Class 87 Locomotive

Contents

How to Install

1) Locate where you have downloaded this pack and unzip it. Information on how to do this can be found *here*.
2) Go to the location where you have extracted the files from the .zip file.
3) Now find the .exe file called 'Class 87 Locomotive 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.

Technical Information

Manufacturer	British Rail Crewe
Years built	1973 - 1975
Number built	36 (87001 – 87035 & 87101)
Traction motors	4 x GEC412AZ (87001 - 87035) & 4 x GEC412BZ (87101)
Maximum speed	110 mph (180 km/h)
Length	17.83 m
Height	3.77 m
Width	2.65 m
Weight	80 t

Liveries

All liveries are provided with weathered variants. These are designated with W1, W2 or W3 suffixes in the scenario editor. W1 being the cleanest and W3 the dirtiest.

BR Blue:

with GEC cross-arm pantograph and no nameplates – *BR Blue 1*
with GEC cross-arm pantograph – *BR Blue 2*
with GEC cross-arm pantograph and orange cant rail – *BR Blue 3*
with Brecknell Willis pantograph – *BR Blue 4*
with original TDM jumpers – *BR Blue 5*
with Railfreight Distribution logo (87101) – *BR Blue (RfD)*
87001 (2003 to 2005) – *BR Blue (87001)*
87002 (2008 to 2015) – *BR Blue (87002)*

BR Grey Large Logo – *BR Grey LL*

InterCity 1:

with original multiple working jumpers – *IC1 1*

with original multiple working & TDM jumpers – *IC1 2*

InterCity 2:

with original multiple working & TDM jumpers – *IC2 1*

with original multiple working & revised TDM jumpers – *IC2 2*

with revised TDM jumpers – *IC2 3*

with revised TDM jumpers & headlight – *IC2 4*

InterCity 3:

with original multiple working jumpers – *IC3 1*

with original multiple working & TDM jumpers – *IC3 2*

with original multiple working & TDM jumpers & revised headlight – *IC3 3*

with original multiple working & revised TDM jumpers – *IC3 4*

with original multiple working & revised TDM jumpers & headlight – *IC3 5*

with revised TDM jumpers & headlight – *IC3 6*

InterCity Mainline:

with original multiple working & TDM jumpers – *ICM 1*

with original multiple working & revised TDM jumpers – *ICM 2*

with revised & TDM jumpers – *ICM 3*

InterCity Swallow:

with NRN radio – *ICS*

with GSM-R – *ICS (GSMR)*

VT

Ex-VT – *Ex-VT 2*

Porterbrook:

with original logos & grey stripe – *PB1*

with revised logos – *PB2*

Network SouthEast:

with 'Back the Bid' logo – *NSE1*

with 'Host City' logo – *NSE2*

London & North Western Railway - *LNWR*

Cotswold Rail - *CR*

Direct Rail Services:

with logo – *DRS*

without logo – *Ex-DRS*

GB Railfreight – *GBRf1*

GB Railfreight 2 – *GBRf2*

GB Railfreight 3 – *GBRf3*

Caledonian Sleeper – *CS*

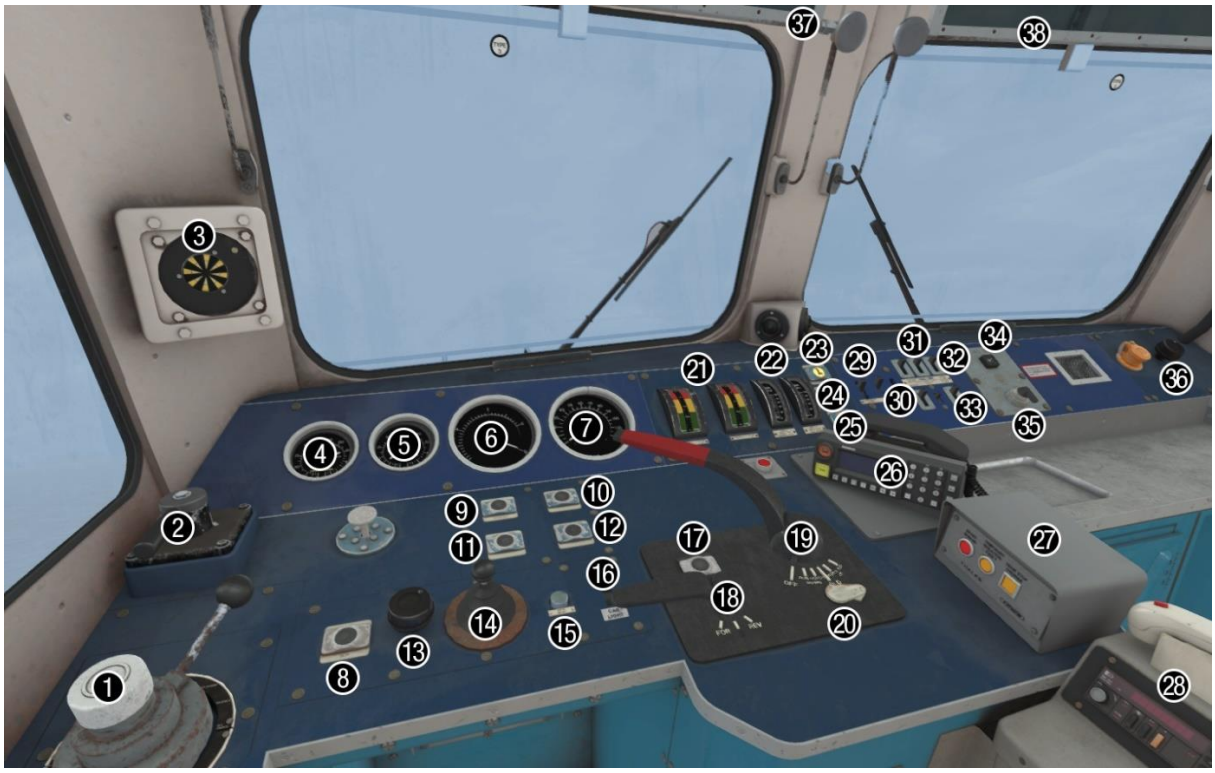
BR Trainload (87101):

