High Speed Train (HST) (Valenta)

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 'HST (Valenta) 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.

Liveries

Italics are what the livery is called in the scenario editor for the relevant class 43. Mk3s liveries are named similarly and should be self-explanatory based on what is listed here.

BR InterCity 125:

Eastern region – *BR IC125 (ER)*

Western region – *BR IC125 (WR)*

InterCity Executive:

Eastern region power cars – *IC Exec (ER)*

Western region power cars – *IC Exec (WR)*

InterCity Executive (Yellow Front) – *IC Exec 2*

InterCity Swallow (Yellow Roof) – *ICS1*

InterCity Swallow (Small Side Numbers):

Eastern region power cars – *ICS2 (ER)*

Western region power cars – *ICS2 (WR)*

InterCity Swallow (Revised Number Position):

Eastern region power cars (early 1990s) – *ICS3 (ER)*

ATP fitted power cars (early 1990s) – *ICS3 (ATP)*

Cross Country power cars (early 1990s) – *ICS3 (XC)*

Eastern region power cars (mid 1990s+) – *ICS4 (ER)*

ATP fitted power cars (mid 1990s+) – *ICS4 (ATP)*

Cross Country power cars (mid 1990s+) – *ICS4 (XC)*

InterCity Swallow (43038) – *ICS (43038)*

Great Western Trains – *GWT*

First Great Western 'Fag Packet' – *FGW1*

First Great Western White – *FGW2*

First Great Western 'Teardrop' – *FGW3*

First Great Western ‘Barbie’ – *FGW4*

GNER:

White logo – *GNER1*

Original light cluster – *GNER2*

Revised light cluster – *GNER3*

The following livery variations are available to applicable power cars when using the above GNER variant. These are treated as nameplates. To show/hide them, please see the Numbering section of this manual.

43039

43051

43099

43116 & 43120

GNER (Buffers)

Ex-GNER (National Express East Coast) – *GNER (NXEC)*

National Express East Coast – *NXEC*

VT CrossCountry – *VTXC*

VT

Grand Central – *GC1*

Midland Mainline:

Original light cluster – *MML1*

Revised light cluster – *MML2*

Midland Mainline Blue:

With Midland Mainline logo – *MML3*

With Midland Mainline logo (Rio power cars) – *MML3(R)*

Without logo – *MML3 (UB)*

With East Midlands Trains logo – *MML3 (EMT)*

East Midlands Trains (43089) – *EMT1a (Valenta)*

Network Rail 1:

With rear luggage van windows – *NR1a*

Plated over rear luggage van windows – *NR1b*

Revised light cluster – *NR1c*

Network Rail 2:

Network Rail logo – *NR2*

Network Rail, Porterbrook & Hitachi logos – *NR2 (43089)*

Cotswold Rail (43070)

Hornby (43087)

External Variations (Class 43)

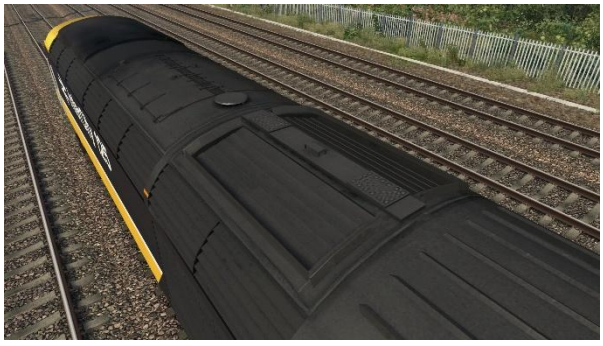
A number of external variations have been modelled to represent the differences between individual power cars. These are automatically applied in the simulator.

Nameplates

Over 300 different 2D nameplates are featured.

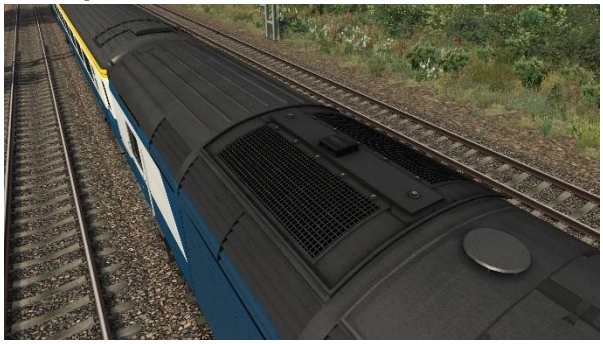
Cooler Group

Marston

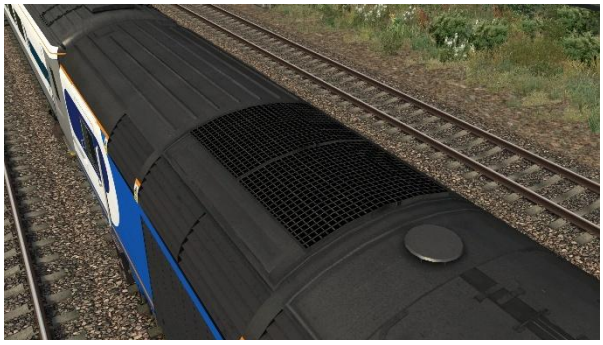


Marston (GNER Modification)

Serck/Voith



Brush



Buffers

Fitted in the late 1980s to 8 power cars; allowing them to act as DVTs with class 91s due to the delay in the Mk4 coaches arriving.

Light Clusters

Original (Black Marker/Tail Casing)

Original (Grey Marker/Tail Casing)

Original (LED Marker/Tail Lights)

Midland Mainline 3 Lights

Modern

Original Light Cluster Surround

Silver

Yellow

Black

Great Western Trains Green

First Great Western Purple

Luggage Van Window

Original

Opening Window Removed

Rear Guard Windows

Horn Grille

Black

Yellow

Silver

Aerial

Camera (New Measurement Train)

Cooler Group Grille

In the 1980s, Eastern Region power cars had a section of their cooler group grille removed to provide an easily accessible coolant refilling point. This never became a region-wide modification but has remained on the relevant power cars ever since.

Oil Leak

There is a 1 in 10 chance of a power car having a visible oil leak from the oil breather on the roof.

Variants (Mk3)

TF (Trailer First) – 41xxx

TGS (Trailer Guard Standard) – 44xxx

TRFB (Trailer Restaurant First Buffet) – 402xx

TRUB (Trailer Restaurant Unclassified Buffet) – 403xx

TRFK (Trailer Restaurant First Kitchen) – 405xx

TLUK (Trailer Lounge Unclassified Kitchen) – 405xx

TRUK (Trailer Restaurant Unclassified Kitchen) – 405xx

TRFB (Trailer Restaurant First Buffet) – 407xx

TRFB (Trailer Restaurant First Buffet) – 408xx

TRSB (Trailer Restaurant Standard Buffet) – 404xx

TS (Trailer Standard) – 42xxx

TSD (Trailer Standard Disabled) (GNER) – 42xxx

TSD (Trailer Standard Disabled) (Great Western) – 42xxx

Cab Variants

Standard

This variant is used on all non-Great Western region power cars. DRA, TPWS, power car number, driver's seat (leather or cloth), clock (analogue or digital), vigilance isolation switch & fire bottle pressure light appear depending on the era of the livery.

