



dovetail  
GAMES

# Gatwick Express Class 73



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# 1 Background

## 1.1 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.

## 1.2 Design & Specification

<b>Power Type</b>	Electro-Diesel
<b>Locomotive Weight</b>	73t
<b>Total Built</b>	49
<b>Build Date</b>	1962, 1965-1967
<b>Vehicle Power</b>	1,420hp (1,059kW) Electric/ 600hp (447kW) Diesel
<b>Top Speed</b>	90mph (145km/h)
<b>Brake Types</b>	Vacuum, Air and Electro-Pneumatic

## 2 Rolling Stock

### 2.1 Gatwick Express Class 73



### 2.2 Mk2E Coaches

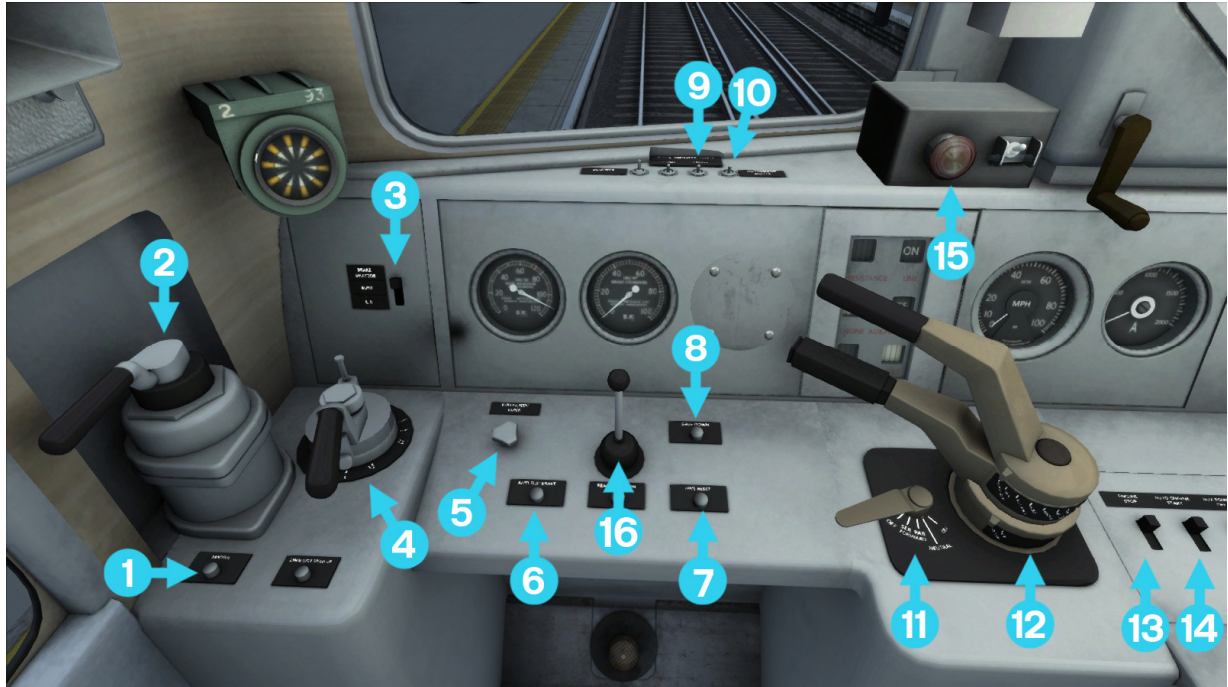


## 2.3 Gatwick Express Class 489 GLV



## 3 Driving the Class 73

### 3.1 Cab Controls



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)

### 3.2 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.

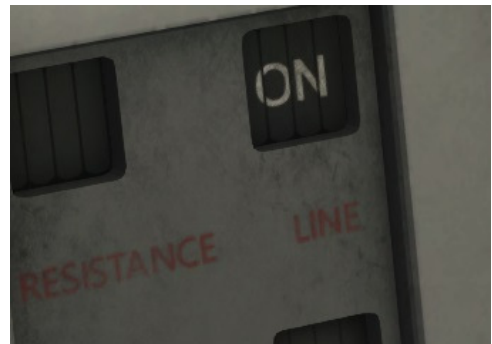
Each power mode has its own throttle handle which must have the opposite handle in the Off position before it can apply its power. The Class 73 can start in either power mode and can switch dynamically when needed.