with BR plaque – *BR Trainload 1*

with BR plaque & Crewe depot plaque - *BR Trainload 2*

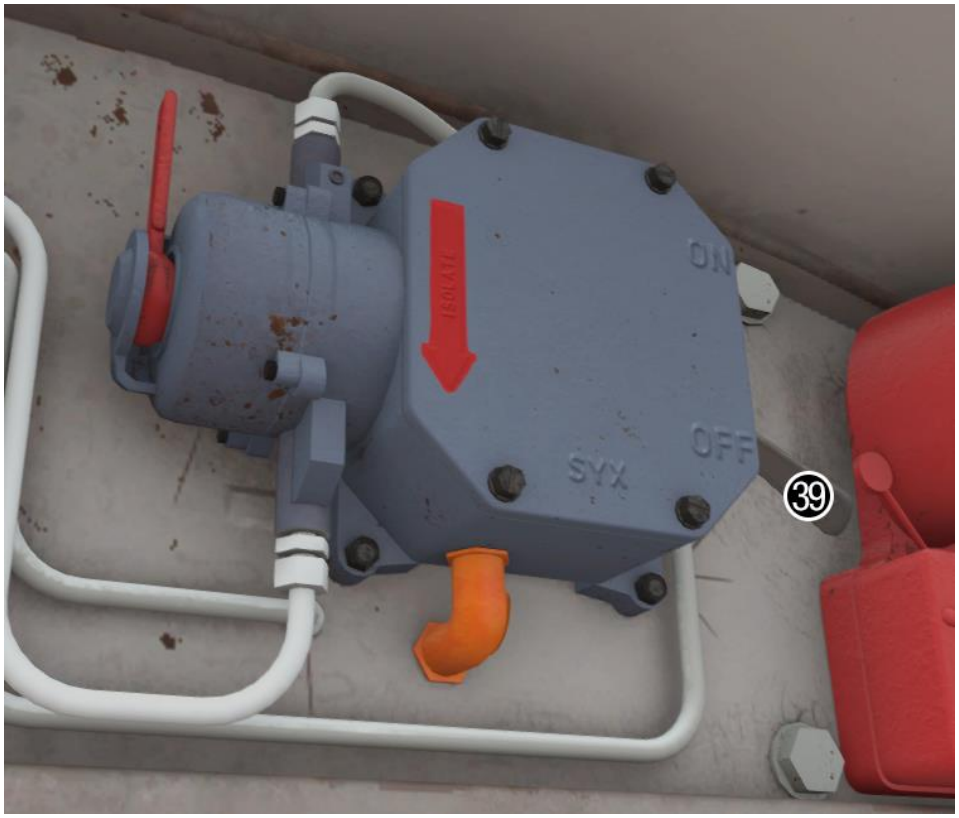
Cab Guide

Desk



1 - Train brake
2 - Loco brake
3 - AWS sunflower
4 - Main reservoir pressure gauge
5 - Brake cylinder pressure gauge
6 - Brake pipe pressure gauge
7 - Speedometer
8 - Anti slip brake button
9 - Pantograph up/reset button
10 - Train heat on button
11 - Pantograph down button
12 - Train heat off button
13 - Driver's wiper switch
14 - Horn
15 - AWS reset button
16 - Cab light switch
17 - Reverser lock button
18 - Reverser
19 - Notching lever
20 - Master key
21 - Ammeters (Traction motors 1 to 4)
22 - Notch indicators (Driving & 2nd loco)
23 - Line light
24 - Fault light
25 - Train heat light
26 - GSM-R
27 - TPWS
28 - NRN radio
29 - Instrument lights switch
30 - Tail lights switch
31 - Headlight switch
32 - Marker light (left-hand) switch
33 - Marker light (right-hand) switch
34 - Parking brake indicator
35 - Parking brake switch
36 - Secondman's wiper switch
37 - Driver's sun visor
38 - Secondman's sun visor