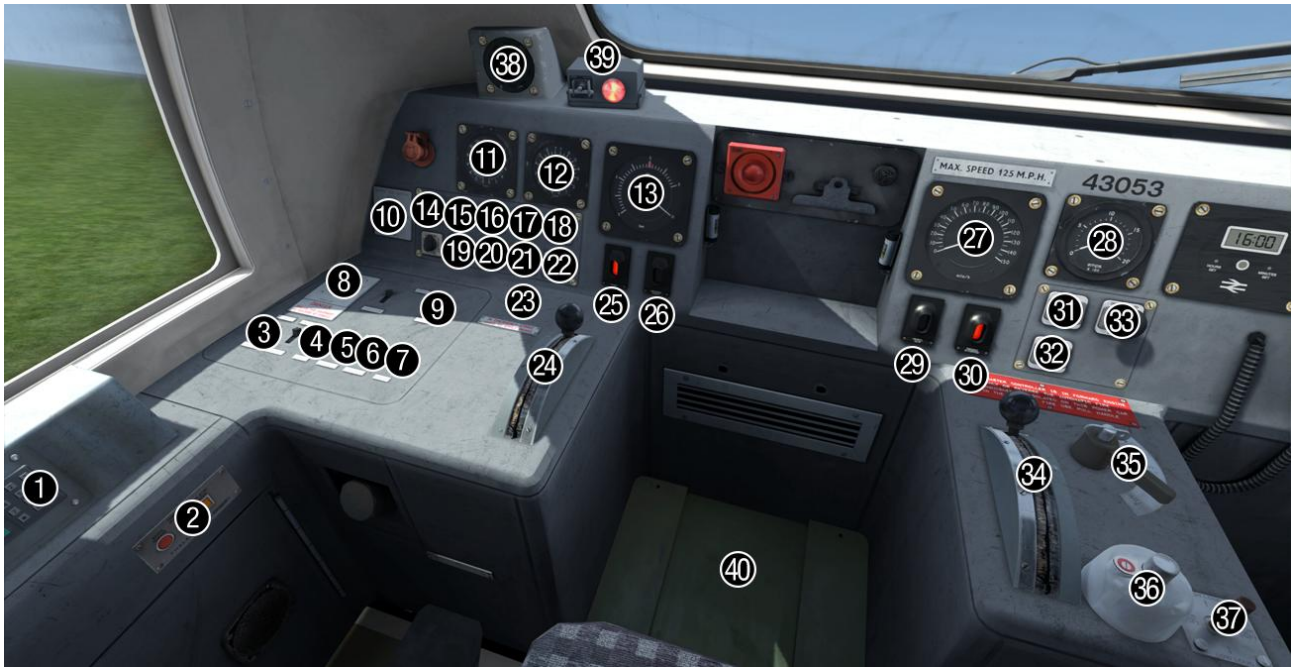
Great Western/ATP

Great Western region power cars fitted with Automatic Train Protection (ATP). DRA, TPWS & driver's seat (leather or cloth) appear depending on the era of the livery.

Cab Guide

The guide pictured shows the non-ATP/Great Western variant of the cab

Desk



1 – NRN radio
2 – TPWS
3 – Train supply dimmer switch
4 – Desk lights switch
5 – Left-hand taillight switch
6 – Right-hand taillight switch
7 – Marker lights switch
8 – Headlights switch
9 – Cab lights switch
10 – Brake test switch
11 – Main reservoir pressure gauge
12 – Bogie brake pressure gauge
13 – Air brake pipe pressure gauge
14 – Wiper switch
15 – Train supply off button
16 – Train supply indicator light
17 – Train supply on button
18 – Brake overcharge button
19 – Parking brake off button
20 – Parking brake indicator
21 – Parking brake on button
22 – Fire alarm test button
23 – Emergency brake plunger
24 – Brake handle
25 – AWS fault light
26 – General fault light
27 – Speedometer
28 – Ammeter
29 – Wheelslip indicator light
30 – Engine stopped light
31 – Engines stop button
32 – Engines start button
33 – Driver to guard buzzer
34 – Power handle
35 – Reverser
36 – AWS reset button
37 – Horn
38 – Train supply indicator light
39 – Driver Reminder Appliance (DRA)
40 - Driver Safety Device (DSD) pedal

Desk (Right)

41 – Driver Vigilance Device (DVD) isolation switch

Desk (ATP)

Items which differ in either their position or function in the Great Western/ATP variant of the cab

1 – AWS light
2 – General fault light
3 – Wheelslip indicator light
4 – Speedometer
5 – ATP control panel
6 – Engines stopped light
7 – ATP data entry unit
8 – Driver Vigilance Device (DVD) isolation switch

Keyboard Controls

Non-standard keyboard controls are listed below:

Ctrl+P -	Automatic Train Protection (ATP) ON/OFF
Shift+Ctrl+P -	Automatic Train Protection (ATP) FULL/PARTIAL
L -	Cab light switch ON/OFF
Shift+C -	Clag Factor INCREASE
Ctrl+C -	Clag Factor DECREASE
I -	Desk lights switch ON/OFF
Y -	Driver reminder appliance (DRA) ON/OFF
C -	Driver to guard signal
E -	Driver vigilance device (DVD) RESET
Ctrl+D -	Driver vigilance device (DVD) ISOLATE
Z -	Engine start button
Shift+Ctrl+Z -	Engine stop button
Shift+F -	Fan Factor INCREASE
Ctrl+F -	Fan Factor DECREASE
Ctrl+Z -	Fire alarm test button
H -	Headlight switch CLOCKWISE
Shift+H -	Headlight switch ANTI-CLOCKWISE
Space -	Horn LOW LOUD
B -	Horn HIGH LOUD
Ctrl+Space -	Horn LOW SOFT
Ctrl+B -	Horn HIGH SOFT
Shift+Ctrl+H -	Horn Factor UP
Ctrl+H -	Horn Factor DOWN
Shift+W -	Master key IN/OUT
Shift+M -	Motor Factor INCREASE
Ctrl+M -	Motor Factor DECREASE
Shift+Ctrl+S -	Train supply off button
Shift+S -	Train supply on button
Ctrl+Numpad Enter -	Visual aids ON/OFF
V -	Wiper switch CLOCKWISE
Shift+V -	Wiper switch ANTI-CLOCKWISE

Features (Class 43)

Physics

Great care has been taken to simulate the distinctive powering and braking characteristics which make this train such a challenge to drive. As any driver will tell you though, it also makes it one of the most rewarding as a result. This section details what is simulated and how this dictates how the HST should be driven.

Traction

Engine RPM

Accurate engine RPM figures are used for each power notch. This varies depending on whether the power car is supplying electric train supply (ETS) or not.

Notch	RPM with ETS disabled	RPM with ETS enabled
Idle	750	1000
1	750	1000
2	1000	1000
3	1145	1145
4	1350	1350
5	1500	1500

Load Timings

When revving up from off to notch 5, it takes around 20 seconds for full power to be supplied. Due to this lag, it's by no means unusual to begin applying power before actually needing to accelerate, especially at speed.

When revving down, to notch 2, 3, 4, amps reduce gently, broadly in sync with the engine rpm. When moving to notch 1, amps reduce much quicker if the driver requires a quicker reduction in power. Moving to off then removes power altogether almost instantly. As a result, it is recommended that when reducing power, you move to notch 1 and wait at least 5 seconds before moving to off so as to reduce the wear on the electrical breaker. To provide an even smoother ride for passengers, move to notch 2, wait for amps to settle, move to notch 1, wait for amps to settle, then move to off.

Tractive Effort

The class 43 is rather unusual in being a diesel electric locomotive with no field diverts. This is because unlike most locomotives which need the flexibility to haul a wide variety of loads, the class 43 is designed for a specific job of hauling 4 or so mk3 coaches, an unusually light load, at high speed. As a result, starting tractive effort at low speeds can be reduced, which brings the benefit of tractive effort reducing a lot slower as speed rises, allowing the HST to reach 125mph.

This reduction in tractive effort reduces the amount of 'back EMF', what field diverts are designed to reduce, which therefore negates the need for field diverts. Also, the fact that the class 43 has an alternator instead of a generator means that a higher voltage can be applied to the traction motors without the risk of flashover, which also helps to counter the opposing effect of 'back EMF'.

What does this mean in practice then? Whilst the class 43 can feel slow to accelerate at first, tractive effort stays constant until 35mph (traditional locomotive tractive effort tends to fall off at 10-15mph), so by the time you reach this speed, you start to feel as though you are making good progress.

This unusually high speed does mean that class 43s are particularly prone to wheelslip though as adhesion reduces as speed increases. As a result, don't be fooled into thinking that because you are over 15-20mph, you are less likely to slip; it's the opposite, with the highest chance being at 35mph! This also means that you might experience slips at high speeds such as 90mph which is all part of the unique character of this train.

Variable Performance

Any driver will tell you that traction performance can vary quite noticeably from one HST set to another depending on mechanical variations between each power car. We have simulated this variance by randomly allocating a 'Power Factor' every time you drive an HST in the simulator. This is calculated for each power car separately and can reduce/increase performance by up to 10% either way.

