

Class 156

Diesel Multiple Unit



MASTER KEY
SIMULATIONS

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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 156 DMU 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	Metro-Cammell Washwood Heath
Years built	1987 - 1989
Number built	114 (156401 – 156514)
Formation	DMS + DMSL (2 car)
Engine	Cummins NT855R5 286hp
Transmission	Hydraulic Voith T211r
Maximum speed	75mph (120km/h)
Coupling type	BSI
Length	23.03m (per car)
Height	3.81m
Width	2.73m
Weight	71.6 tonnes

Liveries

BR Provincial:

with Sprinter/SuperSprinter logo - *BR Prov*

with ScotRail logo - *Ex-BR Prov (SR)*



Regional Railways (North West):

with Regional Railways logo - *RR (NW)*

with First North Western logo - *Ex-RR (NW) (FNW)*



Regional Railways (Express):

with Regional Railways logo - *RR (Exp)*

with Central Trains logo - *Ex-RR (Exp) (CT)*



Central Trains:

with Central Trains logo (2 headlight variants) - *CT / CT (NL)*

with ONE logo - *Ex-CT (ONE)*

with NXEA/GA logo & white stripe - *Ex-CT (NXEA/GA)*



East Midlands Trains:

with East Midlands Trains logo - *EMT*

with East Midlands Trains logo & disabled toilet - *EMT (PRM)*

with East Midlands Railway logo - *Ex-EMT (EMR)*



Northern Spirit:

with Northern Spirit logo - *NS*

with Arriva/Northern Rail logo - *Ex-NS (ATN/NR)*



First North Western:

with First North Western logo - *FNW*

with Northern logo - *Ex-FNW (NR)*



Northern Rail Prototype 1 - *NR P1*



Northern Rail Prototype 2 (2 headlight variants) - *NR P2 / NR P2 (NL)*



Northern Rail Blue (2 headlight variants) - *NR Blue / NR Blue (NL)*



Northern Rail:

with Northern logo (2 headlight variants) - *NR / NR (NL)*

without Northern logo (2 headlight variants) - *Ex-NR / Ex-NR (NL)*



Arriva Northern (2 headlight variants) - *AN / AN (NL)*



ONE



Ex-ONE (with NXEA/GA logo) - Ex-ONE (NXEA/GA)



National Express East Anglia:

with National Express East Anglia logo - *NXEA*

with Greater Anglia logo - *Ex-NXEA (GA)*



Greater Anglia (with GA/AGA/GA2 logo) - *GA / AGA / GA2*



Strathclyde Transport:

with Strathclyde Transport logo - *ST*

with Strathclyde Transport & ScotRail logos - *ST (SR)*

with SPT & ScotRail logos - *Ex-ST (SPT/SR)*



SPT:

with SPT/SPT Rail logo - *SPT / SPT2*

with SPT & ScotRail logos - *SPT (SR)*



ScotRail:

with ScotRail logo - *SR*

with First ScotRail logo - *Ex-SR (FSR)*



First ScotRail:

