Class 68

Enhancement Pack

AP

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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 68 Enhancement 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 requirements installed, as listed on the product page.
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.

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Liveries

Direct Rail Services - *DRS AP*

Direct Rail Services 2 - *DRS 2 AP*

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Chiltern Railways - *CR AP*

ScotRail - *SR AP*

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Transpennine Express - *TPE AP*

All liveries have 2D nameplates that are correct as of January 2019.

Keyboard Controls

Non-standard keyboard controls are listed below:

Shift+C -	Clag Factor INCREASE
Ctrl+C -	Clag Factor DECREASE
E -	Deadman's pedal (DVD reset)
Y -	Driver reminder appliance (DRA) ON/OFF
C -	Driver to guard signal
Ctrl+D -	Driver vigilance device (DVD) ON/OFF
Shift+E -	Electric Train Supply (ETS) ON/OFF
Z -	Engine start button
Ctrl+Z -	Engine stop button
I -	Instrument lights switch ON/OFF
Shift+W -	Master key IN/OUT
Shift+M -	Motor Factor INCREASE
Ctrl+M -	Motor Factor DECREASE
Ctrl+T -	Thrash Mode ON/OFF
Ctrl+Numpad Enter -	Visual aids ON/OFF
V -	Windscreen wiper switch CLOCKWISE
Shift+V -	Windscreen wiper switch ANTI-CLOCKWISE

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Features

Traction Physics

Great care has been taken to simulate the traction physics of this locomotive. For example, the tractive effort curve as shown in the manufacturer's manual, has been translated accordingly into the simulator. Also, as per reality, it takes around 26 seconds for the locomotive to go from idle to delivering maximum tractive effort, which ensures a smooth application of power.

In the past, locomotives of this type have been plagued by a limitation where at speed, the amount of power being applied was not proportional to the power handle and as a result, you could happily maintain a high speed with not much power applied. Using our custom scripting, we bypass this limitation and ensure performance matches the real thing as closely as possible.

Prototypical engine RPM values have been used for each notch on the power handle, as well as differing values depending on whether Electric Train Supply (ETS) is enabled or not:

Notch	RPM with ETS disabled	RPM with ETS enabled
Idle	600	1150
1	975	1350
2	1150	1600
3	1350	1650
4	1600	1700
5	1650	1725
6	1700	1740
7	1725	1740
8	1740	1740

Despite RPM varying depending on ETS, power distribution between the notches remains the same so when ETS is enabled, you will still obtain more tractive effort in notch 8 compared to notch 6, despite engine RPM remaining the same. As a result, you will hear the exhaust note become louder and the turbocharger rise as the engine takes on more load in notch 8. In addition to this, when the locomotive is idling at 1150 RPM supplying ETS, it is under a lot less load than when it is delivering tractive effort in notch 2 at 1150 RPM with ETS disabled, and we have represented this difference in the sound, which is most pronounced in the lower power notches.

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The maximum speed at which maximum tractive effort can be delivered also decreases when supplying ETS, which is calculated by taking the length of the train and estimating its ETS load accordingly. For example, the locomotive's tractive effort will start falling at a lower speed with an 8 coach rake compared to a 4 coach rake. At its maximum load, equivalent to 16 23m coaches, tractive effort will start falling at 13mph, compared to 17mph with no ETS load. In addition to the physics, the locomotive will also react audibly depending on the ETS load. The exhaust note when idling will be louder if hauling a long train with a large ETS load compared to a short train with a lighter ETS load.

ETS can be turned on and off by pressing **Shift+E**. To turn it on for AI, or by default on the player train, add **;ETS=1** to the locomotive number.

Finally, when the reverser is placed in either forward or reverse, the engine will rev up by a single notch for 10 seconds, before returning to idle if power has not been selected in that time.

Tractive effort, power notch & engine RPM can be viewed on the Driver Display Unit (DDU), which is found to the right of the cab desk.

Brake Types

This locomotive is fitted with both pneumatic (air) and dynamic brakes, which are controlled via three brake handles in the cab.

Direct Brake

This brake controls the locomotive's pneumatic brakes and has three notches. **Release**, **0** & **Apply**. **Release** releases the brake, **0** holds the brake and **Apply** applies the brake. This brake should only be used when running light engine.

Dynamic Brake

This brake is part of the power controller and goes from **Off** to -**100%**; **-100%** being the heaviest brake application. It uses the locomotive's traction motors to brake and is most effective between 5mph & 28mph. Its performance tails off rapidly above 28mph and at 100mph, is only 25% as effective. This brake should only be used when running light engine and should not be used to stop a locomotive due to being ineffective below 5mph. When the dynamic brake is active, the engine will rev to 1150 RPM (if ETS is disabled) and the brake fan will activate.

Dynamic brake effort can be viewed on the left-hand side of the Driver Display Unit (DDU), which is found to the right of the cab desk.