The ammeter is a good way of gauging how powerful the particular power car you are driving is. When applying full tractive effort below 35mph in notch 5, a weak power car will pull a measly 1500 amps whilst a strong power car can pull 1800 amps. Remember though, the leading power car is only half of the story, as the rear one will also have its own characteristics which you will need to gauge just by assessing the 'feel' of the train.

Also of note is that the speed/pitch of the turbocharger varies depending on 'Power Factor'. If you have a strong power car, the turbocharger will run at a higher speed/pitch than a weak power car.

One Engine Only (OEO) Operation/Traction Motor Isolation/Taping Out Notches

The redundancy that having two power cars provides has often been used as a 'get out of jail free card' to keep services running albeit with reduced performance. The traction physics of both power cars in a set are calculated completely independent in this pack, which allows us to provide the option to run with only one power car providing traction power. Pairs of traction motors can also be isolated, as well as the 'taping out' of power notches, which in reality, prevents power being taken above a certain power notch by simply placing a piece of electrical tape over the contacts on the Speed Proving Relay to stop them energising that notch on the engine governor.

Any of these things are done in reality to combat faults.

All of these features are achieved by adding values to the power car number which is detailed in the 'Numbering' section of this manual. In the case of running with one engine only, you can also try this out by simply shutting down one of the power cars.

Hot Water Temperature

Due to running at high speeds for extended periods, class 43s are prone to running rather hot, especially in the summer. The original Marston & Serck cooler groups weren't the best at handling this and hot water temperature (HWT) trips were fairly common during hot weather. HWT trips are where traction power is cut as a last resort to prevent the engine coolant from boiling itself dry. If this occurs, a general fault light will illuminate in the cab, regardless of the power notch selected. Do not return the power handle to Off though as the rear power car will still power as normal. Once the temperature of the coolant has decreased sufficiently on your power car, power will automatically return to the selected position on the power handle.

In the early 2000s, Voith cooler groups were fitted to some First Great Western power cars and a little later, Brush cooler groups were fitted to some Midland Mainline/East Midlands Trains/Network Rail power cars. These were more effective and looked to deal with high water temperatures with lighter touch interventions, at lower temperatures, before killing power altogether.

If the Voith cooler group detects that the water temperature is becoming too high, it will isolate power notch 5. Even if the driver has selected notch 5 then, only notch 4 power will be provided on the affected power car. The driver will only know this has occurred by observing a drop in the ammeter and the engine note changing. Notch 5 power will only resume once the temperature has dropped sufficiently.

On a Valenta engined power car, the Brush cooler group does not derate, the only benefit being its improved cooling efficiency.

If derating or a HWT trip occurs on the rear power car, you will not receive a general fault light and will only know about if you sense a decreased rate of acceleration.

To achieve this simulation to a realistic level where temperature related events don't happen too often or too little, we have had to create our most complex coolant temperature simulation to date which takes into account a number of factors. It's almost impossible to gauge exactly how all of these factors affect cooling performance but we have used our best guess by analysing sound recordings of cooler groups and hearing how they operate under different conditions:

- **Fan speed**: The faster the cooler group fan spins, the higher the cooling performance.
- **Engine load**: The higher the load on the engine, the more heat that is created. This operates on a delay so if going from off to notch 5 for example, it will take 60 seconds for the full heating effect of this power change to take effect. This takes into account the heating time of the engine components and the time it takes for the coolant to be pumped around the system before it reaches the thermostat.
- **Random factors**: For both fan speed and engine load factors, a random multiplier is calculated separately to simulate varying levels of mechanical condition where some cooler groups will run more efficiently than others and some engines will produce more heat than others.
- **Ambient temperature (season)**: Cooling performance is at its lowest during summer and highest during winter due to the outside ambient temperature.
- **Ambient temperature (time of day)**: When ambient temperatures are likely to be highest in the middle of the day, cooling performance is reduced compared to during the night. This is most pronounced in summer when cooling performance is reduced by half at the hottest part of the day between 13:00 & 17:00. This is when you are most likely to experience the engine

derating. If it is raining during the summer, it is assumed the temperature is lower than if not.

- **Coolant temperature**: With all other factors treated as constant, temperature rises quicker at lower temperature and slower at higher temperatures. If you think of a boiling kettle, it's a lot quicker to heat water from 20 to 30 degrees than 90 to 100 degrees.

Please note, sustained running at speeds of 110mph or more, with at least 7 coaches, during the afternoon in summer, is when you are most likely to experience any temperature issues. The engine really does have to be working hard for a sustained period to start heating up to a critical level so if this is something you rarely experience, this is intentional.

To add even more variety, there is a 1 in 50 chance of a power car having a faulty thermostat which keeps the cooler group running all of the time and at its maximum speed in relation to engine rpm. On Voith & Brush cooler groups, this chance changes to 1 in 20 in the summer to simulate fitters using the 'fan override switch' to aid cooling on power cars particularly prone to HWT.

Finally, there is a 1 in 20 chance of a Marston cooler group having a faulty thermostat, which when active, runs the cooler group at its maximum speed in relation to engine rpm instead of regulating itself to coolant temperature. Serck cooler groups already work in this manner.

Wheelslip Protection (WSP)

Wheelslip protection aids the driver when powering during times of poor adhesion.

When wheelslip is encountered during acceleration, a two-stage process takes place:

1) Power is quickly reduced and the wheelslip indicator light illuminates in the cab. Engine rpm does not change, only the load is removed.
2) Once the wheelslip stops, power is reapplied quickly to the notch selected on the power handle and the wheelslip indicator light extinguishes. If wheelslip reoccurs, the process starts again.

As a driver, 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.

Please note that wheelslip is calculated separately on each power car so it is perfectly possible for one power car to be slipping whilst the other one is not. This is simulated in both the physics and the audio of this pack. If the rear power car slips, the wheelslip indicator light will illuminate in the leading cab.

Also of note to those who are interested in this kind of thing, engine rpm does actually rise momentarily when the load is removed during wheelslip, as the engine is suddenly being asked to do a lot less and needs a second or so to catch up.

Adhesion

There are a myriad of factors that control the level of adhesion which in turn controls whether a train slips or not. 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.

Brakes & Air System

Whilst class 43s are a little slow in applying power, the real skill to driving an HST is in the braking.

Brake Timings

Applying

For HSTs to be able to run at 125mph within the constraints of the existing signalling system, it is required for the brakes to apply quickly to ensure the train could suitably reduce its speed. To facilitate this, the brake is applied simultaneously from both ends by the E70 or DW2 brake control unit in each power car. From moving the brake handle to bogie brake pressure being applied, there is only a 1 second delay. If going from release to full service, it takes around 8 seconds to reach full braking force.

Releasing

In contrast to applying, the brakes are only released from the leading power car and as a result, are painfully slow. From moving the brake handle to bogie brake pressure dropping, there is a 4 second delay and if moving from full service to release for example, there is a further 15 or so second delay until the brakes are fully released, with the rate of decrease reducing as pressure nears 0 bar.

This is where the ability to anticipate is vital as you will need to move the brake handle to release the brake a good while before brake force is actually reduced. In the days before defensive driving strategies (boooo!), it was not uncommon to see HSTs thundering into a station with a full service brake application and stopping just as the brakes were nearly fully released. This ensured a smooth stop whilst still keeping to time on what were back then, tighter timetables. See if you can master that skill!

Emergency Brake

Unlike many modern trains, the class 43 is surprisingly flexible when it comes to emergency brake applications. Unless you miss an AWS warning which causes a TPWS brake application, you are able to apply the emergency brake and release it whilst on the move. You do not need to wait for the train to come to a stop.

Variable Performance

As with traction, braking performance can also vary quite noticeably from one HST set to another depending on mechanical variations. We have simulated this variance by randomly allocating a 'Brake Factor' every time you drive an HST in the simulator. This will reduce/increase performance by up to 10% either way so it is important you get a 'feel' for the brake to assess whether you have a set with brakes of iron, or cheese…!

Related to this, it's not uncommon for the bogie brake pressure reading to vary on a per power car basis so sometimes at full service, you might be getting 4.6 bar but at other times, it might be as low as 3.8 bar.