with First ScotRail logo (2 headlight variants) - *FSR / FSR (NL)*

without First ScotRail logo - *Ex-FSR (SR)*



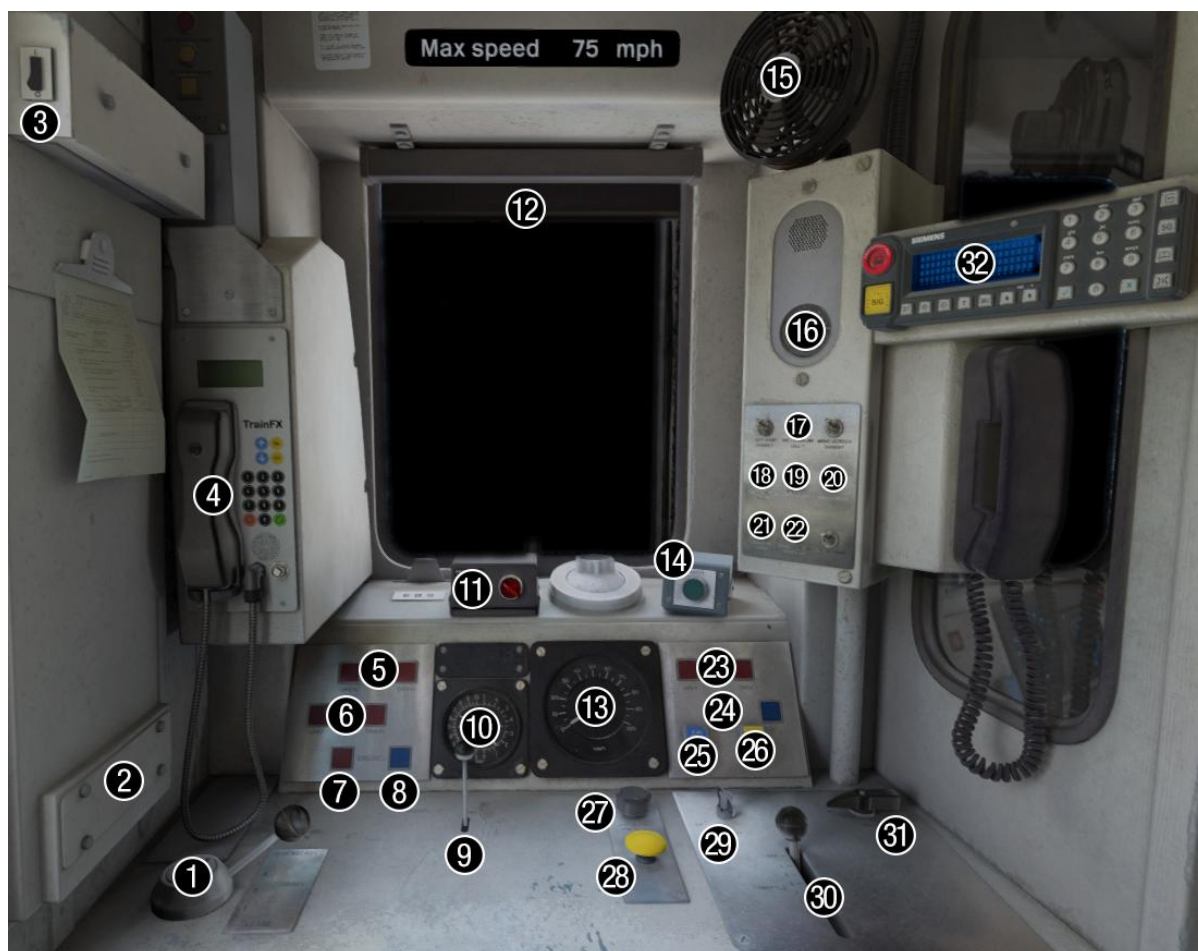
ScotRail Saltire:

without disabled toilet (2 headlight variants) - *SR Salt / SR Salt (NL)*

with disabled toilet - *SR Salt*



Cab Guide



- | | |
|--|--|
| 1 - Brake handle
(release/1/2/full service/emergency) | 17 - Instrument lights switch (off/on) |
| 2 - NRN radio (selected liveries) | 18 - Destination light switch (off/on) |
| 3 - Clipboard light switch | 19 - Tail lights switch (off/on) |
| 4 - Train FX destination display (selected liveries) | 20 - Head lights switch (off/day/night) |
| 5 - Door open (left) buttons (inactive) | 21 - Marker lights switch (off/on) |
| 6 - Transmission fault lights | 22 - Compressor speed up switch (off/on) |
| 7 - Engine stop button | 23 - Door open (right) buttons (inactive) |
| 8 - Engine start button | 24 - Driver to guard buzzer button |
| 9 - Horn (high/low) | 25 - Couple button |
| 10 - Main res. & brake cylinder gauge | 26 - Uncouple button |
| 11 - Driver Reminder Appliance (DRA) | 27 - Windscreen wiper switch (off/slow/fast) |
| 12 - Blind | 28 - AWS reset button |
| 13 - Speedometer | 29 - Master key |
| 14 - Sander button | 30 - Power handle (off to 7) |
| 15 - Fan (off/slow/fast) | 31 - Reverser (off/reverse/neutral/forward) |
| 16 - AWS sunflower | 32 - GSM-R (selected liveries) |

Keyboard Controls

Non-standard keyboard controls are listed below:

L -	Cab light ON/OFF
Shift+C -	Clag Factor INCREASE
Ctrl+C -	Clag Factor DECREASE
F7 -	Destination blind UP
F8 -	Destination blind DOWN
Y -	Driver reminder appliance (DRA) ON/OFF
C -	Driver to guard buzzer
Z -	Engine start button
Ctrl+Z -	Engine stop button
I -	Instrument lights switch ON/OFF
J -	Marker lights switch ON/OFF
Shift+W -	Master key IN/OUT
O -	Saloon lights ON
Shift+O -	Saloon lights OFF
K -	Tail lights switch ON/OFF
Ctrl+Numpad Enter -	Visual aids ON/OFF
V -	Wiper switch ANTI-CLOCKWISE
Shift+V -	Wiper switch CLOCKWISE

