



dovetail
GAMES

BR Blue Diesel Electric Pack

Classes 09/33/73/416/421



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1 Background

1.1 Class 09



The British Rail Class 09 is a class of 0-6-0 diesel locomotive designed primarily for shunting and also short distance freight trips along branch lines.

The 26 locos are similar to the Class 08 shunting locomotives but have different gearing, giving a top speed of 27.5 mph (44 km/h) at the expense of a lower tractive effort. They were introduced from 1959 to 1962 and originally operated in the Southern Region of British Railways. Further locomotives were converted from Class 08 in 1992 and, following this and privatisation in 1997, the class has been distributed much further afield.

Builder	BR Harwich & Darlington
Locomotive Weight	49 long tons
Vehicle Length	29'3" (8.92m)
Vehicle Width	8'6" (2.591m)
Fuel Capacity	668 imp gal (3,040 litres)
Vehicle Power	25,000 lbf (111.2 kN)
Top Speed	27.5 mph (44.3 km/h)

1.2 Class 33



The British Rail Class 33 also known as the BRCW Type 3 or Crompton is a class of Bo-Bo diesel-electric locomotives ordered in 1957 and built for the Southern Region of British Railways between 1960 and 1962. A total of 98 Class 33s were built by the Birmingham Railway Carriage and Wagon Company (BRCW) and were known as "Cromptons" after the Crompton Parkinson electrical equipment installed in them. Like their lower-powered BRCW sisters (BR Classes 26 and 27), their bodywork and cab ends were of all steel construction.

They began service on the South-Eastern Division of the Southern Region but rapidly spread across the whole Region and many were used much further a field such as to Uddingston (South Lanarkshire), though the train only worked as far as York.

They were built with the ability to supply only the then new electric train heating rather than the ubiquitous steam heating which passenger carriages largely used. Early delivery problems and a shortage of steam locomotives resulted in many Class 24 locomotives being borrowed from the Midland Region and pairs, of 33 + 24, became common on Winter passenger services. This resulted in unpopular, complex run-round manoeuvres as Class 24 needed to be coupled inside to provide steam heat. Emergency provisioning of through-piping for steam heat on some examples of class 33 alleviated this somewhat. The Southern Region was unaccustomed to the operational overhead and maintenance associated with the use of class 24 and they rapidly became unpopular. With the advent of modern stock and warmer seasons, they were sent back home with the Midland as pleased to have them back as the Southern was to see them gone.

There were three different types, later known as Class 33/0, 33/1 and 33/2.

Builder	Birmingham Railway Carriage & Wagon Company
Locomotive Weight	73 long tons
Vehicle Length	50'9" (15.47m)
Vehicle Width	8'2" (2.769m)
Fuel Capacity	800 imp gal (3600 litres)
Vehicle Power	1,215hp (906 kW)
Top Speed	85 mph (137 km/h)

1.3 Class 73



The Class 73 is an electro-diesel locomotive designed as part of the British Railways 1955 Modernisation Plan.

With an increase of electrification in the Southern Region, the Class 73 was designed to operate on the 650/750V DC third rail system. However, it was also fitted with a diesel engine to power it through non-electrified track.

The diesel engine is less powerful than the third rail, so Class 73s have tended to stay in the Southern Region of the UK.

Between 1984 and 2005 Class 73 locomotives were used as traction on the Gatwick Express services running between London Victoria and Gatwick Airport, with Class 489 Gatwick Luggage Vans used as driving vehicles to avoid the need to turn the trains at either end.

Builder	Brush Traction
Locomotive Weight	73 long tons
Vehicle Length	53'8" (16.36m)
Vehicle Width	8'9" (2.67m)
Vehicle Power	1,420hp (1,059kW) Electric/ 600hp (447kW) Diesel
Top Speed	90 mph (145 km/h)

1.4 Class 416 2EPB



British Rail Class 416 (2 EPB) electric multiple units were built between 1953 and 1956. They were intended for inner suburban passenger services on London's Southern Electric network. There were two subclasses of Class 416: Class 416/1 to an SR design on salvaged 2 NOL underframes, and Class 416/2 to BR's Mark I coach design.