Back Wall



39 - AWS change end switch

Keyboard Controls

Non-standard keyboard controls are listed below:

O -	Anti-slip brake button
Ctrl+N -	AWS change end switch ON/OFF
Ctrl+B -	Battery isolation switch IN/OUT
Shift+Ctrl+B -	Brake type TREAD/DISC
L -	Cab light switch ON/OFF
Ctrl+L -	Cab light (rear) switch ON/OFF
E -	Deadman's pedal (DVD reset)
C -	Driver to guard signal
Ctrl+D -	Driver vigilance device (DVD) ON/OFF
H -	Headlight switch ON/OFF
Space -	Horn (low tone)
B -	Horn (high tone)
I -	Instrument lights switch ON/OFF
J -	Marker light (left-hand) switch ON/OFF
Ctrl+J -	Marker light (right-hand) switch ON/OFF
Shift+W -	Master key IN/OUT
Shift+M -	Motor Factor INCREASE
Ctrl+M -	Motor Factor DECREASE
U -	Notch up/down button
Shift+P -	Pantograph down button
P -	Pantograph up/reset button
F -	Reverser lock button
Ctrl+R -	Rheostatic brake isolation ON/OFF
K -	Tail lights switch ON/OFF
Ctrl+T -	In-cab tap changer audio ON/OFF
R -	Train brake handle shutdown pin IN/OUT
Ctrl+Numpad Enter -	Visual aids ON/OFF
Shift+V -	Windscreen wiper switch DRIVER
V -	Windscreen wiper switch SECONDMAN

Features

Cab Variants

Throughout their working life, the 87's cab has remained generally unchanged apart from the addition of radios, on-train recorder & safety systems. These variations have been modelled and are applied automatically depending on the era of your chosen livery.

As-built (1973 to late 1970s)

NRN radio, headlight and cab light switch position swapped & revised AWS sunflower (late 1970s to 2003)

TPWS (Train Protection Warning System) (2003 to 2007)

OTMR (On-Train Monitoring Recorder) (2007 to 2015)

GSM-R (2015 to present day)

External Variations

Many of the external variations carried by these locomotives over the years have been modelled. These are automatically applied depending on the era of your chosen livery.

GEC pantograph

Brecknell Willis pantograph

Original headlight

Revised headlight

Original multiple working jumpers

Original TDM jumpers

Revised TDM jumpers

Plated original multiple working jumpers

Black bufferbeam and buffers

Red bufferbeam

Gold buffers

England flag buffers

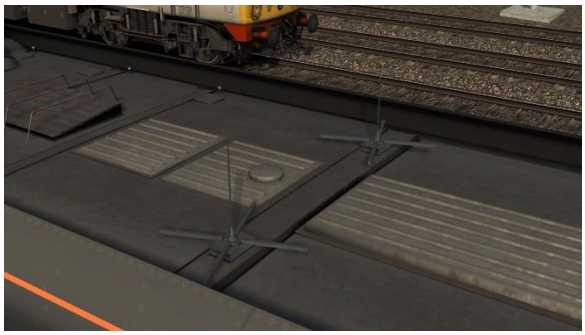
White rimmed buffers

RFID tag

Orange cant rail (middle)

Orange cant rail

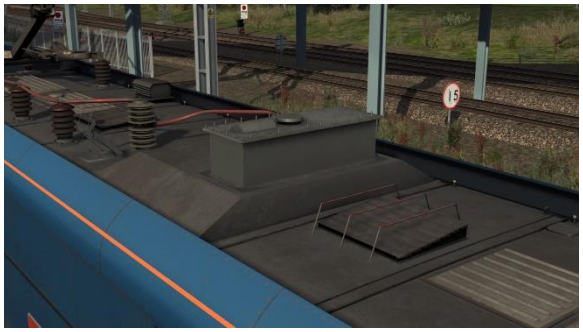
NRN aerials



GSM-R antenna

Roof fire bottles

87101 roof equipment



Original sand box cover

Revised sand box cover

Tap Changer

Traction

Great care has been taken to simulate the distinctive 'tap changer' system of power control. Containing 39 notches, this system allows the driver to exercise fine control over traction power. The final 39th notch is a 'weakfield' notch.

The tap changer is controlled by the notching lever in the cab which has six notches:

Off - Power to the traction motors is cut off.

Run Down - The tap changer notches down continuously at approximately 0.65 seconds per notch. This is most commonly used to reduce power sufficiently to avoid a jolt when moving to **Off**.

Notch Down - The tap changer is notched down once every time the driver moves the notching lever from **Hold** to **Notch Down** and back. One single "to and fro" movement is achieved in the simulator by holding **U** and pressing **D** whilst in the **Hold** position.

Hold - The tap changer is held at its current notch

Notch Up - The tap changer is notched up once every time the driver moves the notching lever from **Hold** to **Notch Up** and back. One single "to and fro" movement is achieved in the simulator by holding **U** and pressing **A** whilst in the **Hold** position.