Features

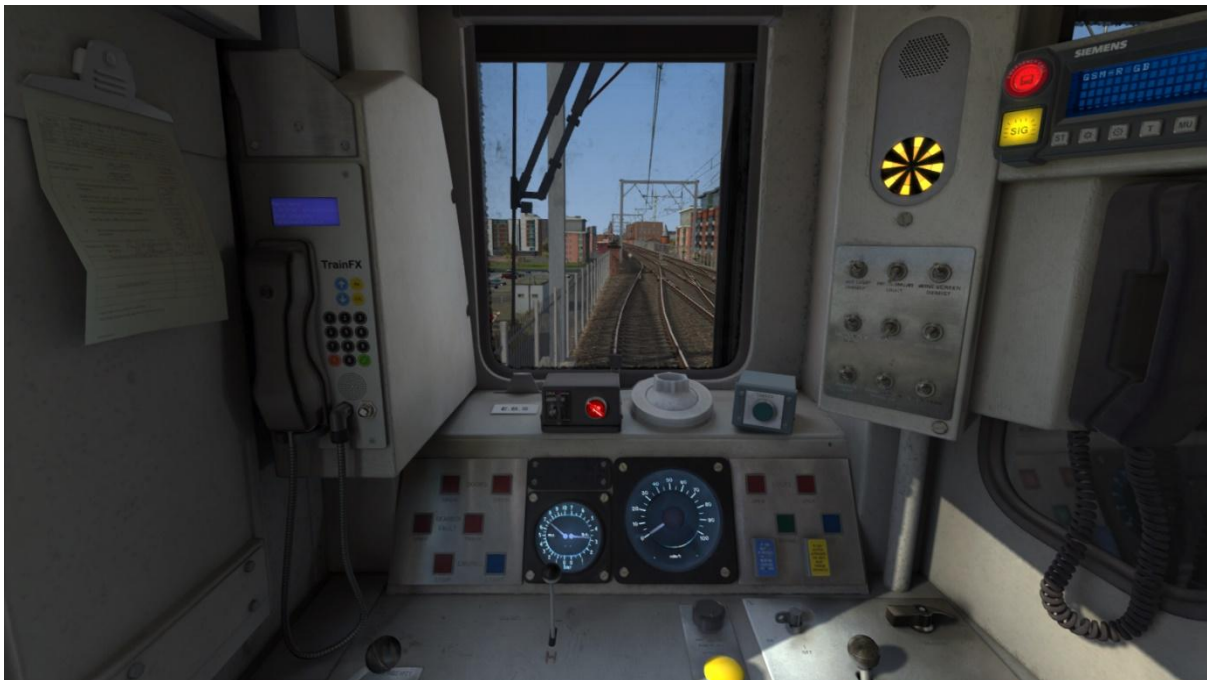
Cab Variants

To represent the main changes that have occurred throughout the last 30 years, 3 cab variants are provided.

Original



Original (with GSM-R, TrainFX & new AWS reset button)



Modern (new style buttons, DRA & proving lights)



Passenger View

2 main variants of passenger view are included. The first with 'as-built' Ashbourne seats and the second with newer 'Chapman' seats. On top of this, 12 different seat moquettes are provided, which are automatically applied to their relevant livery/liveries.

BR Provincial/Strathclyde Transport



Regional Railways (North West)/First North Western



Central Trains



East Midlands Trains



Northern Spirit



Northern Rail



Northern Rail (Chapman)



Arriva Northern



ONE/National Express East Anglia/Greater Anglia



SPT



ScotRail



First ScotRail



ScotRail Saltire



Voith T211r Hydraulic Transmission

Great care has been taken in recreating the characteristics of the 2-stage hydraulic transmission used in this unit.

1st Stage - Torque Converter

When accelerating from a standing start, the engine revs up and oil fills the torque converter, which allows acceleration to take place. There is a 2 second or so delay between the engine revving up and the oil filling the converter, which is why these units don't accelerate as soon as power is applied, and is what causes the distinctive, initial surge of rpm before the engine settles. This also explains why you don't get that same initial surge of rpm when powering up from 'Notch 1', instead of 'Off', as the converter is already filled with oil. During this 1st stage, engine rpm is directly controlled via the notch selected on the power handle.

Please note that of all the 2nd generation DMUs, the class 156 is unique in having an additional 2 second delay when selecting 'Notch 4' from 'Off'. It's important to be aware of this so you don't release the brakes too early and roll back.

2nd Stage - Fluid Coupling

At 45mph, the oil transfers from the torque converter to the fluid coupling which results in a reduction of engine rpm. During this stage, engine rpm is directly proportional to the speed of the train which means rpm will be the same regardless of which notch is selected on the power handle. All that varies is the load being placed on the engine. As speed increases then, you will gradually hear engine rpm rise in sync.

The unit will stay in this second stage until speed drops below 35mph. At this point, the transmission reverts to the first stage.