With the introduction of yellow warning panels from late 1963 the motor coaches of all Southern Region 2 and 3-car units were equipped with an inverted black triangle in order to provide an early visual indication to station staff that there was no brake van at the other end of the unit. As units such the 4 EPB stock had a brake van at each end of the unit they were not so equipped.

In the 1980s some 2 EPB units were used on the North London Line between Richmond and North Woolwich; these units being equipped with window bars.

Builder	Ashford Works, Eastleigh Works & Lancing Works
Locomotive Weight	DMBS 40t, DTS 30t
Vehicle Length	64' (19.50m)
Vehicle Power	500hp (370 kW)
Top Speed	75 mph (121 km/h)

1.5 Class 421 4CIG



The British Rail Class 421 (originally '4CIG' before TOPS introduction) electric multiple units were built at BR York Works between 1964 and 1972. Units were built in two batches, and were initially introduced on services on the Brighton Main Line. Later units were introduced on services to Portsmouth. These units replaced older Southern Railway-designed units, such as the 5Bel "Brighton Belle" units, and 4Cor units. Towards the end of their life, with the increasing use of newer trains which were equipped with sliding or plug doors, these trains became known as "slam door trains".

The term 4CIG comes from a long standing naming convention used for Southern multiple units. 4CIG represents the number of vehicles in the unit, followed by a description of the stock - **C**orridor **I**ntermediate **G**uard. More unit names are listed in the table on the right.

Under the introduction of the TOPS code system in the 1970s, third rail EMU were renumbered in the 4xx range.

The 4CIG units were the first to feature a new arrangement for Southern EMU fleets, in that the motors were mounted under one of the intermediate coaches rather than at either end of a set. This motor coach also included a small guard's compartment with luggage storage. These features classified the coach as an MBS or Motor Brake Standard.

Builder	BREL York
Vehicle Length	265'8" (80.98m)
Vehicle Width	9'3" (2.82m)
Top Speed	90 mph (145 km/h)