Parking Brake

Brake pipe pressure can not be created when the parking brake is on. In other words, to be able to release the brake, the parking brake must be off.

The only exception to this if you have the brake test switch in 'Test'. This allows brake pipe pressure to be created in order to carry out a brake test without the fear of moving.

Compressor

The compressor recharges the main reservoir when it falls below 8.5 bar and cuts out at 10 bar.

The rate at which the compressor charges the air system is chiefly dictated by the efficiency of the compressor, the speed at which it is running and any leaks in the air system.

The efficiency factor is handled with yet another random multiplier which is applied on a per power car basis. The compressor is also directly linked to engine speed so the faster the engine rpm, the faster the compressor will run. Finally, a random air leak rate factor is allocated on a per power car basis. All of this adds up to mean that some power cars will take longer to build up air than others and some will leak air from their system more than others.

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 that it should. To demonstrate how significant this is, there is an 8 mile 1 in 200 uphill gradient between Alexandra Palace & Potters Bar on the East Coast Main Line out of London. In reality, with a 2+9 HST set (2 power cars & 9 Mk3s) on this gradient, it cannot reach much over 105mph. If this was a flat gradient, the same HST would be nearing 125mph by Potters Bar (if the line speed allowed!). As a result, if relying on the default implementation of gradients which treats 1 in 200 as flat, an HST in the simulator would be going much too quickly.

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.

Automatic Train Protection (ATP)

Following a number of incidents, this safety system was introduced on the Great Western Main Line (GWML) between London Paddington & Bristol. It monitors signals/speed limits and should the driver not respond correctly to them, intervenes with a brake application. Note that due to inconsistent behaviour of signals in the simulator, we have not been able to simulate the signal monitoring part of the system.

For the purposes of this pack, ATP can be used on any route.

ATP is only available on liveries that had it fitted in reality. These are InterCity Swallow (ATP), Great Western Trains & First Great Western.

ATP can be disabled/enabled by pressing **Ctrl+P**.

Self Test

When setting up the cab of an ATP fitted power car, you must carry out the ATP self test after keying in and moving the reverser to 'Neutral'. To do this, follow the steps below:

1) Press the 'On' button below the speedometer.
2) A sequence of indications will appear on the speedometer display
3) When 'SP?' appears, press the 'On' button below the speedometer to acknowledge this.
4) When 'OK!' appears, the self test is complete and you must acknowledge it by pressing the 'On' button.

Data Entry

When the self test has completed and the 'On' button is flashing , you must confirm your train's data in the 'ATP DATA ENTRY' unit located on the right-hand side of the cab desk. This allows the braking curve to be calculated for ATP. To do this, follow the steps below:

1) Open the cover of the ATP data entry unit and input a random 3-digit number as your driver's pin.
2) Press 'ENT'.
3) Enter the number of vehicles in your formation. This includes power cars so for an HST set with 2 power cars and 8 Mk3 coaches, you would input 10.
4) Press 'ENT'.
5) Press 'ENT' to confirm your HST is not running with any faults.
6) Check the data you have entered and if it's correct, press 'ENT'. If you would like to re-enter the data, press 'NO' and then 'ENT'.
7) When 'Data Entered – ATP Ready' appears on the display, ATP has been successfully setup and you are now able to obtain a brake release.

Modes

ATP has three modes; partial supervision, full supervision and shunt.

Partial Supervision

Partial supervision is what is selected by default when setting up ATP. This is applicable for all routes where ATP is not fitted. In this mode, only the train's maximum permitted speed is 125mph is supervised. A green LED illuminates on the speedometer to signify this.

If you go over 128mph, a warning 'warble' will sound and 'MAX' will flash on the speedometer display. If you go over 131mph, ATP will intervene by applying a full service brake application and the 'Brakes' button will illuminate below the speedometer.

Once speed drops below 128mph, the warning 'warble' sound will stop and the 'Brakes' button will flash to let you know that the ATP brake intervention can now be cancelled. To do this, press the 'Brakes' button.

Full Supervision

Full supervision is applicable to when driving between London & Bristol where ATP is fitted. This is where both speed limits and the train's maximum permitted speed are supervised. You can switch between full and partial supervision modes by pressing **Ctrl+Shift+P**.

On the speedometer, the current speed limit is displayed with a solid green LED next to the relevant speed. When moving to a higher speed limit, you will hear a 'blip' sound and the solid green LED will move next to the relevant speed. When approaching a lower speed limit, the green LED will start blinking next to the impending lower speed and you will hear the 'blip' sound. Once you reach the speed limit, the green LED will return to a solid state and you will hear the 'blip' sound.

When 3mph above the speed limit, a warning 'warble' will sound as an alert to the driver to reduce their speed. The speed limit will also flash on the speedometer display. If the driver ignores this and reaches 6mph above the speed limit, a full service brake application will be made and the 'Brakes' button will illuminate below the speedometer. Once speed drops below the speed limit, the warning 'warble' sound will stop and the 'Brakes' button will flash to let you know that the ATP brake intervention can now be cancelled. To do this, press the 'Brakes' button.

ATP can also intervene when approaching a lower speed limit. If ATP judges that you are not braking sufficiently, the 'warble' will sound as an alert to the driver to apply the brakes more heavily. The impending speed limit will also flash on the speedometer display. If the driver continues to not brake sufficiently, a full service brake application will be made and the 'Brakes' button will illuminate below the speedometer. Once speed drops below the speed limit, the warning 'warble' sound will stop and the 'Brakes' button will flash to let you know that the ATP brake intervention can now be cancelled. To do this, press the 'Brakes' button.

The train's maximum permitted speed is supervised in the same manner as described in the 'Partial Supervision' section above, except '125' will flash on the speedometer display instead of 'MAX'.

Automatic Supervision Mode Switching

To automatically switch between supervision modes in a scenario, a marker can be placed in the scenario editor to do this. This marker can be found by selecting 'AP/Common' in the 'Object Set Filter' and browsing for 'AP ATP Full Supervision' or 'AP ATP Partial Supervision' 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 in the direction the train is travelling. The name of the marker is the mode that will be switched to upon passing it.

Shunt

When in low speed areas or the formation of your train is likely to change such as within a depot, a shunt mode is provided which bypasses the requirement for you to enter data in the data entry unit.

To enter this mode, ensure you have carried out the self test, then press the 'Shunt' button below the speedometer (behind the blue cover) whilst stationary and with the reverser in 'Neutral'. The 'On' button will extinguish and the 'Shunt' button will illuminate to confirm you have entered shunt mode.

This acts in a similar way to partial supervision except your maximum permitted speed is 20mph instead of 125mph.

To exit shunt mode, ensure you are at a stop with the reverser in 'Neutral' button and press the 'On' button below the speedometer.

National Radio Network (NRN)

A simple representation of the NRN radio is simulated. To set the NRN zone, please follow the instructions below:

1) Turn the radio on by pressing the button below the volume control on the left-hand side of the console.
2) Enter the three-digit zone number by using the numpad.
3) To confirm this, press the green button below the British Rail arrows symbol. The NRN is now successfully set up.
4) If you see an NRN zone change sign (pictured below), you must change the zone number manually. Do this by simply entering the new three-digit zone number on top of the old one.

NRN zone placement in scenarios

NRN zones cover very large areas so it is entirely possible you will not change areas during a scenario but should you wish to do so, a sign is included in this pack and must be placed by the scenario author.

This sign can be found by selecting 'AP/Common' in the 'Object Set Filter' and browsing for 'AP NRN 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 three-digit area number in the right-hand fly-out. Please note that this must be three-digits so zone 65 would be '065'.

General Fault Light

The general fault light in the cab can illuminate for a variety of reasons when applying power from off. Please see below for a list of causes:

- Brake test switch is in 'Test'
- Brake pipe pressure has fallen below 3.4 bar. Traction power will only return once brake pipe pressure rises above 4.3 bar.
- Main reservoir pipe pressure has fallen below 4.2 bar. Traction power will only return once brake pipe pressure rises above 5.72 bar.
- Applying power too soon again after moving the power handle to off.

