same class. We have simulated this variance by randomly allocating a 'Brake Factor' & 'Power Factor' every time you drive a unit in the simulator. This factor can reduce or increase performance by a maximum of 10% either way. There is no way of finding out what factor your unit has been allocated except for assessing its 'feel' when powering or braking; just like a real driver!

Variable Traction Motor Volume

Class 411s & 412s were known for their loud traction motors but in reality, some were louder than others. To simulate this, we have implemented a random 'Motor Factor' to each motor bogie which ranges from 1 to 6; 1 being the quietest and 6 being the loudest. 'Motor Factor' can also be changed on the player train's leading motor bogie by pressing **Shift+M** or **Ctrl+M**.

Horn Variants

Mk1 Southern Region multiple units such as the 411 & 412 are known for their distinctive 'raspberry' horns, where it is rare to find two set of horns that sound alike. We have simulated this by providing six horn variations under the guise of 'Horn Factor'. Upon loading a scenario, your train will be randomly allocated one of these horns but if you wish to change it, press **Shift+H** or **Ctrl+H**.

Please see below for a list of where we sourced each horn variant:

1 - 3545, East Kent Railway
2 - 1497, Spa Valley Railway
3 - 1317, Spa Valley Railway
4 & **5** - 3417, Strawberry Hill Depot
6 - 1101, East Kent Railway

Headcode Roller Blinds

Closed   **Open**

The headcode blinds can be manually changed within the cab. To do this, please follow the instructions below:

1) Unlock the headcode box door lock by clicking it.

2) Open the headcode box door by clicking it.

3) Place the mouse over the crank you wish to move and then click and drag in the direction you wish to move it. The further you drag, the faster the blind will wind.

4) Turn the lights on by either clicking the 'Indicator Lights' switch or pressing **J**.

5) Close the headcode box door by clicking it.

6) Lock the headcode box door lock by clicking it.

Alternatively, you can move the cranks by pressing **Ctrl+1**/**Ctrl+2** for the 1st digit and **Ctrl+3**/**Ctrl+4** for the 2nd digit.

The headcode can be set upon a scenario loading, or on AI trains, by changing the number of the relevant DMS vehicle. More information on this can be found in the *Numbering* section of this manual.

Cab Secure Radio (CSR)

Bar actually being able to speak to the signalman, a fully functioning CSR unit is included in this pack. Introduced in the 1980s/1990s, this radio allows direct communication between the driver and signalman. Please see below on how to use it.

Turning on and setting up

1) Press the 'ON' button and wait for 'AREA NOT SET' or 'RADIO LOST' to appear.
2) Press the 'AR' button.
3) Using the number keys, enter a 2-digit CSR area. If you make a typo, you can use '#' to erase the last digit. If using one of the included scenarios with this pack, the area number is given in the F1 briefing of the scenario.
4) Press the '*' button to validate the CSR area.
5) Wait for the area to register. It will appear on the left-hand side of the screen.
6) Press the 'T' button to test the connection. If all is well, 'TEST OK' will display for 5 seconds.

Registering your train

1) Press the 'SU' button.
2) Using the number keys, enter the number of the signal in front of you. This must be 4-digits so if the number is 55, this is input as 0055. If you make a typo, you can use '#' to erase the last digit.
3) Press the '*' button to validate the signal number.
4) Once the signal number is validated, the headcode of your train will appear on the right-hand side of the screen.

Contacting signalman at red signal

1) When standing at a red signal, press the 'SG' button.
2) 'AT SIG SENT' will appear when the message has been sent.
3) Soon after, the signalman will reply with 'WAIT'. This will always be the reply regardless of whether you can pass the signal or not so do still press 'Tab' if required.
4) To return to the previous screen, press the '#' button.

Emergency message

1) In case of an emergency, press the 'EM' button.
2) 'EMG SENT' will appear when the message has been sent.
3) To return to the previous screen, press the '#' button.

Lamp test

1) Hold the 'LT' button.
2) All display pixels and status lights will illuminate.
3) Release the 'LT' button.

Unit number display

1) Press the blank button between 'EM' and '*' buttons.
2) The unit number will be shown on the screen for a short time.

CSR area placement in scenarios

CSR works by allocating an area number to each signal box (or panel in larger signal boxes) so the driver is always in contact with the signalman signalling his train. As the train moves from one area to another, the CSR unit will automatically change area. Also accompanying these changes in area, are lineside signs which state the number of the new area. This sign is included in this pack and must be placed by the scenario author if the CSR areas are to function.