2 Rolling Stock

2.1 OBA Wagon

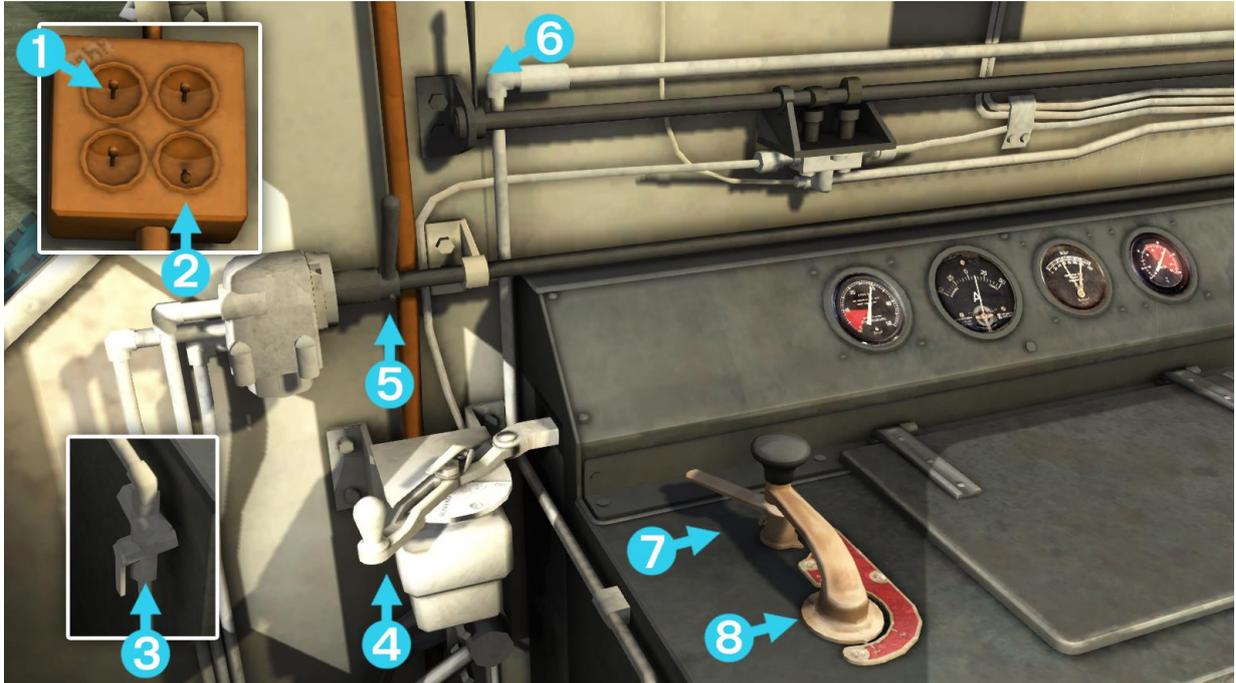


2.2 General Utility Vehicle (GUV)



3 Driving the Locomotives

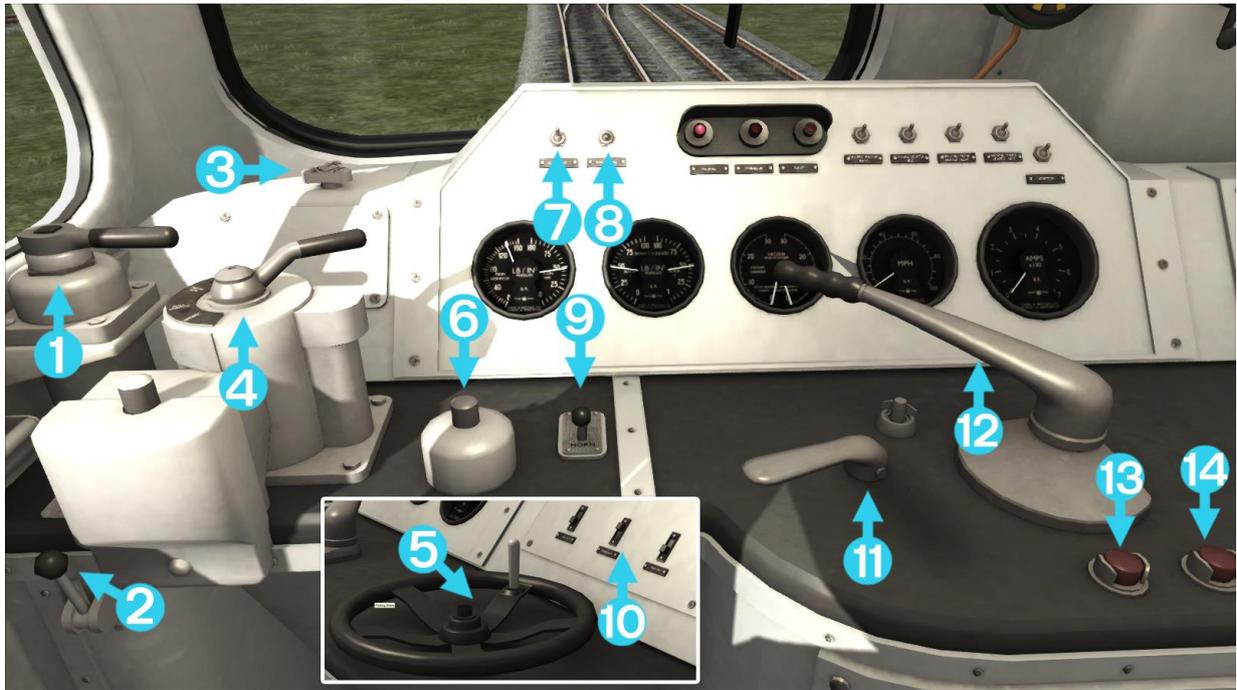
3.1 Class 09



- | | |
|---|-------------|
| 1 | Headlight |
| 2 | Cab Light |
| 3 | Horn |
| 4 | Train Brake |