Run Up - The tap changer notches up continuously at approximately 0.65 seconds per notch. This is most commonly used when applying power at speed and should not be used when moving away from a stand.

Your current notch can be viewed on the notch indicator to the right of the cab desk.

Braking

The tap changer is also used to provide braking effort via the rheostatic brake, which uses the traction motors to brake the locomotive. This is done by turning the motors into generators, which convert the kinetic energy of the locomotive into electricity. This excess electricity is sent to a bank of resistors which dissipate the energy in the form of heat. A set of blowers are provided below the resistors, which speed up in proportion to the strength of the rheostatic brake applied; resulting in the classic wailing sound whilst braking.

Unique to the class 87, this locomotive is fitted with a power/brake switch on the train brake handle which means that as soon as you move the train brake handle

away from ‘Running’, traction power is cut and approximately 500 amps of rheostatic brake is applied. Once the tap changer has completely notched down, normal rheostatic brake performance will resume.

The rheostatic brake can be isolated by pressing **Ctrl+R**. The locomotive’s tread brakes will then be used instead.

Brakes

Westinghouse Brake Handle

This locomotive is fitted with an air-only Westinghouse brake handle which has the following positions:

Release (0%) - This is a sprung load position and recreates the brake pipe pressure to provide a quicker brake release.

Running (24%) - Brakes are fully released and the brake pipe pressure will read 5 bar.

1st Application (40%) - Minimum possible brake force. This equates to around 25% brake force. The brake pipe pressure will read 4.7 bar. Traction power will be cut.

Service (40% to 70%) - Brake pipe pressure can be changed as desired between 3.8 bar & 4.7 bar.

Full Service (70%) - Maximum possible brake force. The brake pipe pressure will read 3.8 bar.

Emergency (85%) - Maximum possible brake force applied quicker compared to 'Full Service'. The brake pipe pressure will read 0 bar.

Shutdown (100%) - Only accessible by raising the pin (**R** key), the brake handle must be placed in this position when shutting down the cab.

Tread Brake Simulation

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

As a result, this pack has scripted brake force to simulate the relatively poor performance at high speed, and the 'bite' at lower speeds where performance increases quite significantly. These tread brake physics are turned off by default as operations with disc braked Mk3 coaches were most common with these locomotives. If you are hauling tread braked stock such as Mk2 coaches, you can change the brake type by pressing **Shift+Ctrl+B**.

Also, please note that the rolling stock you are hauling must be especially adapted to work properly with our tread brake simulation. If it is not, the correct physics will still

occur on the locomotive, and to some degree on the stock behind, except for the extra ‘bite’ at low speed.

87101

The 36th and final class 87 to be built was fitted with a thyristor traction system instead of the more traditional tap changer. This locomotive is simulated to a certain extent with its differing roof equipment, unique liveries (BR Trainload & BR Blue (RfD)) and ‘conventional’ driving mode.

This locomotive had two driving modes, ‘conventional’ and ‘advanced’.

Conventional mode used the electronics rack to simulate how a normal 87/0 would behave with 38 equal notches of power and a 39th weakfield notch. The only real difference as far as the driver was concerned was that after selecting ‘Off’ on the notching lever, he did not need to wait for the notch indicator to fully notch down before re-applying power.

Advanced mode involved the use of a special key, latterly a permanently fitted mode-change knob. Turning the knob would remove all the notches from the notching lever except for ‘Run Down’. Everything beyond ‘Run Down’ was notch-less. Moving from 'Off' to 'Run Down' would shut off power and then anything beyond that was your tractive effort demand, just like a class 90.

Only conventional mode is simulated in this pack.

Neutral Section Functionality

This locomotive will react correctly to the neutral sections on the WCML Over Shap route.

When passing a neutral section, it is advisable, but not essential, that you reduce power to a low level to avoid a jolt. Once the line light extinguishes, you must place the notching lever into **Off**, if you haven’t already. When the line light returns, you will only be able to regain power once the tap changer has fully notched down.

Occasionally, the line light may not illuminate after passing a neutral section. To fix this, press the **Pan Up/Reset** button to ensure the vacuum circuit breaker (VCB) has closed.

Gradients

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

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

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)

A basic form of wheelslip protection is fitted which aids the driver during times of poor adhesion.

This works by looking at the amps on each axle whilst powering. When there is no wheelslip, all four axles will display a similar reading, but if one of them begins to slip and speeds up, this will reduce the amps on this axle. If this results in a 200 amp or more differential, the wheelslip protection system will kick in. This is a two-stage process:

1) The anti-slip brake is applied (15 psi loco brake application) and the tap changer continuously notches down.
2) Once the wheelslip stops, the anti-slip brake is released and control of the tap changer returns to the notching lever. If wheelslip reoccurs, the process starts again.