This sign can be found by selecting 'AP/Common' in the 'Object Set Filter' and browsing for 'AP CSR Sign' in the left-hand 'Track Infrastructure' fly-out. To place it, simply place the marker on the track your train will be passing through, double click the sign, and input the area number in the right-hand fly-out. The area change will take place anywhere within 500m of this sign.

Slam-Doors

Arriving

When arriving at a station in a scenario, a marker can be placed in the scenario editor which lets the train know it is about to stop to load/unload passengers. This allows us to simulate the classic scene of doors opening before the train has come to a stop. Doors are selected at random to open, with progressively more opening as the train reaches a stop, before flinging open just before stopping. The guard's door on the TBC vehicle is also included in this.

This marker can be found by selecting 'AP/Common' in the 'Object Set Filter' and browsing for 'AP Slam Door Pre-Open Marker' in the left-hand 'Track Infrastructure' fly-out. To place it, simply place the marker on the track your train will be passing over and ensure the arrow is pointing the direction the train is travelling. Then double click the sign and input either **LEFT** or **RIGHT** in the right-hand fly-out, depending on which side you wish the doors to open.

This functionality is only available on the train you are driving and not AI.

At a station

Each passenger door is individually scripted and opens/closes at random. This means that very rarely will all doors be open at once, just like reality. Also, the degree to which the door opens varies.

The guard's door also opens.

Departing

All doors will close before the guard gives two bells to the driver. The guard's door will remain open as the train accelerates before closing at a random speed.

Auxiliary Cupboard

The auxiliary cupboard on the non-driver's side of the cab contains a selection of Miniature Circuit Breakers (MCBs). A number of these have been simulated as described below:

- **EP Brake** - This will disable the EP brake. Only the auto brake will be available for braking.
- **AWS/TPWS** - This will disable the AWS and TPWS (if fitted).
- **Lighting & Heating** - This will turn off the saloon lights.
- **Meter Cab Lights** - This this will turn off the in-cab instrument lights.
- **Route Indicator** - This will turn off the route indicator light and headlight (if fitted).
- **Compressor Control** - This will disable the compressor.

There is also a working ammeter which is a good, visual way of seeing the camshaft traction system in action.

AI Horns

To blow an AI train's horn in a scenario, you must edit the speed limit properties of the section of the track at which you would like the AI train to sound its horn. Please see below for instructions:

1) In the scenario editor, go to the location at which you would like the AI train's horn to sound, and press **Spacebar** 3 times. The track will now display a certain colour which represent its speed limit.

2) Go to the top-left-hand fly-out and click the 'Select' icon.
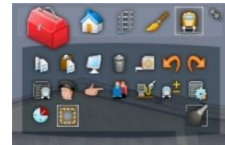
3) Hover your mouse over the piece of track where you like the AI horn to sound. A yellow border will appear around the track when it is selected.

4) Click and drag the yellow box in either direction until the measurement reading at the bottom of the screen says at least '1.0 metres'.
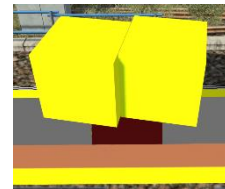
5) Go to the right-hand fly-out and change the two 'Speed Limit' values to '900'.
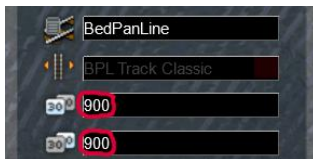
6) Click outside of any menus and the section of track you selected will now say 'Unspecified'. Any AI train which passes over this section of track will now blow its horn.

The manner in which the AI train blows its horn is randomly calculated each time, meaning no horn is ever the same. You may hear a single tone (any post-2007 liveries only), a two tone, a three tone, or now and then, even the infamous 'Ilkley Moor' sequence.