Even if the fault condition has rectified itself, you must return the power handle to off and try applying power again.

The only exception to the above is in the case of a high water temperature (HWT) trip. If this occurs, the general fault light will illuminate regardless of power handle position and power will automatically return without having to move the power handle to off if coolant temperature falls sufficiently.

Headlights

Day, night or both headlights can be illuminated on class 43s of the Valenta era. Over the years though, these largely haven't been used in the traditional manner. We assume this was due to the night headlight simply being seen as the standard headlight and the day was just a backup. Please see below for how AI trains will show their headlights, based on research of photographs from the era:

- **Pre-1993**: Night headlight. 1 in 20 chance of day or both to account for maverick drivers. No link to time of day.
- **1993 to 1998**: Both headlights on ATP fitted power cars. On all other power cars, 75% chance of night headlight & 25% chance of day headlight. No link to time of day.
- **Post-1998**: Both headlights.

Power cars fitted with the Midland Mainline 3 light cluster or modern light cluster show day or night depending on time of day.

We recommend following this guidance on your train if you wish to replicate reality.

Also of note is that the headlights do not work unless Electric Train Supply (ETS) is on.

Dynamic Exhaust Effects

Dynamic exhaust effects mean that the exhaust reacts to what the engine is doing. For example, when in notch 5, the engine will produce more exhaust than it would when idling. Also, when revving up, exhaust thickens before thinning out when rpm settles. Equally, when revving down, exhaust thins. On top of that, when starting up, exhaust rises in sync with the sound of the engine revving up. Finally, how long the engine has been sitting idle is now taken into account so the longer you stand around with carbon deposits building up in the exhaust, the smokier it is when you unleash the power! The engine then 'clears its throat' and the exhaust eases. If you are at speed and regularly applying power, the exhaust stays cleaner.

In reality, the smokiness of each power car varies depending on how well maintained it is, so to represent this in the simulator, a random 'Clag Factor' is allocated to each power car which ranges from 1 to 10; 1 being the cleanest and 10 being the dirtiest. This can also be controlled on the leading power car by using **Shift+C** & **Ctrl+C**.

Exhaust Cam

A camera view facing the exhausts is provided to allow you to enjoy the sight and sound of the power car at work. This replaces the right-hand 'head-out' view so to access it, press **Shift+2** and the **Right-hand Arrow** key.

Electric Train Supply (ETS)

To charge the batteries and supply power for all of the on-board equipment, electric train supply (ETS) should always be on. This is done by holding the 'Train Supply On' button down until the 'Train Supply' indicator light illuminates.

In reality, barring a fault, the rear power car is used to supply ETS. This is so if the driver notices the train supply turn off mid journey due to a fault, they can turn the train supply on in the leading power car. Using the rear power car also reduces noise for the driver as the engine revs to 1000rpm (notch 2) to supply ETS.

On your player train, the rear power car will automatically supply ETS. For AI trains, the rear power car will automatically supply ETS once the train starts moving.

This automatic behaviour can be over-ridden in the scenario editor by consulting the 'Numbering' section of this manual.

Please note that the 'Train Supply On' button only turns ETS on, on the power car you are in. The 'Train Supply Off' button switches off ETS on whichever power car is supplying ETS at that moment. Hence, it is possible to turn the rear power car's ETS off by holding the 'Train Supply Off' button down in the leading power car.

Driver Vigilance Device (DVD)

A driver vigilance device is fitted which ensures the driver is alert. When the reverser is placed into forward or reverse, a high-pitched alarm sounds every 60 seconds which must be reset by lifting the DSD pedal by pressing **E**. If you reset an AWS warning, the system sees this as confirmation that the driver is alive and well so will reset the timer to 60 seconds.

If you fail to reset the alarm within 2.5 seconds, an emergency brake application will occur. This brake application is not locked in until you stop though. If you reset the alarm, the emergency brake application will cease.

The driver vigilance device is isolated by default in our simulation so press **Ctrl+D** if you would like to activate it.

You will note that the driver vigilance device sounds when an AWS warning sounds, this is intentional and was a characteristic of Valenta power cars.

Also, due to the air operated nature of the vigilance timer, the 60 second base time would sometimes vary on Valenta power cars. To simulate this, there is a 40% chance that the timer will be anything between 40 & 60 seconds instead.

Dead Variant

A 'dead' variant of all liveries is provided with a '(Dead)' suffix in the scenario editor. This is identical to a normal variant but has its tail lights turned off and is unpowered so will not provide tractive effort in a consist. Ideal for 'dragging' by a locomotive which is not a class 43.

To add a tail lamp to the nose/front end, add **;TL=1** to the power car number in the scenario editor.

To add a tail lamp to the corridor/rear end, add **;TL=2** to the power car number in the scenario editor.

Cold Start

'Cold start' means the power car is in the following state when it loads:

- Main reservoir and brake cylinder pressures are 0
- The engine is shut down

To prepare an HST from cold, please follow the instructions below:

1) Move to what will be the rear power car when you head out onto the mainline
2) Insert the master key by pressing **Shift+W**.
3) Move the reverser to 'Engine Only' by pressing **W**.
4) Reset the AWS self-test by pressing **Q**.
5) Start the engine by holding **Z** until the 'Engine Stop/Start' indicator extinguishes.
6) Turn ETS on by holding the 'Train Supply On' button down until the 'Train Supply' indicator illuminates.
7) You will now need to wait for the compressor to build the air in the main reservoir. If you need to quicken this process up, move the brake test switch to 'Test', the reverser to 'Forward', turn off the DRA (if applicable), and move the power handle to notch 5. This will rev the engine up without applying power. The compressor is directly linked to the engine so when the engine revs faster, the compressor also does, which then builds the air pressure faster.
8) When the main reservoir reaches 6.5 bar, you have sufficient air to obtain a brake release and are ready to carry out a brake test. If you have moved the power handle away from off, return it to off. If you would rather not carry out the brake test, please skip to step 15. This wouldn't be an option in reality but in the simulator, sometimes you just want to get down to business!
9) Ensuring the brake test switch is in 'Test' and the parking brake on, move the brake handle to 'Run' and observe the brake pipe pressure rise to 5.1 bar.
10) Now apply the brake step-by-step to 'Full Service', ensuring the brake pipe pressure reduces in even increments with each step.
11) When you have reached 'Full Service', depress the emergency brake plunger and observe the air brake pipe pressure fall to 0 bar.
12) Now lift the emergency brake plunger and observe the air brake pipe pressure rise to 3.35 bar.
13) Move the brake handle to 'Running' and observe the air brake pipe pressure rise to 5.1 bar and the brake cylinder pressure fall to 0 bar.

14) Press **Ctrl+D** to activate the driver vigilance device, move the reverser to 'Forward' and lift the DSD pedal by holding **E**. Within 2.5 seconds, observe that the air brake pipe pressure begins to fall to 0 bar. As soon as you observe this, move the reverser to 'Off' and ensure the air brake pipe pressure continues to fall to 0 bar with the brake cylinder pressure rising to its maximum. You may now release the DSD pedal by lifting off from the **E** key.

15) Move the brake test switch to 'Normal'.

16) Release the parking brake by pressing the 'Parking Brake Off' button and waiting for the parking brake indicator to display 'OFF'. In an ATP fitted power car, the 'Parking Brake Off' button will illuminate when the parking brake is released.

17) Move the brake handle to 'Full Service'.

18) You must now move to the other power car.

19) Insert the master key by pressing **Shift+W**.

20) Move the reverser to 'Engine Only' by pressing **W**.

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

22) If driving an ATP fitted power car, carry out the self test and data entry. You must do this to obtain a brake release.

23) Setup the NRN radio.

24) If you wish to continue the prototypical brake test, repeat steps 9 to 15. Alternatively, proceed to the next step.

25) Ensure the brake handle is in a holding brake position; minimum of 'Hold'.

After carrying out this procedure, your HST is successfully prepared from cold. A minimum of 15 minutes should be allowed by scenario creators for players to complete this procedure.

Audio

This section of the manual is dedicated to outlining audio aspects of the pack which are not necessarily self-evident and require explanation.