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.

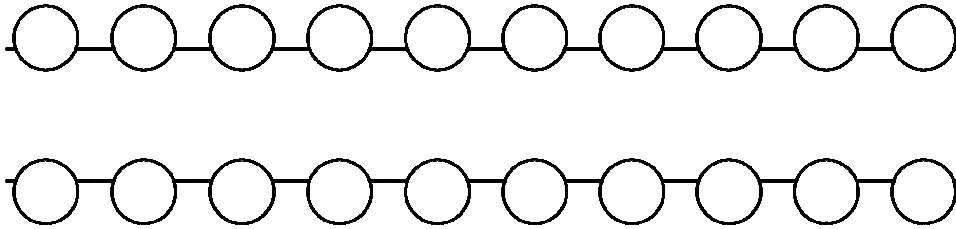


*Comparison of Line off and on. Showing the status of diesel/ electric traction respectively.*



*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.



*An array of resistors*

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**.





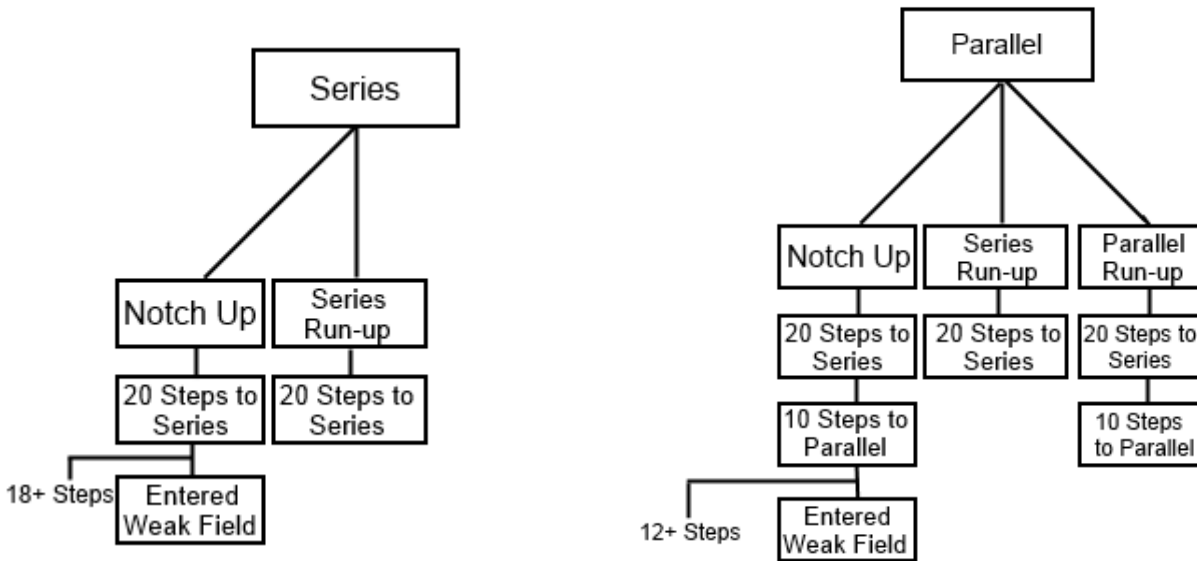
*Resistors opening.*

*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 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.