If you wish to be more specific in how and when the horn is sounded, please see the table below for values other than '900' which can be inputted in the speed limit field for different behaviour:

Speed Limit Value	Notes
900	Random number of tones
901	1 tone (low)
902	1 tone (high)
903	2 tone (low/high)
904	2 tone (high/low)
905	3 tone (low/high/low)
906	3 tone (high/low/high)
907	'Ilkley Moor' sequence
921	Same as 900 but 1 in 20 (5%) chance of horn sounding
922	Same as 900 but 1 in 16 (6.3%) chance of horn sounding
923	Same as 900 but 1 in 12 (8.3%) chance of horn sounding
924	Same as 900 but 1 in 8 (12.5%) chance of horn sounding
925	Same as 900 but 1 in 6 (16.6%) chance of horn sounding
926	Same as 900 but 1 in 4 (25%) chance of horn sounding
927	Same as 900 but 1 in 3 (33.3%) chance of horn sounding
928	Same as 900 but 1 in 2 (50%) chance of horn sounding
929	Same as 900 but 1 in 1.33 (75%) chance of horn sounding
930	Same as 900 but intended for use at platform ends*
931	Same as 921 but intended for use at platform ends*
932	Same as 922 but intended for use at platform ends*
933	Same as 923 but intended for use at platform ends*
934	Same as 924 but intended for use at platform ends*
935	Same as 925 but intended for use at platform ends*
936	Same as 926 but intended for use at platform ends*
937	Same as 927 but intended for use at platform ends*
938	Same as 928 but intended for use at platform ends*
939	Same as 929 but intended for use at platform ends*
940	Whistle boards**
950	Tunnels***

* **Platform ends** - Horn will sound only if train is travelling over 50mph, which at platforms of 12 car length of less, ensures that stopping trains do not sound their horn. Also, the point at which the train sounds its horn randomly varies from 1m to however fast the train is travelling. For example, if a train is passing at 125mph, the maximum possible distance it will sound its horn away from the trigger point is 125m. This simulates the propensity for drivers to sound their horn earlier if they are travelling at speed.

** **Whistle boards** - Intended for use at whistle boards. Pre-2007, trains sounded at least two tones at all times of day. From April 2007, following increasing concerns about noise, drivers were instructed to use only a single low tone and only between the hours of 07:00 & 23:00. This was later changed to between 06:00 & 23:59 in 2016.

To simulate this, any pre-2007 liveries will exhibit pre-2007 behaviour (at least two tones/no time restriction) and any post-2007 liveries will exhibit a hybrid of post-2007 & 2016 behaviour (single low tone/between 06:00 & 23:59 only). The point at which the horn sounds varies randomly from 1m to 40m away from the trigger point.

*** **Tunnels** - Historically, trains always blew their horn when entering & exiting tunnels to warn potential track workers of their presence. With increased health & safety regulations reducing the presence of track workers in 'live' tunnels, and to allay complaints of increasing noise pollution due to louder modern horns, this requirement was removed on Saturday 6th November 2004.

To simulate this, any pre-2004 liveries will sound at least two tones. The point at which the horn sounds varies randomly from 1m to 40m away from the trigger point.

Whilst these tools are primarily intended for use by scenario creators, they can also be used by route editors to 'bake' these features into a route. The platform end, whistle board & tunnel values being of particular use in this respect.

Finally, due to the custom speed limits being of such a short distance, they do not affect AI train performance or appear as the current speed limit on the F3/F4 HUD. Also, assuming the route you are using is configured to only show signed speed limits (the majority do this), custom speed limits will not appear in the part of the F3/F4 HUD which shows forthcoming speed limit changes.

Cold Start

'Cold Start' means the unit is in the following state when it loads:

- Main reservoir, brake pipe and brake cylinder pressures are 0
- Auxiliary Isolation Switch (AIS) is tripped
- The handbrake is applied and the paddle is positioned on the right-hand side window

To prepare a unit from cold, please follow the instructions below:

1) Move the brake handle to the full EP brake position (44% on the HUD) by pressing **@**. This will ensure that the brake applies in sync with the brake pipe/main reservoir once the the compressor is running.

2) Look to your right for a flap labelled 'AUX'. Open this and close the 'Auxiliary Isolation Switch (AIS).

3) Turn the master key by pressing **Shift+W** and move the reverser to Neutral by pressing **S.**

4) Reset the AWS self-test by pressing **Q.**

5) You will now need to wait for the compressor to build the air up in the brake pipe and main reservoir. You can check its progress by looking at the yellow needle on the far left-hand gauge in the cab. When this reaches 55 psi, you may move onto the next step.

6) Release the handbrake on the right-hand side of the cab, remember to lift the lock, and then remove the paddle in the right-hand window by clicking it. It will then move to the emergency cupboard in the vestibule.