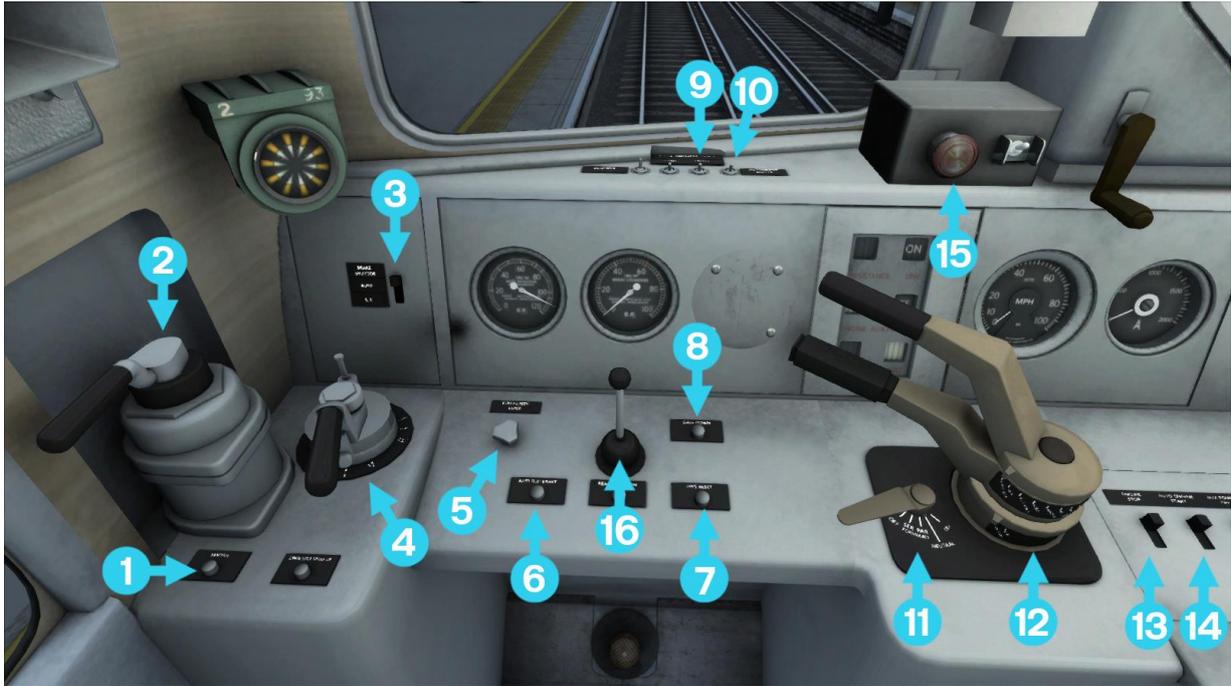
- | | |
|---|------------|
| 5 | Loco Brake |
| 6 | Sander |
| 7 | Reverser |
| 8 | Throttle |

3.2 Class 33



- | | | | |
|---|-------------|----|-------------------|
| 1 | Loco Brake | 8 | Instrument Lights |
| 2 | Sander | 9 | Horn |
| 3 | Wipers | 10 | Headlights |
| 4 | Train Brake | 11 | Reverser |
| 5 | Handbrake | 12 | Throttle |
| 6 | AWS Reset | 13 | Engine Start |
| 7 | Cablight | 14 | Engine Stop |

3.3 Class 73



1	Sander (x)	9	Headlights (h)
2	Loco Brake ([,])	10	Instrument Lights (i)
3	Brake Selector Switch	11	Reverser (w, s)
4	Train Brake (;, ')	12	Throttles (a, d)
5	Wipers (v)	13	Engine Stop
6	Anti-Slip Brake	14	Engine Start
7	AWS Reset (q)	15	DRA
8	Shoe Down Button	16	Horn (space)

3.3.1 Dual Control

The Class 73 is a dual-power controlled unit. It has both a diesel engine and pick-up shoes to collect electricity from third-rail track where available.

Each power mode has its own throttle handle which must have the opposite handle in the Off position before it can apply its power. The Class 73 can start in either power mode and can switch dynamically when needed.

Diesel mode can be engaged by moving the diesel power handle into the positive range, after 5 seconds the Diesel engine will activate.

