



# North London Line



<b>1 ROUTE INFORMATION .....</b>	<b>4</b>
1.1 Background .....	4
<b>2 ROLLING STOCK .....</b>	<b>5</b>
2.1 Class 378 Capitalstar .....	5
2.2 Design & Specification .....	5
2.3 Class 378/1 DMSO .....	6
2.4 Class 378/2 DMSO .....	6
2.5 Class 378/1 MSO .....	7
2.6 Class 378/2 MSO .....	7
2.7 Class 378/1 PTSO .....	8
2.8 Class 378/2 PTSO .....	8
<b>3 DRIVING THE CLASS 378 CAPITALSTAR .....</b>	<b>9</b>
3.1 Class 378 Cab Controls .....	9
3.2 Locomotive Keyboard Controls .....	10
3.3 General Keyboard Controls .....	10
<b>4 SCENARIOS .....</b>	<b>11</b>
4.1 [378/2] 1. Coming from Clapham .....	11
4.2 [378/2] 2. Quattro Service .....	11
4.3 [378/2] 3. Late For Work! .....	11
4.4 [378/2] 4. Stratford Slurry: Part 1 .....	11
4.5 [378/2] 5. Stratford Slurry: Part 2 .....	11
4.6 [378/2] 6. Early Morning Run .....	11
4.7 [378/2] 7. Camden Showers .....	11
<b>5 RAILFAN MODE SCENARIOS .....</b>	<b>12</b>
5.1 [RailfanMode] Gospel Oak .....	12
5.2 [RailfanMode] Highbury & Islington .....	12
5.3 [RailfanMode] Willesden .....	12
<b>6 SIGNALS .....</b>	<b>13</b>
6.1 Main Signal Head Aspects .....	13
6.2 Theatre Type Signals .....	13
6.3 Feather Type Signals .....	14
6.4 Ground Signals and Position Light Signals .....	14
6.5 Entering an Occupied Section of Track .....	15
6.6 Repeater Signals .....	15
<b>7 SPEED SIGNS .....</b>	<b>16</b>
7.1 Permissible Speed Indicators .....	16
7.2 Permissible Speed Warning Indicators .....	16

**8 SAFETY SYSTEMS .....17**  
    8.1 AWS (Automatic Warning System) ..... 17

**9 CREDITS .....18**

# 1 Route Information

## 1.1 Background

The North London line spans about 17 miles between Richmond and Stratford and is part of the London Overground network. It is used as a commuter route connecting the inner suburbs North of London. This makes the route a rough semi-circle shape from the south west to the north east of the capital, avoiding the city centre. Built for a total of 25 years in 5 connecting sections, the 1st portion of the line was opened as the Eastern Counties and Thames Junction Railway in 1846/7 between Stratford and North Woolwich, and the last portion opened was between South Acton and Richmond in 1869 by the London & South Western Railway.

The 1980s started to see some closures across the line, the most notable being the closure of Broad Street station, a once major terminus for the City of London that became a dwindling station with very few passengers it was closed and demolished in 1986. Other closures on the line include the Tottenham Hale – Stratford link and more recently the section between Stratford and North Woolwich in 2006. Where that track once stood is now used by the Docklands Light Railway and will also become part of the Crossrail branch to Abbey Wood in 2018.

Today the line is populated by Class 378/2 Capitalstars forming the London Overground services, D78 Tube Stock for the District Line services between Richmond and Gunnersbury. The route also sees a lot of freight usage hauled by Class 66's, 70's, 90's, 92's etc. You will also find loco/multiple unit drags on part of the route, Class 375/3's being dragged by DRS Class 57/4's for refurbishment in Derby is a recent example. The line is electrified mostly with 25kV AC overhead catenary between Stratford and Acton Central, and 3<sup>rd</sup> rail from Acton Central to Richmond. This was done because the class 313's that were used at the time were dual voltage and it also proved advantageous for electric freight locomotives. However between Gunnersbury and Richmond, there is also a 4th rail as the London Overground and District line shares this 2.5 mile stretch of track.



**NORTH LONDON LINE  
RICHMOND TO STRATFORD**

## 2 Rolling Stock

### 2.1 Class 378 Capitalstar

Built by Bombardier as part of the Electrostar family and derived from the Class 376, the Class 378 was introduced to replace a variety of ageing multiple units (Class 313, 508, 456 and A60/62 stock) on the growing London Overground network. Originally delivered in September 2008 as 3 car units, the Class 378/0s cost some £223 million and were based at the recently built New Cross Gate depot.