After carrying out this procedure, your unit will be successfully prepared from cold.

Bits and Bobs

This section is dedicated to aspects of this pack that don't warrant a dedicated section but are still of note:

- How many hopper or droplight windows that are open is dependent on season and weather. For example, there will be more windows open during the summer compared to the winter and equally, more open on a dry summer day compared to a wet summer day.

- Phone cord in the cab wobbles as you gain speed.

- Wobbly speedometer needle. Especially at low speed.

- Random fly splats on the windscreen which can be cleared using the wiper.

- The squealing of the brakes as you come to a stop is a classic sound of these units. A random selection of sounds are played from a choice of 74 individual sound samples every time you come to a stop, to try and simulate the variance you would hear in real life. Individual bogies will also start squealing at different speeds.

- The pitch of the Motor Generator (MG) changes depending on the load placed on it such as when the saloon lights are turned on or power is applied.

- If you try to apply power with the handbrake applied, the buzzer will sound to alert you to this.

- 1 second delay between train passing over AWS magnet and AWS warning sound occurring. The F3/F4 HUD will show the warning immediately so you must wait 1 second before trying to cancel it.

- The headlights only provide illumination before sunrise and after sunset. This is to avoid the unrealistic appearance of projected light in broad daylight.

- For the most realistic visual appearance within the confines of the simulator, the saloon lights and route indicator light will only be turned on by default between one hour before sunset and one hour after sunrise.

- Wipers operate on AI services if it's raining.

Setting up the Driver's Cab

Please follow the steps below to set up the cab so you are ready to move:

1) Move the brake handle to the full EP brake position (44% on the HUD) by pressing **@**.

2) Turn in the master key by pressing **Shift+W**.

3) Move the reverser to 'Neutral' by pressing **S**.

4) Reset the AWS self-test by pressing **Q**.

5) Turn on the instrument lights by pressing **I**.

6) If applicable, register the Cab Secure Radio (CSR).

7) Ensure the headcode blind is correct.

8) If you have a proceed signal aspect and are in a cab fitted with a Driver's Reminder Appliance (DRA), turn it off by pressing **Y**.

You should now be ready to move off. For information on this, please see below.

Driving Guide

The following steps should allow you to drive in a realistic and safe manner:

1) Move the reverser to your desired direction of travel by pressing either **W** for 'Forward' or **S** for 'Reverse'.

2) Move the brake handle to 'Release' by pressing **;**.

3) When the brake cylinder pressure gauge nears 0, move the power handle to 'Notch 1' by pressing **A**.

4) From then on, increase power as you see fit. In dry conditions outside of autumn, you should be safe to use 'Notch 4' for the maximum rate of acceleration.

5) To brake the train using the EP brake, you may make applications and releases by moving the handle anywhere between 'Release' (0%) and 'Full EP' (44%). It is recommended you only use 'Full EP' as a last resort so as to ensure you always have more brake force available if required.

6) To brake the train using the Auto brake, please see the detailed explanation earlier in this manual.

7) Just before coming to a stop, move the brake handle to 'Release' (0%) before applying again when you come to a stop. This is to ensure a smooth stop for the passengers.

AP

How to Use in the Scenario Editor

How to place

To place in the scenario editor, please follow the instructions below:

7) In the left-hand rolling stock fly-out, click the object set filter which looks like a blue box with an orange arrow to the right of it.

8) Go to the right-hand fly-out which should have appeared. Select 'AP' from the drop-down menu.

9) Tick the second & third box beside 'Class411Pack01'.

10) The liveries should now be visible in the left-hand rolling stock fly-out.
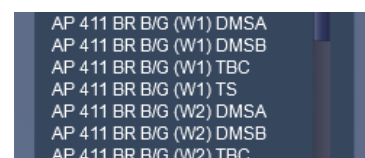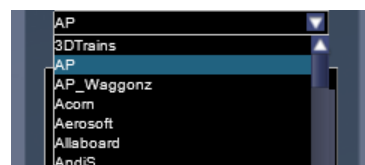
Formation

Class 411 - DMSA + TBC + TS + DMSB
Class 412 - DMSA + TBC + TSRB + DMSB

Numbering

When placing in the scenario editor, you are able to control a number of features via the number of the unit. Please note that for the unit number itself, the only number you need to change is the DMSA's, as other vehicles in the consist will automatically be numbered correctly.