To activate third-rail power, set both power controllers to the Off position and then press the Shoe Down button on the cab desk. This will lower the third-rail shoes and let current run to the traction motors.

Pressing the Shoe Down button again will toggle back to diesel mode.

Both power handles can be controlled with the A and D keys. In Diesel mode use A to increase the throttle and D to decrease the throttle to the off position. In Electric mode use D to increase the throttle and A to decrease the throttle.

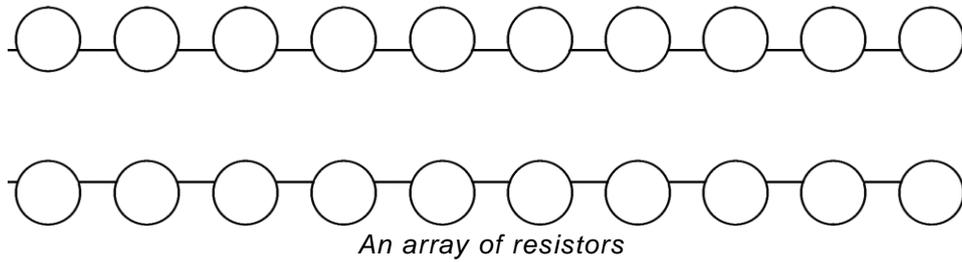


Comparison of Line off and on. Showing the status of diesel/ electric traction respectively.



Status of diesel engine from left to right. Off, running up / down and on.

In Third-Rail mode power is broken down into three stages, **Series**, **Parallel** and **Weak Field**. The simplest way to understand this system is to know what it is doing under the hood.



When power is first drawn from third-rail the current is too high for the traction motors to handle. To counteract this, the power is run through an array of resistors as shown above. These resistors are closed to begin with and are opened sequentially to allow more current to pass.

In **Series** the resistors are opened one by one. This allows the current to be applied proportionally and gives 20 different power outputs. This is useful for pulling freight as there are effectively more 'gears' to gain traction.

In **Parallel** the resistors are opened in pairs. This means there are only 10 possible power outputs but is useful for quick acceleration.

Weak Field is the final power mode and can be transitioned to from either **Series** or **Parallel**. This opens up the remaining resistors and allows full current to flow into the traction motors. However if there is not enough power running through the traction motors when **Weak Field** is entered it will cause a fault, leading to an emergency brake application and requiring a throttle reset to carry on.

In **Series**, when 18 resistors have been opened the driver can safely access **Weak Field**. In **Parallel** the driver must wait until 12 resistors have opened.

When going through the resistors the R symbol will be shown on the cab display as shown below. When that symbol switches to the plain black square the resistors in that power setting have fully opened. This can be used to know when to transition to the next power stage, e.g. **Series** to **Weak Field**.



Resistors opening.