Please note that this is a rather crude system and as a result, the protective measures may carry on for a good few seconds after the slip has been corrected. In addition, if slip occurs at low speed where you have only taken a few notches of power, this protection could cause the locomotive to stall. If you fear this might occur, you can over-ride the protection by pressing the anti-slip brake button.

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.

National Radio Network (NRN)

A simple representation of the NRN radio is simulated and is operational on pre-GSM-R liveries (except *BR Blue 1*). To set the NRN zone, please follow the instructions below:

1) The NRN will turn on as long as the battery isolation switch is in.
2) Enter the three-digit zone number by using the numpad.
3) To confirm this, press the button below the British Rail arrows symbol. As well as the zone number, a four-digit number will appear which is a unique identity code for your NRN radio unit. 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.

The NRN can be reset at any time by pressing **#** on the unit.

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'.

Global System for Mobile Communication-Railway (GSM-R)

Beginning in 2013 and completed by 2016, Global System for Mobile Communication - Railway, more commonly known as GSM-R, replaced the existing National Radio Network (NRN) & Cab Secure Radio (CSR) systems. This communication system and its accompanying unit has been simulated to the best of our ability within the simulator. Please see below for how to register & deregister your train:

Registering

1) Insert the master key by pressing **W** or hold down either the 'Registration' or 'Accept' button for 5 seconds. The GSM-R unit will begin a boot up sequence.
2) When 'GSM-R GB' appears, the unit has successfully booted.
3) Press the 'Registration' button in the top right-hand corner.
4) Using the numerical keys, insert your 4-character train reporting number (headcode), followed by the signal number you are standing at in a 3-digit format. For example, signal WH84 would require you to enter '084'. If you wish to delete a character, press the 'x' button.
5) Press the '✓' button.
6) Registration will take a moment. Once it has completed, you will hear a double beep and the train reporting number will appear in the top right-hand corner of the display.

Deregistering - Method 1

If you are closing down the driving desk, use this method.

1) Remove the master key by pressing **W**.
2) Deregistration will automatically begin and you will be given the opportunity for a short moment to retain the registration by pressing the '✓' button. Simply do nothing if you would like to continue with the deregistration.
3) Deregistration will take a moment. Once it has completed, the train reporting number will no longer be displayed.

Deregistering - Method 2

If you wish to keep the driving desk active after deregistering, use this method.

1) Press the 'Registration' button in the top right-hand corner.
2) A prompt will appear on the unit saying 'Confirm deregister?'.
3) Press the '✓' button.
4) Deregistration will take a moment. Once it has completed, the train reporting number will no longer be displayed.

Driver Vigilance Device

A driver vigilance device is provided which sounds every 60 seconds, regardless of control movement, when the reverser is in either **Forward** or **Reverse**. This must be reset using the pedal (**E** key).

Guard to Driver Signal

A 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. Please note that this will only work when using the locomotive either with our *Mk2D-F Coach Pack* or *Mk3A-B Coach Pack*.

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.

Variable Power & Brake Performance

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

Variable Traction Motor Volume

The howling of the traction motors is a distinctive feature of this locomotive and we have made a lot of effort to recreate this, using recordings taken on-board preserved 86259 which has very similar traction motors to a class 87.

In addition, 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**.

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, except the pantograph is down and will not provide tractive effort in a consist. Ideal for 'dragging'.

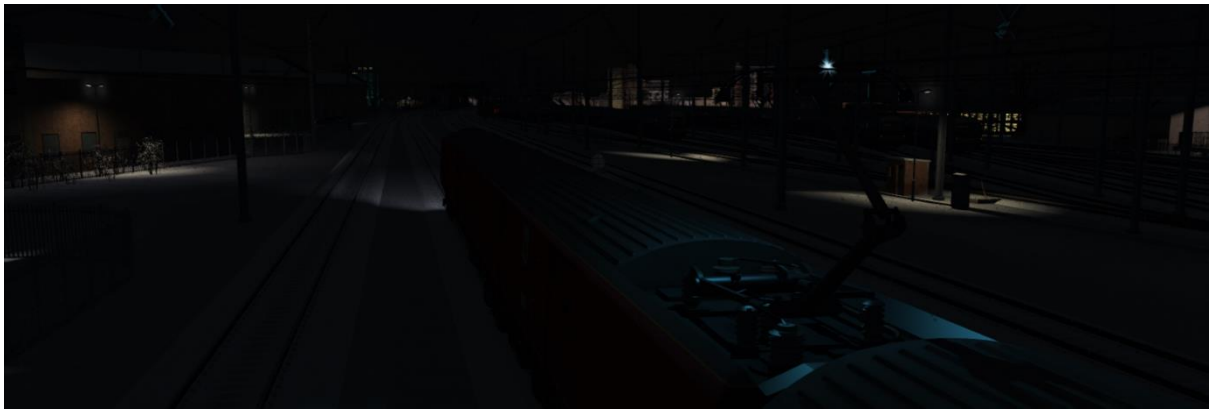
Traction Motor Isolation

Due to faults, traction motors are sometimes isolated to allow a locomotive to still operate in service. Isolated traction motors do not provide any traction power.