Tread Brake Simulation

By default in Train Simulator, braking performance is constant throughout the speed range so a full brake application at 70mph will have the same level of retardation than at 10mph. This is a fairly good representation of how disc brakes work but for stock with tread brakes, like the class 156, 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.

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 when powering during times of poor adhesion.

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

- 1) Power is automatically reduced and the two gearbox fault lights illuminate in the cab.
- 2) Once the wheelslip stops, power is reapplied to the notch selected on the power handle and the two gearbox fault lights extinguish. 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.

Wheelslide

When braking during poor adhesion, it is possible that the wheels will lock up and slide. As with wheelslip, the two gearbox fault lights will illuminate but there is no automatic sander or reduction of the brake, so it is up to you to either apply sand or move the brake handle to a lower step in an attempt to control the slide.

In a bid to reduce wheel flats, Greater Anglia have fitted their units with wheelslide protection which will automatically reduce/increase brake pressure as it sees fit so as to control wheelslide. This is available by default on GA2 livery only. Other TOCs are following suit but implementation is patchy so we have not implemented it on those relevant liveries by default. If you would like to implement it, please see the *Numbering* section of this manual.

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 or 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.

National Radio Network (NRN)



A simple representation of the NRN radio is simulated and is operational on pre-GSM-R liveries. 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'.

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) Move the reverser away from 'Off' 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) Move the reverser to 'Off'.
- 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.

Please note that GSM-R is only included for liveries that are relevant for operations post-2013.

Automatic Unit Numbering

When placing a class 156 unit in the scenario editor or using one in Quick Drive, both the DMS & DMSL will automatically be given correct unit and coach numbers instead of you having to select each vehicle and changing their number manually so they match. The unit number is controlled via the DMSL vehicle if you wish to change it. Please note that the destination display on both driving vehicles is also controlled via the DMSL vehicle.

Dynamic Exhaust Effects

Dynamic exhaust effects mean that the exhaust reacts to what the engine is doing. For example, when in notch 7, 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, in reality, the smokiness of each vehicle varies depending on how well maintained it is, so to represent this in the simulator, a random 'clag' factor is allocated to each vehicle which ranges from 1 to 10; 1 being the cleanest and 10 being the dirtiest. This can also be controlled on the leading player vehicle by using **Shift+C** & **Ctrl+C**.



Destination Roller Blind

On liveries not fitted with an LED destination board, the destination blind can be changed during a scenario by pressing either the F7 or F8 keys. Please see below for a list of the available destinations on each livery and their relevant code if you wish to use them via the unit's number on an AI service:

BR Provincial

a - Blank	s - Fort William	K - Manchester Victoria
b - Aberdeen	t - Glasgow Central	L - Markinch
c - Bangor	u - Glasgow Queen Street	M - Morecambe
d - Barrhead	v - Great Yarmouth	N - Newcastle
e - Birmingham New Street	w - Hexham	O - Norwich
f - Blackpool North	x - Holyhead	P - Nottingham
g - Blaenau Ffestiniog	y - Inverness	Q - Oban
h - Buxton	z - Ipswich	R - Preston
i - Cardiff Central	A - Kilmarnock	S - Sheffield
j - Carlisle	B - Lancaster	T - Sheringham
k - Chester	C - Leeds	U - Stranraer
l - Cowdenbeath	D - Liverpool	V - Warrington
m - Crewe	E - Llandudno	W - Whifflet
n - Cumbernauld	F - Lowestoft	X - Depot
o - Derby	G - Mallaig	Y - Not In Service
p - East Kilbride	H - Manchester Airport	Z - Special
q - Edinburgh	I - Manchester Oxford Road	
r - Felixstowe	J - Manchester Piccadilly	

Regional Railways (North West) / First North Western / Northern Spirit / all Northern Rail liveries

a - Blank	s - Darlington	K - Scarborough
b - Barrow	t - Kirkby	L - Selby
c - Bangor	u - Lancaster	M - Sheffield
d - Bishop Auckland	v - Leeds	N - Southport
e - Blackburn	w - Lincoln	O - Sunderland
f - Blackpool North	x - Liverpool	P - Wakefield Kirkgate
g - Blackpool South	y - Llandudno	Q - Warrington
h - Buxton	z - Manchester Airport	R - Whitby
i - Carlisle	A - Manchester Oxford Road	S - Whitehaven
j - Chester	B - Manchester Piccadilly	T - Wigan North Western
k - Cleethorpes	C - Manchester Victoria	U - Wigan Wallgate
l - Clitheroe	D - Metrocentre	V - Windermere
m - Crewe	E - Middlesbrough	W - York
n - Doncaster	F - Morecambe	X - Depot
o - Hexham	G - Newcastle	Y - Not In Service
p - Heysham Port	H - Nunthorpe	Z - Special
q - Holyhead	I - Preston	
r - Huddersfield	J - Saltburn	