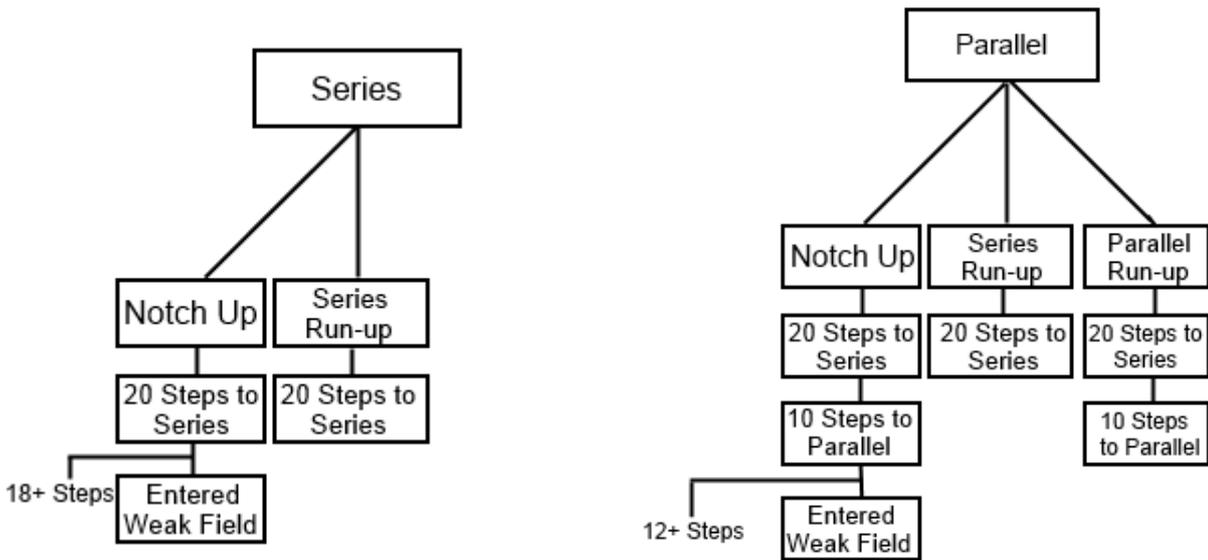


Resistors open / all closed.

To work through these power settings the Reverser must be set to the corresponding mode. Starting in Series gives access to both Series and Weak Field, whereas starting in Parallel gives access to all three modes. Both throttle handles must be in the Off position in order to set the Reverser.



Reverser showing Neutral, Reverse and the two Forward settings; Series and Parallel.



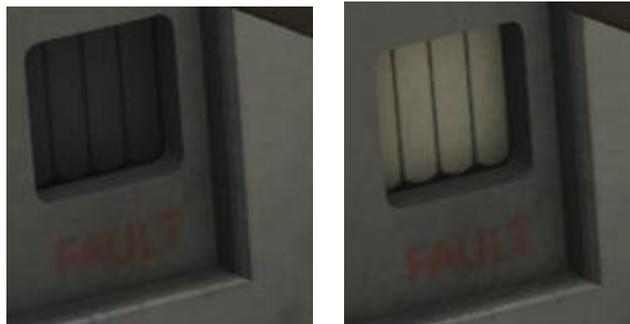
Diagrams showing the progression of power when setting Series or Parallel on the Reverser.

Once the starting mode has been set the Driver can focus on moving through the power settings.



Electric Throttle Handle showing all power settings.

- **Hold** – Holds the current number of open resistors in the power setting. Let the throttle rest here and tap the throttle keyboard input to move into Run-back or Notch-Up, this will increment the resistors accordingly.
- **Run-Back** – Close resistors sequentially. Operates in Series or Parallel.
- **Notch-Up** - Open resistors in the selected power setting sequentially. (Single resistors in Series and paired resistors in Parallel).
- **Series Run-Up** – Auto notch up until all the resistors have been opened in Series.
- **Parallel Run-Up** – Auto notch up until all the resistors have been opened in Parallel. Will auto notch through Series beforehand if this has not already occurred.
- **Weak Field** – Transition into Weak Field if the power requisites have been met. Otherwise a fault will be triggered.



Black indicates a fault whereas white indicates clear.

3.3.2 DSD

DSD (Driver Safety Device) is a vigilance system that monitors the driver. It can be activated or deactivated by using the Ctrl-D hotkey. Once activated the system monitors the locomotives speed and starts a timer once the vehicle reaches over 5mph. The timer then waits for one minute before playing an alert sound that must be acknowledged by pressing the DSD pedal (Numpad Enter).

If the alert is not acknowledged after five seconds it will trigger an emergency brake application, bringing the train to a stop. The brakes will only release if the acknowledge is pressed by the driver, after which they can continue their journey.