To isolate traction motors, add **;TM=x** to the locomotive number in the scenario editor. **x** = the number of traction motors you wish to isolate which can be anything from 1 to 3.

The physics will respond accordingly so if you have 2 traction motors isolated for example, you will only have half the normal amount of power at your disposal. Also, when any traction motor is isolated, the rheostatic brake is automatically isolated and the weakfield power notch is no longer available.

Arcing Pantograph



Special attention has been given to simulating arcing between the pantograph and overhead wire.

From one hour after sunrise to one hour after sunset on a dry day, there is only light arcing.

From one hour after sunset to one hour after sunrise, there is moderate arcing to simulate the moisture that tends to build up on the overhead wire once night falls. There is also moderate arcing when raining at any time of day.

During the winter, from one hour after sunset to one hour after sunrise, there is heavy arcing to simulate ice/frost that tends to build up on the overhead wire once night falls. There is also heavy arcing when snowing at any time of day during the winter.

Finally, arcing becomes more frequent as you gain speed.

When arcing, you will visually see it on the pantograph which illuminates the area around it to a varying degree with each arc. Please note that the illumination of the surrounding area will only occur after sunset and before sunrise. This is to avoid the unrealistic appearance of projected light in broad daylight.

You will also audibly hear it if the arcing is moderate or heavy.

Cold Start

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

- Main reservoir & brake cylinder pressures are 0.
- Pantograph is down
- Parking brake is applied
- Battery isolation switch is out

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

1) Turn the battery isolation switch in by pressing **Ctrl+B**.

2) The auxiliary compressor will start building up pantograph air pressure. When the auxiliary compressor stops, sufficient air pressure has been built to raise the pantograph. Use sound to know when the auxiliary compressor is running.

3) Turn the master key in by pressing **Shift+W** and move the reverser to 'Forward' by pressing **W**.

4) Press the 'Pantograph Up/Reset' button by pressing **P** for at least 15 seconds. Upon releasing this button, check that the line light illuminates to confirm the pantograph is raised and the vacuum circuit breaker (VCB) is closed.

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

6) Lift the train brake handle brake pin by pressing **R** and at the same time, move the train brake handle to 'Full Service' (70%) by pressing **semi-colon**.

7) Now wait for the main reservoir to build to 70 psi.

8) Move the train brake handle to 'Running' (24%) and confirm the brakes are fully released.

9) Move the train brake handle to 'Full Service' (70%) and confirm the brakes are fully applied.

10) You must now release the parking brake. Move the reverser to 'Forward' by pressing **W**. The buzzer you hear is to warn you that you have moved the reverser away from 'Off' and the parking brake is applied. This is to help prevent a driver from trying to move with the parking brake applied.

11) Hold the parking brake switch in the 'Off' position until the parking brake indicator has displayed 'OFF' for 15 seconds. This is to make absolutely sure that the parking brake is released.

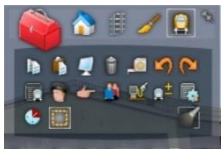
After carrying out this procedure, your locomotive will be successfully prepared from cold.

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:

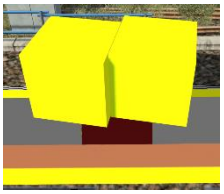
1) In the scenario editor, go to the location at which you would like the AI train's horn to sound, and press **Spacebar** 3 times. The track will now display a certain colour which represent its speed limit.

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.

Bits and Bobs

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

- A comprehensive selection of nameplates which to our knowledge, cover all nameplates ever carried by the fleet in a variety of colours and positions.
- 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.
- Make the tap changer audible within the cab by pressing **Ctrl+T**. This does not function on 87101 due its thyristor control system.
- As per reality, the speedometer needle wobbles when providing a reading.
- Variable speed windscreen wipers.
- The '2nd loco' notch indicator operates when working in multiple with a class 86 or 87.
- On pre-1998 liveries, the headlight only illuminates when the reverser is away from 'Neutral'.
- The visible driver automatically moves to whichever cab you are in, or is leading on an AI train.

Class 86 vs Class 87

As a quick aside, how does the Class 87 vary to the similar Class 86/2?

- Maximum top speed of 110mph vs 100mph of the 86/2
- Extra weakfield notch to assist in reaching 110mph
- Power/brake switch on the train brake handle which means that as soon as you move the train brake handle away from 'Running', traction power is cut and approximately 500 amps of rheostatic brake is applied. Once the tap changer has completely notched down, normal rheostatic brake performance will resume.
- Hydraulic parking brake instead of the manual hand brake on the 86/2
- Traction motor overload set to 1,840 amps opposed to 1,585 amps on the 86/2
- Different horn

Setting up the Driver's Cab

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

1) Ensure the master key is turned in. If not, press **Shift+W**.
2) Move the AWS change end switch to 'ON' by pressing **Ctrl+N**. You must ensure the AWS change end switch in the other cab is set to 'OFF'. If it's not, you will receive a warning message.
3) If the pantograph is not raised, do so by moving the reverser into 'Forward' by pressing **W** and then pressing the Pan Up/Reset Button by pressing **P**. The notching lever must also be in 'Off'.
4) Lift the train brake handle brake pin by pressing **R** and at the same time, move the train brake handle to 'Full Service' (70%) by pressing **semi-colon**.
5) Turn off the tail lights by pressing **K**.
6) Turn on the marker lights by pressing **J** and **Ctrl+J**.
7) If applicable, turn on the headlight by pressing **H**. Note that on pre-1998 liveries, the headlight will only illuminate when the reverser is away from 'Neutral'.