Engine

Using recordings from 41001 at the Great Central Railway (North) and our own recordings "in the field" from when these engines were in service, we have attempted to capture every nuance of the Paxman Valenta 12RP200L engine.

Load

As mentioned in the 'Physics' section above, class 43s are quite unusual in maintaining constant tractive effort until 35mph. To maintain this tractive effort, the voltage being demanded from the alternator (what creates the electricity from the rotation of the engine) has to increase as speed increases from 0 to 35mph. As a result, whilst engine rpm stays the same assuming the driver doesn't change the power notch, the load on the engine is continually increasing from 0 to 35mph. This is why the turbocharger doesn't reach its maximum speed/pitch until 35mph, leading to the characteristic steady increase of the turbocharger when pulling away from a stand. The sound of the engine itself also changes as it works harder.

A selection of rev-up sounds are included too to represent the engine revving up under different load conditions. For example, going from off to notch 5 from a standing start sounds a lot more pedestrian than at 35mph or above where the engine is taking on a much higher load.

Possibly the clearest way of hearing this for yourself is at 35mph or above, select notch 1 power from off and hear the engine note change as the amps build. Engine rpm stays the same at 750rpm, all that has changed is the load.

All of this adds to the feeling of acceleration and the train getting into its stride.

Turbocharger

When built, Valenta engines were fitted with an SA-084 turbocharger. With many of these coming to the end of their working life in the early 2000s, some power cars were fitted with a newer NA256 turbocharger. Both types are represented in this pack and whilst sounding similar at higher speed, the NA256 is noticeably whinier at low speed.

Which power cars have which turbocharger is automatically applied on a per power car basis. As a rule, East Midlands Trains, Midland Mainline Blue (Rio), Network Rail

and Grand Central power cars had the newer NA256. Some Midland Mainline Blue power cars also received them towards the end of their life as a Valenta. Finally, Midland Mainline Blue (Rio) power cars transferred to First Great Western retained them.

Single Bank Firing

In the early 2000s, single bank firing was fitted to some Valenta engine power cars which is where only half of the engine's cylinders are firing. Ours research suggests these were First Great Western, GNER & Network Rail examples.

The reason for this is that with all cylinders firing on large engines such as the Valenta, the engine is actually doing very little and just ticking over. As a result, fuel is liable to slide down the cylinders and collect in the oil sump, diluting the oil in the process, meaning it has to be changed more often. When single bank firing is active, 6 of the 12 cylinders work twice as hard meaning more of the fuel is burnt and not sliding down the cylinder. The other 6 aren't firing at all so have no fuel in them.

How does this work in practice then? When idling, only the 'A' bank cylinders are firing. Upon selecting notch 1 power, 'B' bank kicks in and all 12 cylinders will start firing and the engine note will suddenly sound smoother and less rattly as the engine momentarily has less to do before the amps start building. When shutting off power, single bank firing will activate again after 25 seconds.

Cooler Group

In British Rail's dual sourcing tradition, class 43s were fitted with either a Marston or Serck cooler group. The Marston was the most common and from new, was fitted to the first 151 power cars (43002 to 43152). The Serck was fitted to the remaining 46 power cars (43153 to 43198). Both were interchangeable so it wasn't long before you could see either in any power car. In the 2000s, newer Voith & Brush cooler groups were fitted to some power cars. Their operation all broadly followed the same logic.

When a certain coolant temperature is reached, the cooler group fan activates. The speed at which this runs is governed by two factors, coolant temperature and engine speed. The warmer the coolant, the faster the fan will try to run. However, when activated, the fan is directly driven by the engine so even if the coolant is running hot, it can only run at its desired speed if the engine is also running at a high enough speed to provide the necessary force. This is why cooler groups are often heard revving up and down in sync with the engine.

This is exactly how the newer Voith & Brush cooler groups operate. These are fairly quiet and generally blend into the sound of the engine.

The Marston was one of the trademark sounds of the HST, and could often be heard howling away on a warm day. It worked as described above but with one difference. To control fan speed in relation to coolant temperature, a fluid coupling was provided which filled with oil to control fan speed. Without this, the fan would simply run proportionally to engine speed when active. What gave the Marston such a unique sound though was that when the engine revved up, this momentum seemed to overcome the force being provided by the fluid coupling, meaning that the fan would momentarily run at a higher speed, before settling down to its intended speed once engine rpm settled; assuming the desired fan speed was lower than the speed dictated by engine rpm.

This results in often hearing a wonderful howling crescendo in line with the engine speed when revving up before the fan then slows down to its intended speed dictated by coolant temperature.

Sercks were a more mellow drone and information on their exact operation is scarce, but from listening to videos of them in action, it seems the fan speed did not gradually increase/decrease depending on coolant temperature but simply activated upon reaching a certain temperature. When active, fan speed was solely controlled by the direct linkage with the engine.

Finally, depending on the condition of the fan bearings, both the Marston & Serck cooler groups could vary in volume quite considerably. Enter a new 'X' factor; 'Fan Factor'! To represent this variance in the simulator, a random 'Fan Factor' is allocated to each power car which ranges from 1 to 6; 1 being the quietest and 6 being the loudest. This can also be controlled on the leading power car by using **Shift+F** & **Ctrl+F**.

Brakes

Once again, in British Rail's dual sourcing tradition, class 43s are fitted with either a Davies & Metcalfe E70 or Westinghouse DW2 brake distributor. The E70 is the most common and from new, was fitted to the first 151 power cars (43002 to 43152). The DW2 was fitted to the remaining 46 power cars (43153 to 43198) and has a completely different sound. The DW2 is distinctive for making a loud, haunting woosh as the brakes apply.

The E70 & DW2 are interchangeable so it wasn't long before you could hear either in any power car. On pre-privatisation liveries, you will have a 23% chance of having the DW2 brake, this is randomly chosen every time you load the simulator.

Post-privatisation, an effort was made to group all of the DW2s with the Great Western region so from this point onwards, you will only have a chance of hearing it on Great Western Trains, First Great Western & VT power cars. You may also hear it on 'Rio' Midland Mainline Blue power cars which were ex-VT.

If you have the DW2 brake on First Great Western 'Teardrop' & 'Barbie' liveries, you will hear the silenced version, which was introduced in the early 2000s following complaints from drivers about the volume in the cab.

Compressor

Similar to the brake units outlined above, British Rail also dual sourced the compressors. 43002 to 43152 had the Davies & Metcalfe variant whilst 43153 to 43198 received the Westinghouse. Again, due to their interchangeable nature, they soon ended up on any power car so which one you will hear is proportionally random with there being a 23% chance of the rarer Westinghouse.

As previously mentioned too, the compressor is directly linked to engine rpm so as the engine revs up, you will also hear the compressor do so.

Horn

Variants

As is the case with much older rolling stock, every horn tends to sound different between power cars. To simulate this, we have provided six horn variations under the guise of 'Horn Factor'.

Normally, upon loading a scenario, your power car would be randomly allocated one of these horns. However, for reasons we are unsure of, the nature of class 43 horns changed at some point after the replacement of the Valenta engine. Most of them became less punchy, especially from outside. As a result, only Horn Factor '1' is a variant we would consider truly authentic for a class 43 of the Valenta era. As a result, you will always have this variant chosen for you upon loading a scenario. We have kept the other variants available for those who wish to have variety, and spend most of their time in the cab where the sound change was less noticeable. If you wish to change the Horn Factor, press **Shift+Ctrl+H** or **Ctrl+H**.

In addition, both soft and loud tones are provided. The loud tones are controlled using the usual **Space** and **B** keys whilst the soft tones are controlled using **Ctrl+Space** and **Ctrl+B**.

Please see below for a list of where we recorded each horn variant and from which power car:

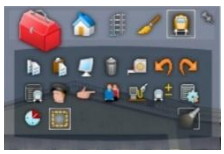
1 – 43xxx – Old Oak Common
2 – 43082 – Great Central Railway (Nottingham)
3 – 43467 – Great Central Railway (Nottingham)
4 – 43071 – Colne Valley Railway
5 – 43159 – Midland Railway Centre
6 – 43048 – Midland Railway Centre

AI

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:

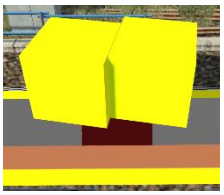
1) In the scenario editor, go to the location at which you would like the AI train's horn to sound, and press **Spacebar** 3 times. The track will now display a certain colour which represent its speed limit.