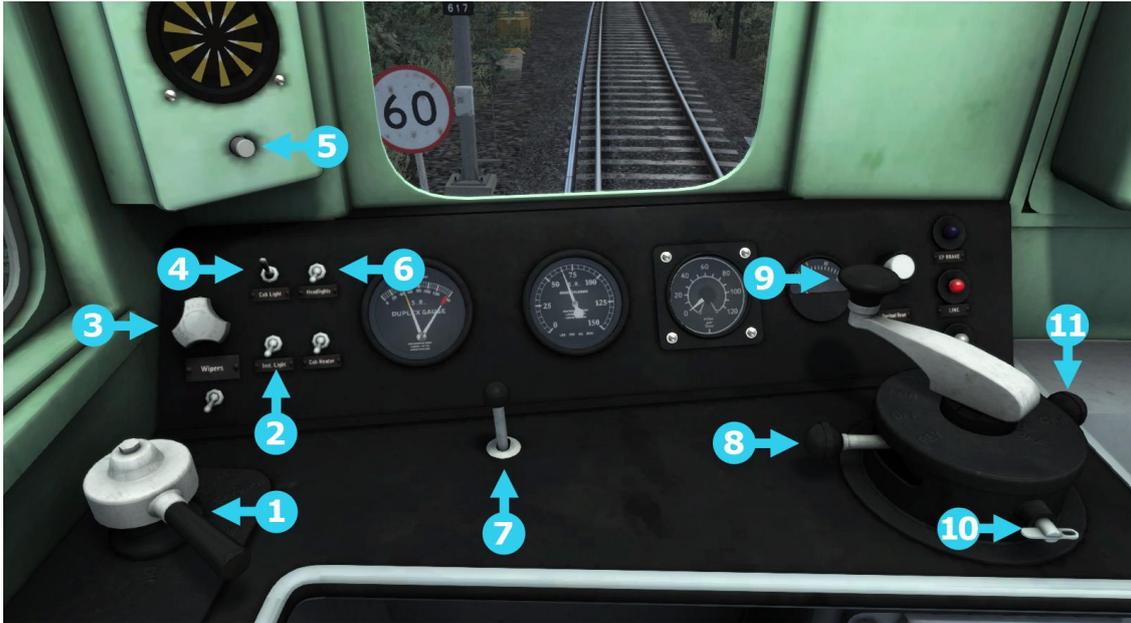
3.3.3 DRA

DRA (Driver Reminder Appliance) is an additional safeguard to stop Drivers from passing signals at danger. It must be applied when the locomotive has stopped at a RED signal (by pressing in the red plunger provided) which will stop power being applied to the traction motors. Once the signal has been cleared, the plunger can be released thus restoring the control circuit.

3.3.4 E.P Brake

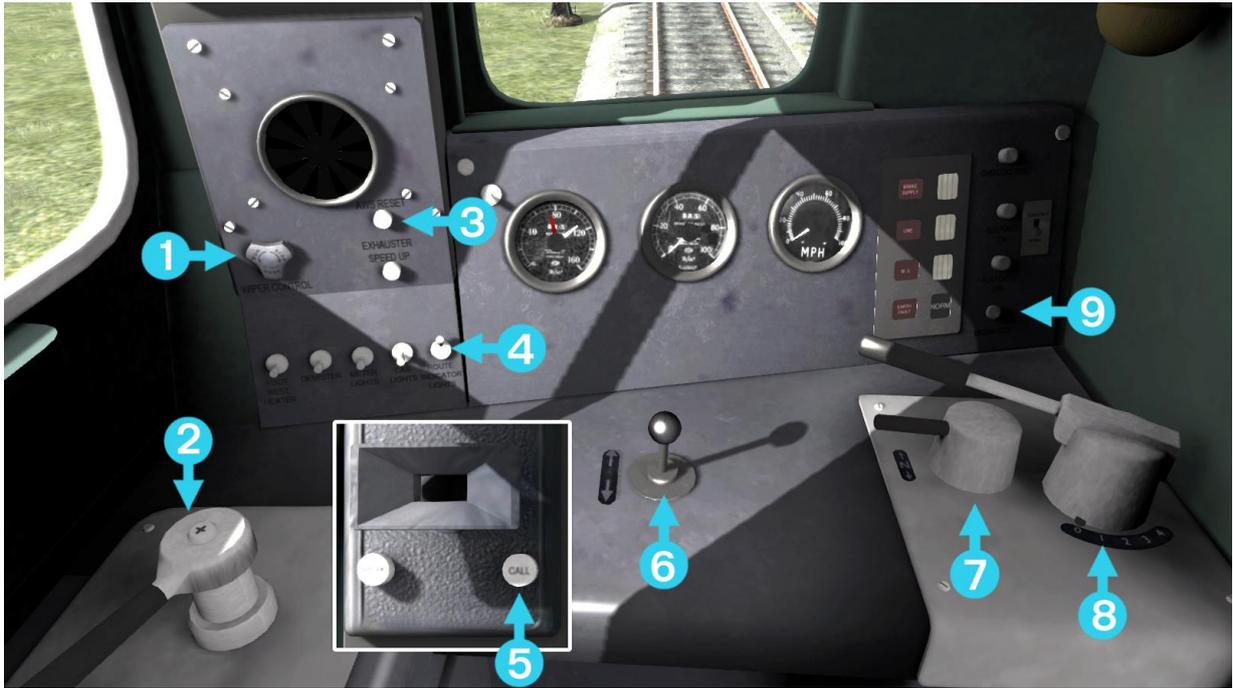
The Electro Pneumatic Brake or E.P Brake is a system used to hold a minimum brake pressure. If the E.P brake has set the minimum brake application it may be released by moving the train brake into the release position, or increased further by moving the auto brake beyond the minimum application position.