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

Driving Guide

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

1) Move the reverser to your desired direction of travel by pressing either **W** for 'Forward' or **S** for 'Reverse'. If you wish to select 'Reverse', you will need to hold down the 'Reverse Lock' button using the **F** key at the same time.
2) Move the brake handle to 'Running' (24%) by pressing **semi-colon**.
3) As soon as possible, move the notching lever to 'Notch Up' (80%) and back to 'Hold' (60%) by pressing **A** and **U** at the same time. This will increase the tap changer by one notch for every "to and fro" movement. Do this repeatedly until you have notched up enough power to move your train
4) Rail conditions permitting, continue to notch up power whilst aiming to stay in the yellow zone of the ammeter. You may stray briefly into the red zone but not for any length of time. If amps exceed 1840, the traction motors will overload and a fault light will illuminate. You must press the **Pan Up/Reset** button to fix this and regain the line light.
5) If you only need to reduce power slightly, you may notch down by moving the notching lever to 'Notch Down' (40%) and back to 'Hold' (60%) by pressing **D** and **U** at the same time. This will decrease the tap changer by one notch for every "to and fro" movement.
6) If you are looking to reduce power significantly or shut off completely, you may use the 'Run Down' (20%) notch of the notching lever which will continually notch down the tap changer. When shutting off power, it is advised, but not essential, that you reduce power to a low setting to avoid a jolt when moving to 'Off' (0%), which will shut off power completely. Once moving to 'Off' (0%), you must wait until the tap changer notches down fully to off before being able to reapply power. The only exception to this is when driving 87101 where power can be reapplied straight away.
7) If you wish to apply power at speed, you may use the 'Run Up' (100%) notch of the notching lever which will continually notch up the tap changer. It is not recommended you use this notch from a standing start as you will most likely overload the traction motors.
8) To brake the train, use any 'Service' setting on the train brake handle between '1st Application' (40%) & 'Full Service' (70%). To provide a smooth stop, it is recommended to be in '1st Application' as you come to a stop.

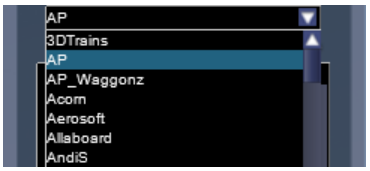
How to Use in the Scenario Editor

How to place

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

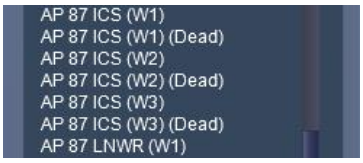
7) In the left-hand rolling stock fly-out, click the object set filter which looks like a blue box with an orange arrow to the right of it.

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



9) Tick the second & third box beside 'Class87Pack01'.

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



Numbering

When placing in the scenario editor, you are able to control a number of features via the number of the locomotive.

Logos

On liveries which have existed without a logo, adding **;L=0** to the locomotive number will remove the relevant logo.

Nameplates

You can control the nameplate shown by adding **;NP=x** to the locomotive number.

- The first nameplate carried by a locomotive. x = **1**
- The second nameplate carried by a locomotive. x = **2**
- The third nameplate carried by a locomotive. x = **3**
- The fourth nameplate carried by a locomotive. x = **4**
- The fifth nameplate carried by a locomotive. x = **5**

For example, for 87033 in InterCity Swallow livery, **;NP=2** shows 'Thane of Fife' with a red background & **;NP=3** shows 'Thane of Fife' with a black background.

Adding **;NP=0** will remove any nameplates.

Overhead line warning stickers

In their default state, liveries show the most common style of overhead line warning sticker that they carried; sometimes with no sticker at all. For where this varied within a livery's time period though**, ;OHL=x** can be added to the locomotive number.

- **1** = New style. 4 on side and 2 on front below windscreen wipers.
- **2** = New style. 4 on side and 2 on outer edges of front.
- **3** = New style. 4 on side.
- **4** = New style. 2 on outer edges of front.
- **5** = Old style. 4 on side.
- **6** = New style. 8 on side and 2 on outer edges of front.

Guard to driver signal

For when flag and whistle dispatch is required instead of the guard to driver signal, add **;G=1** to the locomotive number.

Reversing motor whine

When changing direction, the motors will make a distinctive high pitch whining sound that slowly fades away over time. After one reversal, this sound activates automatically but to enable it at the start of a scenario, add **;RW=1** to the locomotive number. This is mostly intended to be used when a scenario starts at a terminus.