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.

Traction Motors

Much effort has been made to ensure the traction motors rise at the correct pitch in relation to speed, and are more resonant at certain speeds than others to match reality.

In addition, power cars can vary quite significantly in how loud their traction motors are. To simulate this, we have implemented a random 'Motor Factor' to each power car which ranges from 1 to 6; 1 being barely audible and 6 being very prominent. This can also be controlled on the player power car by using **Shift+M** and **Ctrl+M**.

Cab

On the whole, the cab sounds do what they say on the tin. There are a couple of items of note though.

First Great Western power cars have a different sounding driver to guard buzzer.

VT and Midland Mainline Blue 'Rio' power cars have a different sounding AWS warning horn.

If driving from a power car with its engine shut down and the rear one supplying ETS (Electric Train Supply), you will still hear the air conditioning sound in the cab which revs up and down with the engine rpm of the rear power car. This is because the voltage supplied by the ETS goes from 274v when the engine is idling to 415v at power notch 5. The air conditioning equipment is directly powered by this.

Bits and Bobs

This section is dedicated to aspects of the class 43 that don't warrant a dedicated section but are still of note:

- Both power cars on an AI train rev up/down in sync.
- Windscreen wipers on AI trains automatically turn on when it is raining
- Speedometer needle drifts due to small inaccuracies in speed calculation. Not applicable to the ATP fitted cab.
- On AI trains during summer between 09:00 & 20:30, there is a 1 in 20 chance of both cab doors being open and a 1 in 10 chance of the driver's door being open.
- There is a random delay between the doors closing and the guard giving the 'right away' signal.
- Marston cooler group roof louvres open when the fan is running
- AWS fault light on the cab desk extinguishes when you move the reverser away from 'Off'.
- Instrument lights illuminate when the reverser is moved away from 'Off'.
- The reverser must be placed in 'Engine Only' to start the engine.
- 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 headlight only provides illumination before sunrise and after sunset. This is to avoid the unrealistic appearance of projected light in broad daylight.
- The engine start button will startup both power cars in an HST formation.
- The engine stop button will shutdown both power cars in an HST formation.
- The fire alarm test button shuts down only the power car you are in.
- The engine start/stop indicator light illuminates if either power car or both power cars are shutdown.

Features (Mk3)

Advanced Slam-door Functionality

On coaches with their original slam-door, each door is individually scripted and opens/closes at random. This means that very rarely will all doors be open at once, just like reality. The only exception is the guard's door on the TGS which remains open the whole time.

Central Door Locking (CDL)

In the early 1990s, central door locking was fitted to prevent the doors being able to be opened on the move. Both the original and LED variants of the accompanying bodyside indicator lights are included in this pack. Also, after the doors close, there is a delay of a few seconds before the indicator lights extinguish upon locking, simulating the delay in the guard doing this. Finally, if you listen closely near the doors, you will hear the locking bolt move.

Coach Letters

Coach letters are represented on all applicable liveries in this pack. Barring out-of-the-ordinary formations, these are automatically applied depending on the formation. One exception is when using the Grand Central livery, due to these HSTs rarely having their coaches in a consistent order and sometimes with no coach letters at all. Also, early BR InterCity 125 formations with no TGS or two catering vehicles will need manual intervention to display the correct letters.

Table Lamps

Upon privatisation, table lamps were fitted to GNER liveried Mk3s with first class seating. The ex-loco hauled Mk3s in use with Grand Central also had lamps fitted in first class. These are simulated externally and only appear illuminated after sunset or before sunrise.

Air Suspension Valve

Mk3s have very distinctive sounding air suspension valves which have been simulated in great detail. When releasing air, they make a hissing sound as well as a whine.

Upon loading a scenario, each bogie on a coach is allocated a random pitch value so they will whine at a different pitch to each other as per reality. Sometimes, the valves will only make the hissing sound and not the whine.

How often the valve releases air is scripted randomly and dependent on speed/curvature. It is more likely to sound at lower speeds and when leaning into a curve on superelevated track.

There is a chance that upon stopping, a valve will continuously release air before slowly fading out and warbling in pitch.

Track Whine

Since the advent of rail grinding, Mk3s have made a whining sound whilst moving, almost like a traction motor, which increases in pitch as speed increases. It is difficult to pinpoint when exactly this sound became more prevalent so we have made an educated guess of the late 1990s. All post-late 1990s liveries will therefore make this sound.

In addition, only primary high-speed routes tend to receive a regular visit from the rail grinder, so this sound tends not to be audible on secondary routes and branch lines. To try and account for this, if the speed limit of the line you are travelling on is below 80mph, you will not hear this whine.

Flushing Toilets

Yes, your eyes don't deceive you, we have implemented flushing toilet particle effects! On coaches not fitted with retention tanks, above 15mph, each toilet will flush every 3 to 15 minutes. This functionality only activates once the doors have been opened in a scenario to try and prevent these effects incorrectly appearing on empty coaching stock services. These effects are also disabled on the Network Rail 'New Measurement Train'.

Whilst this all might seem rather silly, seeing this from the lineside always added to the sense of speed as these mighty machines flew by. You just had to remember to look away at the right moment...!

Passenger Views

Three variants of passenger view are provided in this pack.

Saloon (Catering Vehicle)

BR InterCity 125

InterCity Executive/InterCity Swallow

Great Western Trains/First Great Western

GNER/GNER (NXEC)

VT (TRFB)

VT (TRSB)

Midland Mainline

Midland Mainline Blue

Midland Mainline Blue (Rio)

Grand Central

All Other Vehicles

All other vehicles have a 'head out' view. The perfect place to enjoy the outside sights and sounds.

To cycle through passenger views on your train, press **Ctrl+Left Arrow** or **Ctrl+Right Arrow**.

Bits and Bobs

This section is dedicated to aspects of the Mk3s that don't warrant a dedicated section but are still of note:

- The frequency at which the internal air conditioning sound activates, and stays on, is dependent on season.
- The internal air conditioning sound revs up and down with the engine rpm of the power car supplying ETS. This is due to the air conditioning system being powered directly from the ETS which varies in voltage depending on engine rpm.
- When entering the passenger view of a Midland Mainline coach, there is a 1 in 10 chance that within 20 seconds, you will hear the classic announcement chime.
- Apart from the Network Rail New Measurement Trains, coach end data panels show the correct information as per the coach variant.

Setting up the Driver's Cab

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

1) Turn the master key in by pressing **Shift+W**.
2) Move the reverser to 'Engine Only' by pressing **W**.
3) Cancel the AWS self-test alarm by pressing **Q**.
4) If driving an ATP fitted power car, carry out the ATP self test and data entry as detailed earlier in this manual. You must do this to obtain a brake release.
5) Move the brake handle to 'Full Service' by pressing **semi-colon**.
6) If applicable, register the NRN radio.
7) Select the relevant position on the headlight switch by pressing **H** or **Shift+H**.
8) If fitted with a Driver 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) When you receive two buzzes from the guard, return them by pressing **C** twice.
2) Move the reverser to your desired direction of travel by pressing either **W** for forward or **S** for reverse.
3) Move the brake handle to 'Hold' by pressing **semi-colon**.
4) Move the power handle to notch 1 by pressing **A** and confirm the ammeter is rising. As soon as you have done that, move the power handle to notch 2 and move the brake handle to the running position.
5) As soon as you begin moving, move the power handle to notch 3 and apply further power as you see fit. Despite what certain Western Region driving techniques may have taught in the past, there is nothing wrong with being in notch 5 by the time you get to 10mph…! Speed limits permitting of course.
6) When returning the power handle to off by by pressing **D**, ideally you should move to notch 2, wait for the amps to settle, then notch 1, wait for the amps to settle, and then move to off. This provides the smoothest ride for passengers.
7) To brake the train, you may make applications and releases by moving the handle between 'Initial' and 'Full Service' by pressing **@.** It is recommended you only use 'Full Service' as a last resort so as to ensure you always have more brake force available if required. Also, please be aware of the distinctive brake release timings as detailed in this manual
8) Just before coming to a stop, aim to have the brakes in 'Initial' or 'Hold' brake so as to provide a smooth stop.
9) Once at a stop, apply 'Hold' brake as 'Initial' is not trusted to hold the train in all circumstances.