Ex-Regional Railways (Express) (Central Trains) / Central Trains

a - Blank	r - Great Yarmouth	I - Sheffield
b - Birmingham International	s - Hereford	J - Shrewsbury
c - Birmingham Moor Street	t - Kidderminster	K - Skegness
d - Birmingham New Street	u - Leamington Spa	L - Stafford
e - Birmingham Snow Hill	v - Leicester	M - Stansted Airport
f - Cambridge	w - Lincoln	N - Stoke-on-Trent
g - Cardiff Central	x - Liverpool	O - Stratford upon Avon
h - Cheltenham Spa	y - Lowestoft	P - Walsall
i - Cleethorpes	z - Manchester Oxford Road	Q - Wolverhampton
j - Crewe	A - Manchester Piccadilly	R - Worcester Foregate Street
k - Derby	B - Mansfield Woodhouse	S - Worcester Shrub Hill
l - Doncaster	C - Matlock	T - Worksop
m - Ely	D - Newark Castle	U - Depot
n - Gloucester	E - Newark North Gate	V - Not in Service
o - Grantham	F - Norwich	W - Special
p - Great Malvern	G - Nottingham	X - Loughborough
q - Grimsby Town	H - Peterborough	Y - Coventry

East Midlands Trains

a - Blank	s - Kettering	K - Norwich
b - Alfreton	t - Leeds	L - Nottingham
c - Bingham	u - Leicester	M - Peterborough
d - Blythe Bridge	v - Lincoln	N - Scarborough
e - Boston	w - Liverpool Lime Street	O - Sheffield
f - Burton-on-Trent	x - London St Pancras	P - Skegness
g - Chesterfield	y - Long Eaton	Q - Sleaford
h - Cleethorpes	z - Longton	R - Spalding
i - Corby	A - Loughborough	S - Stockport
j - Crewe	B - Lowestoft	T - Stoke-on-Trent
k - Derby	C - Manchester Oxford Road	U - Warrington
l - Doncaster	D - Manchester Piccadilly	V - Worksop
m - Ely	E - Mansfield Woodhouse	W - York
n - Gainsborough	F - March	X - Depot
o - Grantham	G - Matlock	Y - Not In Service
p - Grimsby Town	H - Melton Mowbray	Z - Special
q - Hunts Cross	I - Newark Castle	
r - Irlam	J - Newark North Gate	

ONE / Ex-ONE (NXEA/GA) / Ex-CT (ONE/NXEA) / NXEA / Ex-NXEA (GA)

a - Blank	g - Saxmundham	m - Sudbury
b - Norwich	h - Ipswich	n - Colchester
c - Great Yarmouth	i - Felixstowe	o - Depot
d - Lowestoft	j - Peterborough	p - Not In Service
e - Sheringham	k - Cambridge	q - Special
f - Cromer	l - Marks Tey	

Ex-BR Provincial (ScotRail) / ScotRail / Strathclyde Transport / SPT

a - Blank	s - Dyce	K - Montrose
b - Aberdeen	t - East Kilbride	L - Motherwell
c - Alloa	u - Edinburgh	M - Newcastle
d - Anniesland	v - Elgin	N - Newcraighall
e - Arbroath	w - Falkirk Grahamston	O - North Berwick
f - Barrhead	x - Fort William	P - Oban
g - Bathgate	y - Glasgow Central	Q - Perth
h - Cardenden	z - Glasgow Queen Street	R - Stirling
i - Carlisle	A - Glenrothes	S - Stranraer
j - Carnoustie	B - Inverkeithing	T - Thurso
k - Criarlarich	C - Inverness	U - Tweedbank
l - Cowdenbeath	D - Inverurie	V - Whifflet
m - Cumbernauld	E - Kilmarnock	W - Wick
n - Dingwall	F - Kirkcaldy	X - Depot
o - Dumfries	G - Kyle of Lochalsh	Y - Not In Service
p - Dunbar	H - Mallaig	Z - Special
q - Dunblane	I - Markinch	
r - Dundee	J - Maryhill	

TrainFX Destination Display



For liveries with an LED destination display, this is controlled via the 'TrainFX' system to the left of the driver's window. Instructions for this system's use can be found below:

- 1) If a destination is already set, navigate to 'Terminate Route' by clicking ↓ and click ✓.
- 2) Using the number keys, enter the four digit route code and click ✓.
- 3) Confirm the route by pressing ✓. If you would like to return to the previous screen, click x.