Automatic Brake

This brake is the normal brake to use for all types of train at any speed. This will automatically apply the locomotive's dynamic brake and train brake as deemed necessary to provide the requested brake force. Below 5mph, the locomotive's pneumatic brake is blended to replace the dynamic brake. It has three notches, **REL**, **0** & **BR**. **REL** releases the brake, **0** holds the brake and **BR** applies the brake. **REL** & **BR** are spring-loaded.

Use the yellow needle on the brake pipe pressure gauge to view the requested brake force. 5 bar is fully released and 3.35 bar is fully applied.

In reality, there is an additional emergency notch (**EB**) but this has been disabled so as to prevent it being accidentally selected. In the event of an emergency, please use the red plunger instead.

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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 Protection (WSP)

Wheelslip protection aids the driver during times of poor adhesion.

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

1) Power is automatically reduced, sand is applied and the wheelslip indication will appear on the Driver Display Unit (DDU). Engine RPM stays steady but you will hear the turbocharger spool down as some load is removed from the engine.

2) Once the wheelslip stops, power is reapplied to the selected power handle setting and the wheelslip indication extinguishes on the DDU. After 3 seconds, sand will stop being applied. If wheelslip reoccurs, the process starts again.

As a driver, you must assess which power setting is most suitable for the conditions and balance the occurrence of wheelslip with the maximum possible rate of acceleration. This locomotive does have a very advanced form of wheelslip protection though, so most of the time you will be better off letting the on-board computer handle it.

The automatic application of sand can be disabled by pressing the 'Sanding Cancellation' button which is located next to the master key on the right-hand side of the cab desk.

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Dynamic Exhaust Effects

Dynamic exhaust effects mean that the exhaust reacts to what the engine is doing. This locomotive is prone to producing most exhaust at 1350 RPM and this has been faithfully replicated. Aside from that, the general rule of more exhaust being visible at full power compared to idle still applies. 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, in reality, the smokiness of each locomotive varies depending on how well maintained it is, so to represent this in the simulator, a random 'clag' factor is allocated to each locomotive which ranges from 1 to 10; 1 being the cleanest and 10 being the dirtiest. This can also be controlled on the player locomotive by using **Shift+C** & **Ctrl+C**.

Guard to Driver Signal

A basic simulation of the guard to driver signal has been implemented where you receive two beeps from the guard after the doors have closed. You are then expected to reply with two beeps using the **C** key. This relies on the locomotive being next to a platform when loading/unloading passengers and the simulator recognising that this is so. This is very temperamental within the simulator so you may find you don't always receive the signal depending on how the platform has been set up in the route.

For when flag and whistle dispatch is used instead, this feature can be disabled by adding **;G=1** to the locomotive number in the scenario editor.

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Variable Traction Motor Volume

Similar to exhaust, locomotives tend to vary in how loud their traction motors are. To simulate this, we have implemented a random 'motor' factor to each locomotive which ranges from 1 to 6; 1 being barely audible and 6 being very prominent. This can also be controlled on the player locomotive by using **Shift+M** and **Ctrl+M**.

Thrash Mode

One issue we face in our enhancement packs is working with cab models that don't feature opening windows or doors to allow the external sound into the cab. To compensate for this, we have introduced a player controllable 'Thrash Mode' which when activated, plays the external sound in the cab as if you have the window or door open. This can be turned on and off by pressing **Ctrl+T**.

Exhaust Cam

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

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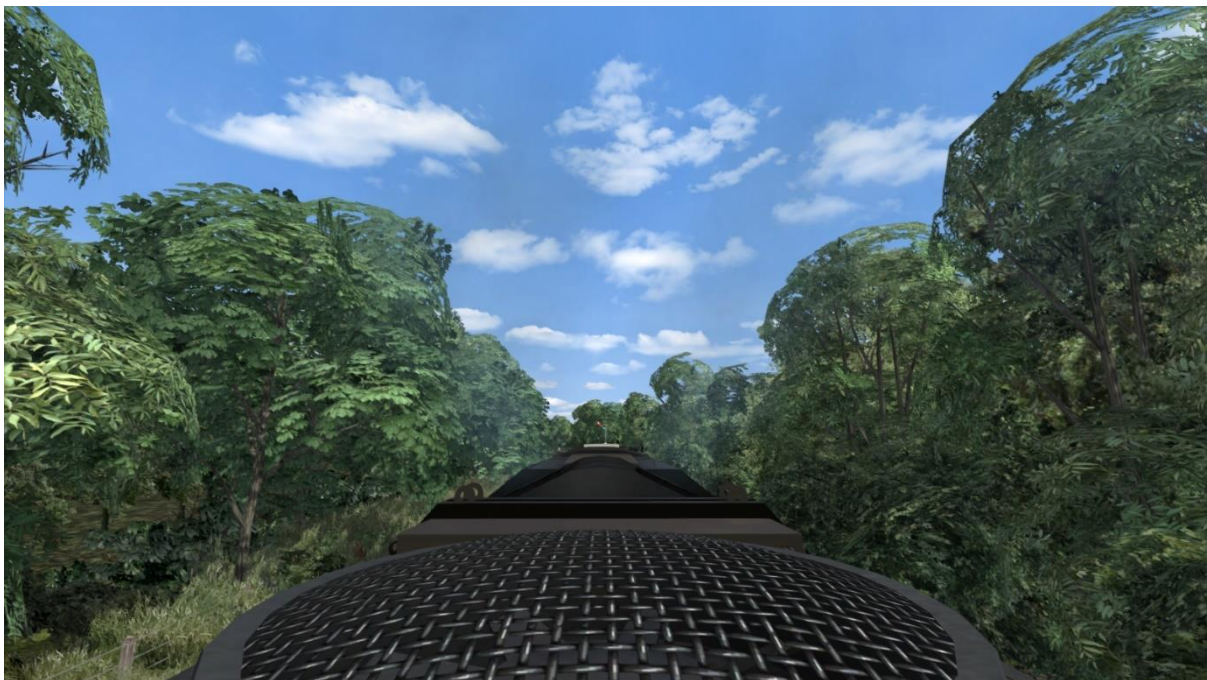
Trailing Mode