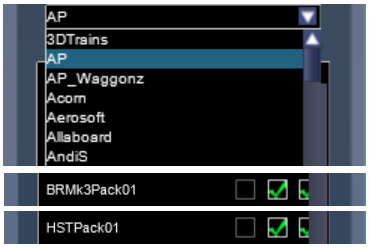
How to Use in the Scenario Editor

How to place

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

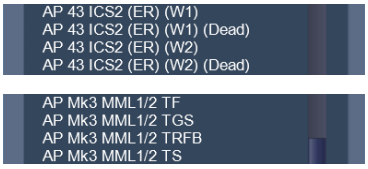
1) In the left-hand rolling stock fly-out, click the object set filter which looks like a blue box with an orange arrow to the right of it.

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



3) Tick the second & third box beside 'BRMk3Pack01' & 'HSTPack01'.

4) The liveries should now be visible in the left-hand rolling stock fly-out. For the class 43s, W1, W2 & W3 variants are provided. W1 being the cleanest & W3 the dirtiest.



Numbering

When placing in the scenario editor, you are able to control a number of features via the number of the class 43 power car.

Cold Start

To activate cold start mode on a player train, add **;Cold=1** to both power cars in the consist.

NRN

To have the NRN radio already active when a scenario starts, add **;NRN=x** to the leading power car number. x = 3-digit NRN zone number.

Numbers

On some liveries, the number on the power car varies in position and/or size. Most of the time, this stayed the same throughout the period of a power car carrying a certain livery but sometimes it changed. You can change the number style by adding **;N=x** to the power car number. Please see what to put as 'x' to receive your desired result on each livery:

InterCity Executive

1 = Side numbers
2 = Side numbers and medium sized front numbers
3 = Side numbers and large front numbers
4 = Side numbers and small front numbers

InterCity Swallow

1 = Small van end numbers
2 = Small van end numbers and large front numbers
3 = Small van end numbers and small front numbers
4 = Below cab numbers
5 = Below cab numbers and large front numbers
6 = Below cab numbers and small front numbers
7 = Small van end number on driver's side. Small below cab number on off side. Medium sized front numbers.

On BR InterCity 125, InterCity Executive & InterCity Swallow liveries, to add the set number to a power car, add **;S=xxxxxx** to the power car number.

Nameplates

Most of the time, the correct nameplate will automatically appear depending on the livery and power car number. Occasionally though, you may wish to change this to suit specific eras. To do this, add **;NP=x** to the power car number.

- The first nameplate carried by a locomotive in its relevant livery. x = **1**
- The second nameplate carried by a locomotive in its relevant livery. x = **2**
- The third nameplate carried by a locomotive in its relevant livery. x = **3**
  and so on…

Add **;NP=0** to the power car number to remove a nameplate.

Please note that the specific decals seen on GNER power cars are treated as nameplates, so to remove/change those, follow the instructions above.

Cooler Group

To change the type of cooler group fitted, add **;CG=x** to the power car number.

- Marston. x = **M**
- Serck. x = **S**
- Voith. x = **V**
- Brush. x = **B**

Original Light Cluster Surround

To change the colour of the light cluster surround on power cars with the original light clusters, add **;HL=x** to the power car number.

- Silver. x = **1**
- Yellow. x = **2**
- Black. x = **3**
- Great Western Trains Green. x = **4**
- First Great Western Purple. x = **5**

Grey/Black Marker/Tail Light Casing

To change the colour of the marker/tail light casing on power cars with the original light clusters, add **;G_HL=x** to the power car number.

- Black. x = **0**
- Grey. x = **1**
- 50/50 chance of either. x = **2**

Horn Grille

To change the colour of the horn grille, add **;HG=x** to the power car number.

- Black. x = **1**
- Yellow. x = **2**
- Silver. x = **3**

Opening Luggage Van Window

Add **;LW=x** to the power car number.

- Single pane window. x = **0**
- Opening luggage van window. x = **1**
- Single pane window with metal surround. x = **2**

Rear Guard Windows

Add **;GW=x** to the power car number.

- Hide. x = **0**
- Show. x = **1**

Aerial

Add **;A=x** to the power car number.

- Hide. x = **0**
- Show. x = **1**

Electric Train Supply (ETS)

To override the automatic operation of Electric Train Supply (ETS) as detailed in the relevant section earlier in this manual, add **;ETS=0** to turn it off or **;ETS=1** to turn it on.

Engine State

To force a power car's engine to be shutdown upon loading a scenario, add **;ENG=0** to the power car number.

Turbocharger

Add **T=x** to the power car number.

- SA-084. x = **0**
- NA256. x = **1**

Single Bank Firing (SBF)

Add **SBF=x** to the power car number.

- No SBF. x = **0**
- SBF. x = **1**

Automatic Train Protection (ATP)

If starting a scenario in an area fitted with ATP where you wish for full supervision mode to be automatically activated, add **;ATP=1** to the power car number.

Traction Motor Isolation/Taping Out Notches/Control Cut Out

To isolate a pair of traction motors, add **;PL=3** to the power car number. This limits the engine/alternator output to notch 3 to prevent damaging the two remaining operational traction motors.

To tape out power notch 5 as described earlier in this manual, add **;PL=4** to the power car number. This will limit power to notch 4 only.

To tape out power notches 4 & 5 as described earlier in this manual, add **;PL=3** to the power car number. This will limit power to notch 3 only.

To operate the control cut out switch so the power car supplies no power but still has the engine running and/or is supplying ETS, add **;PL=0** to the power car number.

Tail Lamp (Class 43)

Add **;TL=1** to the power car number to add a tail lamp to the nose/front end, or add **;TL=2** to the power car number to add a tail lamp to the corridor/rear end.

Tail Lamp (Mk3)

To add a tail lamp to the rear of a mk3, add **;TL=1** to the coach number.

Example Number

43069;Config=ICS4;ETS=1

Key:
43069 - Locomotive number
;Config=ICS4 – Ignore this, internal configuration
;ETS=1 – Electric train supply forced on

Scenarios

APHSTVAL: 1C53 17:24 Sheffield - St. Pancras
Route = Just Trains – Midland Main Line
Track covered = Sheffield - Leicester
Traction = Midland Mainline 43043 & 43076
Date = 5th November 2001
Duration = 1 hour 10 minutes

APHSTVAL: 1H61 15:00 St. Pancras - Manchester Piccadilly
Route = Just Trains – Midland Main Line
Track covered = Leicester – Manchester Piccadilly
Traction = Midland Mainline Blue 43070 & 43069
Date = 8th September 2004
Duration = 1 hour 45 minutes

APHSTVAL: 1A12 09:30 Weston-super-Mare - Paddington
Route = Just Trains - South Western Expressways - Reading
Track covered = Weston-super-Mare - Chippenham
Traction = First Great Western 'Barbie' 43143 & 43027
Date = 3rd November 2006
Duration = 1 hour

APHSTVAL: 1C78 19:35 Paddington - Plymouth
Route = Just Trains – South Western Expressways - Reading
Track covered = Reading – Exeter St Davids
Traction = InterCity Swallow 43188 & Great Western Trains 43026
Date = 10th July 1997
Duration = 2 hours 5 minutes

APHSTVAL: 1B11 06:15 Peterborough - King's Cross
Route = ECML London - Peterborough
Track covered = Peterborough – King's Cross
Traction = InterCity Executive 43157 & InterCity Swallow 43074
Date = 1st May 1989
Duration = 1 hour 15 minutes

APHSTVAL: 1S22 15:30 King's Cross – Edinburgh
Route = ECML London - Peterborough
Track covered = King's Cross - Peterborough
Traction = GNER 43108 & 43114
Date = 18th July 2006

Duration = 50 minutes

Credits

125 Group/Midland Railway Centre/125 Heritage/East Midlands Trains/First Great Western - Assistance in recording sounds

James Ivell – Roof vents on Mk3s