Please see below for a list of the available destinations on each livery and their relevant code. The numerical code is what you need to input into the 'TrainFX' and the letter is if you wish to control the destination via the unit's number on an AI service:

Arriva Northern

0100/a - Blank	0118/s - Darlington	0136/K - Scarborough
0101/b - Barrow	0119/t - Kirkby	0137/L - Selby
0102/c - Bangor	0120/u - Lancaster	0138/M - Sheffield
0103/d - Bishop Auckland	0121/v - Leeds	0139/N - Southport
0104/e - Blackburn	0122/w - Lincoln	0140/O - Sunderland
0105/f - Blackpool North	0123/x - Liverpool	0141/P - Wakefield Kirkgate
0106/g - Blackpool South	0124/y - Llandudno	0142/Q - Warrington
0107/h - Buxton	0125/z - Manchester Airport	0143/R - Whitby
0108/i - Carlisle	0126/A - Manchester Oxford Road	0144/S - Whitehaven
0109/j - Chester	0127/B - Manchester Piccadilly	0145/T - Wigan North Western
0110/k - Cleethorpes	0128/C - Manchester Victoria	0146/U - Wigan Wallgate
0111/l - Clitheroe	0129/D - Metrocentre	0147/V - Windermere
0112/m - Crewe	0130/E - Middlesbrough	0148/W - York
0113/n - Doncaster	0131/F - Morecambe	0149/X - Depot
0114/o - Hexham	0132/G - Newcastle	0998/Y - Not In Service
0115/p - Heysham Port	0133/H - Nunthorpe	0999/Z - Special
0116/q - Holyhead	0134/I - Preston	
0117/r - Huddersfield	0135/J - Saltburn	

East Midlands Trains (PRM) / Ex-East Midlands Trains (East Midlands Railway)

0100/a - Blank	0118/s - Kettering	0136/K - Norwich
0101/b - Alfreton	0119/t - Leeds	0137/L - Nottingham
0102/c - Bingham	0120/u - Leicester	0138/M - Peterborough
0103/d - Blythe Bridge	0121/v - Lincoln	0139/N - Scarborough
0104/e - Boston	0122/w - Liverpool Lime Street	0140/O - Sheffield
0105/f - Burton-on-Trent	0123/x - London St Pancras	0141/P - Skegness
0106/g - Chesterfield	0124/y - Long Eaton	0142/Q - Sleaford
0107/h - Cleethorpes	0125/z - Longton	0143/R - Spalding
0108/i - Corby	0126/A - Loughborough	0144/S - Stockport
0109/j - Crewe	0127/B - Lowestoft	0145/T - Stoke-on-Trent
0110/k - Derby	0128/C - Manchester Oxford Road	0146/U - Warrington
0111/l - Doncaster	0129/D - Manchester Piccadilly	0147/V - Worksop
0112/m - Ely	0130/E - Mansfield Woodhouse	0148/W - York
0113/n - Gainsborough	0131/F - March	0149/X - Depot
0114/o - Grantham	0132/G - Matlock	0998/Y - Not In Service
0115/p - Grimsby Town	0133/H - Melton Mowbray	0999/Z - Special
0116/q - Hunts Cross	0134/I - Newark Castle	
0117/r - Irlam	0135/J - Newark North Gate	

First ScotRail / ScotRail Saltire

0100/a - Blank	0118/s - Dyce	0136/K - Montrose
0101/b - Aberdeen	0119/t - East Kilbride	0137/L - Motherwell
0102/c - Alloa	0120/u - Edinburgh	0138/M - Newcastle
0103/d - Anniesland	0121/v - Elgin	0139/N - Newcraighall
0104/e - Arbroath	0122/w - Falkirk Grahamston	0140/O - North Berwick
0105/f - Barrhead	0123/x - Fort William	0141/P - Oban
0106/g - Bathgate	0124/y - Glasgow Central	0142/Q - Perth
0107/h - Cardenden	0125/z - Glasgow Queen Street	0143/R - Stirling
0108/i - Carlisle	0126/A - Glenrothes	0144/S - Stranraer
0109/j - Carnoustie	0127/B - Inverkeithing	0145/T - Thurso
0110/k - Crianlarich	0128/C - Inverness	0146/U - Tweedbank
0111/l - Cowdenbeath	0129/D - Inverurie	0147/V - Whifflet
0112/m - Cumbernauld	0130/E - Kilmarnock	0148/W - Wick
0113/n - Dingwall	0131/F - Kirkcaldy	0149/X - Depot
0114/o - Dumfries	0132/G - Kyle of Lochalsh	0998/Y - Not In Service
0115/p - Dunbar	0133/H - Mallaig	0999/Z - Special
0116/q - Dunblane	0134/I - Markinch	
0117/r - Dundee	0135/J - Maryhill	