To simulate this locomotive with the engine on but not providing any power, we have provided a 'Trailing' version which can be found under the 'Rolling Stock' tab in the scenario editor, with a '(Trail)' suffix. Please note that this is not driveable. As per reality, the radar air hiss will be audible every 25 seconds above 3mph.

The following things can be changed via the locomotive number:

Electric Train Supply (ETS)

To make the engine idle as if it is supplying ETS, add **;ETS=1** to the locomotive number.

Tail Lights

To turn on the tail lights at no.1 end, add **;TL=1** to the locomotive number.

To turn on the tail lights at no.2 end, add **;TL=2** to the locomotive number.

To place a tail lamp at no.1 end, add **;TL=3** to the locomotive number.

To place a tail lamp at no.2 end, add **;TL=4** to the locomotive number.

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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'.
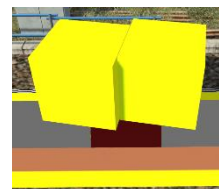
5) Go to the right-hand fly-out and change the two 'Speed Limit' values to '900'.

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.

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** **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.

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Bits and Bobs

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

- Simulated master key via keyboard command which triggers AWS self-test.

- Separate engine start & stop keys.

- As per reality, speedometer rises in 1mph increments.

- Maximum loco brake cylinder pressure changed to 3.4 bar.

- Direct brake no longer sprung-loaded as per reality.

- Emergency brake plunger stays down upon activation until released by the player.

- Emergency brake automatically applied if speed goes above 106.9mph.

- Traction will automatically cut out if speed goes above 102.5mph and won't return until speed is below 96.3mph.

- Driver reminder appliance (DRA) on by default upon loading.

- 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.

- As per reality, the driver vigilance device (DVD) now sounds every 60 seconds regardless of control movement. Also, it is only active above 3mph.

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

- Tail lights work correctly on AI so if the locomotive is coupled to rolling stock, the tail lights will not be illuminated next to the rolling stock.

- The hazard lights button flashes in time with the headlights flashing.

- Radar air hiss audible every 25 seconds when reverser is in either forward to reverse. The radar is used for assessing the locomotive's speed.

- As per reality, the compressor is only audible in no.2 end cab and the brake fan/brake sounds are only audible in no.1 end cab.

- Cab camera slightly amended so more of the cab desk is visible.

- Cab window glass made more transparent.

- Dynamic driver which automatically appears in the cab where the player is or the leading cab of an AI train.

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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) Cancel the AWS self-test alarm by pressing **Q**.

3) Turn the headlights on by pressing **H**.

4) Turn the Driver Reminder Appliance (DRA) off by pressing **Y**.

You should now be ready to move off.

How to Use in the Scenario Editor

How to Place

To place a class 68 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 'DTG' from the drop-down menu.

9) Tick the second & third box beside 'Class68Pack01'.

10)   The class 68 liveries should now be visible in the left-hand rolling stock fly-out with a prefix of 'Class 68'. All AP enhanced liveries have a suffix of 'AP'.

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Scenarios

APC68EP: 0Z99 Norwich - Lowestoft
Route = Wherry Lines
Track covered = Norwich - Lowestoft
Traction = DRS 68007
Year = 2014
Duration = 45 minutes

APC68EP: 5Z67 Lowestoft - Norwich Crown Point
Route = Wherry Lines
Track covered = Lowestoft - Norwich Crown Point
Traction = DRS 68007
Year = 2014
Duration = 50 minutes

APC68EP: 2P29 17:17 Great Yarmouth - Norwich
Route = Wherry Lines
Track covered = Great Yarmouth - Norwich
Traction = DRS 68005
Year = 2016
Duration = 35 minutes

APC68EP: 2P76 15:50 Norwich - Great Yarmouth
Route = Wherry Lines
Track covered = Norwich - Great Yarmouth
Traction = DRS 68004
Year = 2018
Duration = 35 minutes

Credits

Nicolas Schichan - Advanced scripting
Direct Rail Services - Assistance in recording sounds
'South East Train Hub' - Assistance on the technical operations of this locomotive

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