### **3.4 DRA**

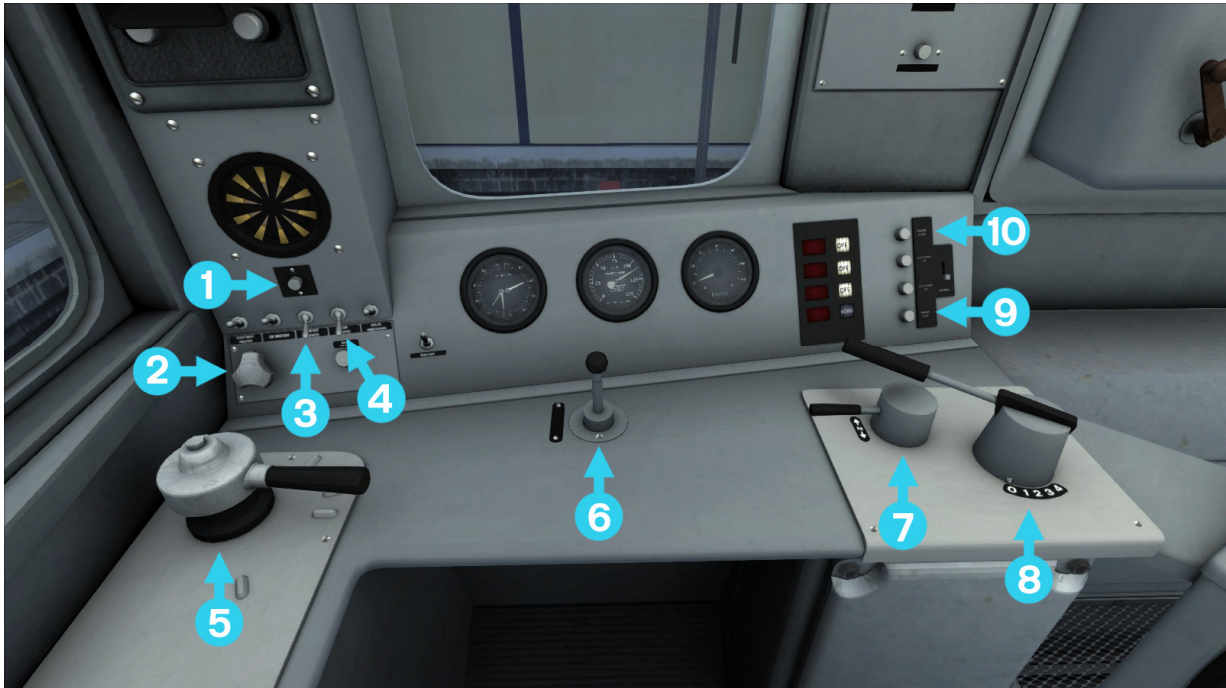
DRA (Driver Reminder Appliance) is an additional safeguard to stop Drivers from passing signals at danger. It must be applied when the locomotive has stopped at a RED signal (by pressing in the red plunger provided) which will stop power being applied to the traction motors. Once the signal has been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

### **3.5 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.

## 4 Driving the Class 489 GLV

### 4.1 Cab Controls



1	AWS Reset (q)	6	Horn (space)
2	Wipers (v)	7	Reverser (w, s)
3	Instrument Lights (i)	8	Throttle (a, d)
4	Cab Light (l)	9	Engine Stop
5	Train Brake (;, ')	10	Engine Start

## 5 Scenarios

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

### 5.1 [73] 1. A Crowded Space

*(Listed under Class 489 GLV)*

London Victoria has become a very crowded area at the moment. Holiday travellers are out in force and levels are higher than expected. Battle your way through the signals and traffic to complete your final approach into Victoria.

**Duration:** 15 Minutes

**Difficulty:** Medium

### 5.2 [73] 2. Outbound Express

Run a Gatwick Express service from London Victoria to Gatwick Airport.

**Duration:** 30 Minutes

**Difficulty:** Easy

### 5.3 [73] 3. Return Diversion

Run the Gatwick Express return service back up to London Victoria. The fast lines have just been closed for some engineering maintenance, so all services are being re-routed via the slow lines. Expect delays.

**Duration:** 45 Minutes

**Difficulty:** Hard

## 6 Acknowledgements

Dovetail Games would like to thank the following people for their contribution to the development of the Gatwick Express Class 73:

Beta Testing Team