Greater Anglia

0100/a - Blank	0106/g - Saxmundham	0112/m- Sudbury
0101/b - Norwich	0107/h - Ipswich	0113/n - Colchester
0102/c - Great Yarmouth	0108/i - Felixstowe	0114/o - Depot
0103/d - Lowestoft	0109/j - Peterborough	0115/p - Not In Service
0104/e - Sheringham	0110/k - Cambridge	0116/q - Special
0105/f - Cromer	0111/l - Marks Tey	

Cold Start

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

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

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

- 1) Insert the master key by pressing **Shift+W**.
- 2) Move the reverser to 'Neutral' by pressing **S**.
- 3) Reset the AWS self-test by pressing **Q**.
- 4) Start the engine by holding **Z** until the 'Engine Start' button illuminates.
- 5) You will now need to wait for the compressor to build the air in the main reservoir. You can speed up this process by turning on the 'Compressor Speed Up' switch which increases engine rpm. The compressor is directly linked to the engine so when the engine revs faster, the compressor also does.
- 6) When the main reservoir reaches 4.5 bar, you have sufficient air to obtain a brake release and get on the move. Ideally though, you want to have between 6.5 & 7.5 bar as if it drops below 4.5 bar, an emergency brake application will occur.
- 7) If going into passenger service, turn the saloon lights on by pressing the 'Train Lights On' button on the back wall.

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

Coupling Procedure

Please see below for how to couple to another unit in a realistic manner:

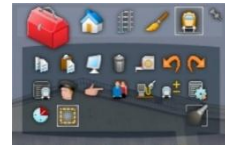
- 1) Approach the unit you are going to couple to at caution and come to a stop just short of it.
- 2) Select 'Notch 1' power and ease up to the unit. As soon as you have coupled, apply 'Step 3' brake and return the power handle to 'Off'.
- 3) To ensure the coupling is secure, you must perform a 'pull-away' test. To do this, select 'Reverse' on the reverser, 'Step 1' brake and apply 'Notch 1' on the power handle for a few seconds. If you do not move, the coupling has been successful.
- 4) Hold the 'Couple' button down on the cab desk for 5 seconds. This will connect the two units' air and electrical systems.

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:

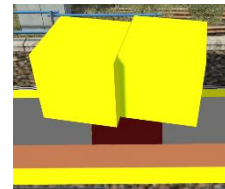
- 1) In the scenario editor, go to the location at which you would like the AI train's horn to sound, and press **Spacebar** 3 times. The track will now display a certain colour which represent its speed limit.

- 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 or 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.

Bits and Bobs

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

- The driver to guard buzzer is inactive when the doors are open. This is to prevent the driver incorrectly giving the right away buzzer.
- The reverser must be placed in 'Neutral' to start the engine.
- Power cannot be applied if the brake handle is in 'Step 2', 'Step 3' or 'Emergency'.
- If the emergency brake applies, power can only be regained by placing the reverser into 'Neutral', brake handle into 'Emergency' & power handle in 'Off'.
- If the brake handle is placed in 'Step 2', 'Step 3' or 'Emergency' whilst powering, power will be lost and you must return the power handle to 'Off' before being able to regain power.
- 1 second delay between train passing over AWS magnet and AWS warning sound occurring. The F3/F4 HUD will show the warning immediately so you must wait 1 second before trying to cancel it.
- The headlights only provide illumination before sunrise and after sunset. This is to avoid the unrealistic appearance of projected light in broad daylight.
- Old and new style door alarms on relevant liveries.

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 the 'neutral' position by pressing **W**.
- 3) Cancel the AWS self-test alarm by pressing **Q**.
- 4) Turn off the tail lights by pressing **K**.
- 5) Turn the marker lights on by pressing **J**.
- 6) Turn the headlights on by pressing **H** or **Shift+H**.
- 7) Turn the Driver Reminder Appliance (DRA) off by pressing **Y**.
- 8) If applicable, register the NRN or GSM-R.

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:

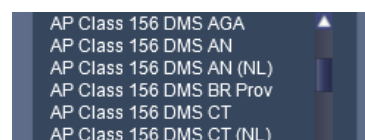
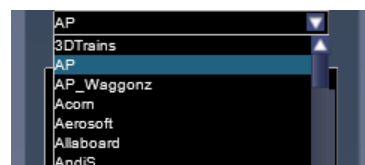
- 1) When you receive two buzzes from the guard, return them by pressing **C** twice.
- 2) Move the reverser to your desired direction of travel by pressing either **W** for forward or **S** for reverse.
- 3) Move the brake handle to step 1 by pressing **;**.
- 4) Move the power handle to notch 3 by pressing **A** and let the engine rev up. After a couple of seconds, move the brake handle to the release position which will ensure you depart without rolling back.
- 5) From then on, apply further power as you see fit.
- 6) When returning the power handle to off, make sure to hold it in notch 1 for a second or two beforehand. This is to let the power die off before removing it.
- 7) To brake the train, you may make applications and releases by moving the handle between step 1 and full service. 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.
- 8) Just before coming to a stop, aim to have the brakes in step 1 so as to provide a smooth stop.