Headcode

To apply a pre-set headcode to a DMS vehicle, you must add **;HC=xy** to the relevant DMS vehicle. **x** or **y** being any digit from **0** to **9**, **R** for red, **B** for black or **W** for white.

Guard Door

To disable the guard door from opening on a specific unit, add **;G=0** to the TBC number. This is useful when running as an 8 or 12 car formation where with one guard on board, only one door would be used in the formation.

Data Panel

To add a data panel to the front of the unit, add **;DP=1** to the DMSA number.

Headboard

To add the 'Lymington Flyer' headboard to a South West Trains liveried unit, add **;HB=1** to the DMSA or DMSB you wish for it to be attached to.

Cab Secure Radio (CSR)

To allow realistic configuration of the CSR unit in scenarios, **;CSR=DAASSSSTTTT** can be added to the driven vehicle (DMSA or DMSB). Please see below for what each sequence of letters represents:

- 'D' controls whether the CSR is already configured upon starting the scenario. Replace 'D' with '0' for no or '1' for yes.
- 'AA' is the 2-digit CSR area number required to set up the CSR at the start of the scenario. (eg. 75)
- 'SSSS' is the 4-digit signal number required to set up the CSR as the start of the scenario. (eg. 0439)
- 'TTTT' is the 4-character train reporting number of the train (eg. 1W40).

Overhead Line Stickers

There are nine different types of overhead line stickers represented. We have done our best to ensure each unit shows the correct type but if you wish to change it, add **;OHL=x** to the DMSA number. Please see below for your options:

x = 1 - old style - x2 front
x = 2 - old style - x2 front & x2 side
x = 3 - old style - x1 front in window
x = 4 - old style - x1 front in window & x2 side
x = 5 - new style - x2 front
x = 6 - new style - x2 front & x2 side
x = 7 - new style - x1 front in window
x = 8 - new style - x1 front in window & x2 side
x = 9 - new style - x2 side

Numbers

To show the full 6-digit TOPS number on BR Blue/Grey livery, add **;N=1** to the DMSA number.

Cold Start

To activate cold start mode on a player train, add **;Cold=1** to the number of the DMSA or DMSB which has the driver icon applied to it.

Example DMSA number

1198;Config=00s;HC=97;OHL=5;HB=1

Key:

1198 – Unit number

;Config=00s - Configuration setting. Leave this alone.

;HC=97 - Headcode '97' displayed on DMSA

;OHL=5- x2 new style OHL stickers on the front

;HB=1 - 'Lymington Flyer' headboard visible on DMSA

Scenarios

APC411: 1S36 12:35 Victoria - Dover Priory
Route = Chatham Main & Medway Valley Lines
Track covered = Victoria - Rainham
Traction = Connex 1602 & BR Green 1592
Year = 2001
Duration = 55 minutes

APC411: 2K66 09:02 Dover Priory - Victoria
Route = Chatham Main & Medway Valley Lines
Track covered = Rainham - Victoria
Traction = Ex-Network SouthEast 1607
Year = 2002
Duration = 1 hour 10 minutes

APC411: 2T65 17:23 Tonbridge - Strood
Route = Chatham Main & Medway Valley Lines
Track covered = Tonbridge - Strood
Traction = Ex-LSE (NSE) 1532
Year = 1989
Duration = 55 minutes

APC411: 1B43 16:45 Waterloo - Poole
Route = SWML: Southampton to Bournemouth
Track covered = Southampton Central - Bournemouth
Traction = South West Trains 1563 & 1535
Year = 2003
Duration = 40 minutes

APC411: 1W02 06:50 Weymouth - Waterloo
Route = SWML: Southampton to Bournemouth
Track covered = Bournemouth - Southampton Central
Traction = Network SouthEast 2306 & 1578
Year = 1993
Duration = 50 minutes

APC411: 2P57 20:28 Brockenhurst - Lymington Pier/ 2P60 20:43 Lymington Pier - Brockenhurst
Route = SWML: Southampton to Bournemouth
Track covered = Brockenhurst - Lymington - Brockenhurst
Traction = South West Trains 1198
Year = 2004
Duration = 30 minutes

Credits

Nicolas Schichan - Scripting

SETG - Southern Electric Traction Group - A very special thanks for assistance in recording sounds. Please visit https://www.setg.org.uk/ to help return 3417 to the mainline.