3.4 Class 416 2EPB



- | | | | |
|---|-------------------|----|-----------------|
| 1 | Train Brake | 8 | Reverser |
| 2 | Instrument Lights | 9 | Regulator |
| 3 | Wipers | 10 | Master Key |
| 4 | Cab Light | 11 | Master Switch |
| 5 | AWS Reset | 12 | Sun Visor |
| 6 | Headlights | 13 | Headcode |
| 7 | Horn | 14 | Handbrake Wheel |

3.5 Class 421 4CIG



- | | | | |
|---|----------------|---|-----------|
| 1 | Wipers | 6 | Horn |
| 2 | Train Brake | 7 | Reverser |
| 3 | AWS Reset | 8 | Throttle |
| 4 | Headlights | 9 | Shut Down |
| 5 | Guard's Buzzer | | |

3.6 Locomotive Keyboard Controls

Key Equivalent	Action
D / A	Decrease or Increase the Regulator.
S / W	Decrease or Increase the Reverser.
; / .	Decrease or Increase the Train Brake.
[/]	Decrease or Increase the Locomotive Brake.

3.7 General Keyboard Controls

Key Equivalent	Action
T	Load/Unload. Press once to load/unload passengers or freight.
H	Lights. Repeatedly pressing will cycle through headlight states.
Q	(Expert) Alerter. The Alerter is a system used to ensure that the driver has seen a signal. If the alert sounds (a black/yellow striped symbol is shown in the cab) it must be acknowledged by pressing the Alerter button or the emergency brakes will be applied.
X	(Expert) Sander. Causes sand to be laid on the rails next to the wheels to assist with adhesion. Press once to apply sand and again to stop.
Space	Horn. Sound the locomotive horn.
/	Handbrake On/Off. This icon is displayed in the Coupling view
Shift+Ctrl+C	Couple Manually.

4 Scenarios

*****For driving tutorials, please visit the Academy from the main TS2016 menu screen*****

4.1 [BRB] 01. Going Back in Time

An express passenger service bound for London Victoria. You're currently at Farningham Road and will be calling at Swanley, St Mary Cray, Bromley South, Denmark Hill and London Victoria.

Duration: 45 Minutes
Difficulty: Easy
Train: Class 421 4-CIG

4.2 [BRB] 02. Night Shunter

Assemble a consist of newspaper and parcel vans to be delivered later in the morning.

Duration: 30 Minutes
Difficulty: Medium
Train: Class 09 BR Blue

4.3 [BRB] 03. Paper Run

You have just been coupled to the newspaper and parcel consist that were assembled in [BRB] 02. Night Shunter. You're tasked with travelling down the Chatham Main Line delivering newspapers and parcels by making stops at stations.

Duration: 55 Minutes
Difficulty: Very Hard
Train: Class 73

5 Acknowledgements

Dovetail Games would like to thank the following people for their contribution to the development of the BR Blue pack.

Beta Testing Team
Ben Jervis