How to Use in the Scenario Editor

How to place

To place a class 156 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 'Class156Pack01'.
- 10) The liveries should now be visible in the left-hand rolling stock fly-out.



Formation

DMS + DMSL

Numbering

When placing in the scenario editor, you are able to control a number of features via the number of the DMSL vehicle. Please note that unless otherwise stated, you need only change the DMSL number to apply to the whole unit. The DMS number is simply a placeholder.

Cold start

To activate cold start mode on a player train, add **;Cold=1** to the vehicle the driver icon is placed on. This can be either the DMS or DMSL.

NRN

To have the NRN radio already active when a scenario starts, add **;NRN=x** to the DMSL vehicle 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 DMSL vehicle number. In this example, '1A22' is the train reporting number and '084' is the signal number.

RETB

Add **;RETB=1** to the DMSL vehicle number to display an in-cab RETB unit. Please note that this is purely cosmetic and not functional.

Branding

To remove branding from a livery, remove the **;L=x** part of the DMSL vehicle number. If there is no **;L=x** then it is not possible to remove the branding.

If you own our Wherry Lines 2.0 product, on ONE livery, add **;L2=x** to the DMSL vehicle number for the following additional branding:

- The Bittern Line - '10th Anniversary 2007'. x = **4**
- Travel the East Suffolk Lines. x = **2**
- Ride the Wherry Lines. x = **3**

Variations configuration

All DMSL vehicle numbers have a **;Config=x** entry and this must be left alone to ensure the most common variations are applied to that particular livery. If desired though, some of these variations can be overridden by adding further entries to the DMSL vehicle number. Please see below for more information:

Corridor connection door

Add **;doorcover=x** to the DMSL vehicle number:

- Protected door with window visible. x = **plastic**
- Reinforced door with window not visible. x = **none**



Snowploughs

Add **;plough=x** to the DMSL vehicle number:

- No snowplough. x = **none**
- Standard snowplough. x = **normal**
- Reinforced snowplough. x = **extra**



Coupler bag & 'no multi' cab window sticker

Add **;dontcouple=y** to the DMSL vehicle number.



Wheelslide protection

Add **;wsp=y** to the DMSL vehicle number to apply wheelslide protection functionality and relevant equipment to the bogie.



Example number

156402A;Cold=1;GSMR=1A22084;plough=none

Key:

156402 - Unit number

A - Destination

;Cold=1 - Cold start

;GSMR=1A22084 - Restricted GSM-R settings. '1A22' is the train reporting number and '084' is the signal number.

;plough=none - No snowplough

Scenarios

APC156: 10:03 Norwich - Liverpool Lime Street

Route = Liverpool to Manchester Piccadilly via Warrington
Track covered = Manchester Piccadilly - Liverpool Lime Street
Traction = Ex-Regional Railways (Central Trains) 156419
Year = 2000
Duration = 50 minutes



APC156: 2F07 19:49 Warrington Central - Liverpool Lime Street

Route = Liverpool to Manchester Piccadilly via Warrington
Track covered = Warrington Central - Liverpool Lime Street
Traction = Ex-Northern Rail 156429
Year = 2017
Duration = 45 minutes



APC156: 2097 10:19 Liverpool Lime Street - Manchester Oxford Road

Route = Liverpool to Manchester Piccadilly via Warrington
Track covered = Liverpool Lime Street - Manchester Oxford Road
Traction = Arriva Northern 156487
Year = 2018
Duration = 1 hour 20 minutes



APC156: 17:05 Norwich - Great Yarmouth

Route = Wherry Lines
Track covered = Norwich - Great Yarmouth via Acle
Traction = ONE 156407
Year = 2007
Duration = 50 minutes



APC156: 2C17 16:18 Great Yarmouth - Norwich

Route = Wherry Lines
Track covered = Great Yarmouth - Norwich via Reedham
Traction = East Midlands Trains 156415
Year = 2013
Duration = 35 minutes



APC156: 2J64 06:45 Norwich - Lowestoft

Route = Wherry Lines
Track covered = Norwich - Lowestoft
Traction = Greater Anglia 156422
Year = 2017
Duration = 45 minutes



Credits

Master Key Simulations - Modelling & texturing

Zane Saxton/Oovee Games - Modelling & texturing

Nicolas Schichan - Scripting

ScotRail - Assistance in recording sounds

Third Party Restrictions

Prior permission must be sought if you would like to repurpose any aspect of this pack on a train that isn't a Class 156.