Cold start

To activate cold start mode, add **;Cold=1** to the locomotive number.

Brake type physics

To apply tread brake physics, add **;BT=T** to the locomotive number.

Train heat

Except for when doing a cold start, train heat is on by default. To have it off by default, add **;ETS=0** to the locomotive number.

NRN

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

GSM-R

To restrict the train reporting number and signal number that the player can use to register with on the GSM-R, add **;GSMR=1A22084** to the locomotive number. In this example, '1A22' is the train reporting number and '084' is the signal number.

Tail lamp

To add a tail lamp to the no. 1 end, add **;TL=1** to the locomotive number.
To add a tail lamp to the no. 2 end, add **;TL=2** to the locomotive number.

External variations

By default, we have supplied the locomotive in its most common forms on a per livery basis. If you place a locomotive though and would like to amend its external features, please see below:

Headlight

Add **;HL=x** to the locomotive number**:**

- Original headlight. x = **2**

Revised headlight is applied by default.

Jumpers

Add **;J=x** to the locomotive number**:**

- Original multiple working jumpers (yellow front). x = **1**
- Original multiple working jumpers (black front). x = **2**
- Original multiple working jumpers and original TDM (yellow front). x = **3**
- Original multiple working jumpers and original TDM (black front). x = **4**
- Yellow plated original multiple working jumpers and revised TDM (yellow front). x = **5**
- Black plated original multiple working jumpers and revised TDM (black front). x = **6**
- Yellow plated original multiple working jumpers and revised TDM (black front). x = **7**
- Orange plated original multiple working jumpers and revised TDM (yellow front). x = **8**
- Original multiple working jumpers and revised TDM (yellow front). x = **9**
- Original multiple working jumpers and revised TDM (black front). x = **10**

TDM jumper box

Add **;TDM=1** to the locomotive number to show the red/white striped sticker on the box which holds the revised TDM jumper cables.

Bufferbeam & buffers

Add **;B=x** to the locomotive number**:**

- Red bufferbeam and black buffer plates. x = **2**
- Red bufferbeam and silver buffer plates. x = **3**
- Black bufferbeam and silver buffer plates. x = **4**
- Red bufferbeam, black buffers and silver footplates. x = **5**
- Red bufferbeam and gold buffers. x = **6**
- Black bufferbeam, red buffers and gold buffer plates and. x = **7**
- Black bufferbeam, black buffers and gold buffer plates and. x = **8**
- Black bufferbeam, black buffers and white rimmed buffer plates. x = **9**
- Black bufferbeam, red buffers and England flag buffer plates. x = **10**.

Black bufferbeam and buffers are applied by default.

Roof fire bottles & TPWS (Train Protection Warning System)

Add **;FB=1** to the locomotive number. Both of these modifications were made around 2003.

Example locomotive number

87001;J=5;OHL=2;TDM=1;NP=3

Key:
87001 - Locomotive number
;J=5 - Yellow plated original multiple working jumpers and revised TDM (yellow front).
;OHL=2 - New style OHL stickers. 4 on side and 2 on outer edges of front.
;TDM=1 - Red/white striped sticker on the revised TDM cable box
;NP=3 - The third nameplate carried by 87001.

Scenarios

APC87: 1C20 15:33 London Euston - Carlisle
Route = WCML Over Shap
Track covered = Preston - Carlisle
Traction = InterCity Swallow 87005
Date = 12th August 2000
Duration = 1 hour 25 minutes

APC87: 6M64 21:35 Aberdeen Guild Street - Willesden Brent
Route = WCML Over Shap
Track covered = Carlisle - Preston
Traction = BR Trainload 87101
Date = 6th June 1992
Duration = 2 hour 10 minutes

APC87: 1A13 06:00 Manchester Piccadilly - London Euston
Route = WCML South
Track covered = Rugby - London Euston
Traction = InterCity Swallow 87018
Date = 1st November 2000
Duration = 1 hour 20 minutes

APC87: 1A97 19:30 Warrington R.M.T. - Willesden P.R.D.C.
Route = WCML South
Track covered = Rugby - Wembley Yard
Traction = Network SouthEast 87012
Date = 9th June 2006
Duration = 1 hour 5 minutes

APC87: 1F15 11:10 London Euston - Liverpool Lime Street
Route = WCML South
Track covered = London Euston - Rugby
Traction = InterCity 87025
Date = 15th November 1994
Duration = 1 hour 20 minutes

APC87: 1G56 19:15 London Euston - Wolverhampton
Route = WCML South
Track covered = London Euston - Rugby
Traction = VT 87007
Date = 19th July 1999
Duration = 1 hour 10 minutes

Credits

Waggonz - Modelling
Nicolas Schichan - Scripting
John Dean - Scenarios
James Mather - Reference material & in-depth knowledge
David Grieff & **Les Ross** - A special thanks for assistance in recording sounds