After a 14 week test on the North London line, TfL ordered 36 more carriages at a cost of £36 million, this was to add 3 more 4 car units to the fleet and upgrade the original 24 Class 378/0s to 4 cars long. The addition of the fourth car saw the 378/0s reclassified as 378/2s.

Today, there are 57 Class 378s in service, there are 20 /1s which are 750V DC third Rail only, and there are 37 /2s which are dual voltage, sporting the third rail shoe and a pantograph for the 25kV AC catenary. An ongoing extension to the fleet is underway with 57 new carriages, allowing for all the Class 378s to be increased to 5 cars, this is expected to be complete by the end of 2015.

As of June 2015, it was announced that another 45 units have been ordered, 30 to replace the Class 315/317s on the recently acquired services from Greater Anglia, one unit for the service between Romford and Upminster, 6 will be used to strengthen the existing fleet and the final 8 will be used to replace the Class 172/2s on the Gospel Oak to Barking line once it has been electrified.

With a top speed of 75mph, wide sliding doors instead of the typical plug style and open plan gangways, much like an articulated bus, the Class 378 is perfect for start-stop commuter services in and around London.'

### 2.2 Design & Specification

Total Built: 57 Trainsets

Weight: 159.5t

Length: 20.4m

Vehicle Power: 800hp

Max Speed: 75mph

### 2.3 Class 378/1 DMSO



### 2.4 Class 378/2 DMSO



## 2.5 Class 378/1 MSO



## 2.6 Class 378/2 MSO



## 2.7 Class 378/1 PTSO



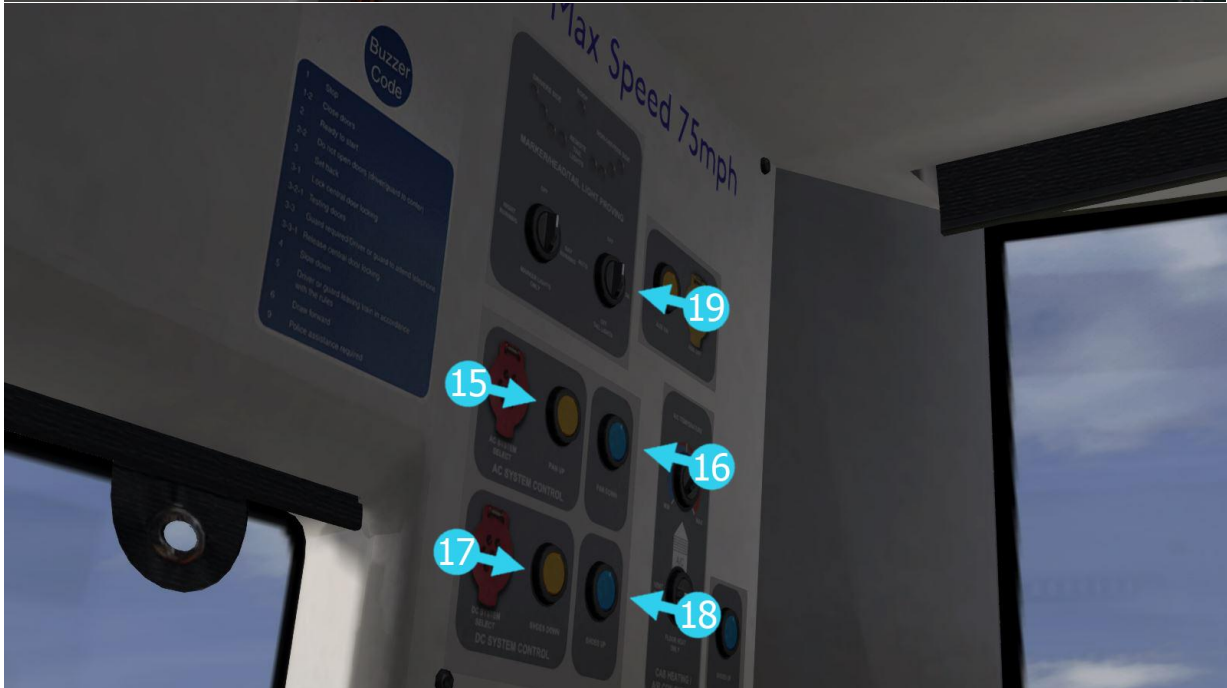
## 2.8 Class 378/2 PTSO





## 3 Driving the Class 378 *Capitalstar*

### 3.1 Class 378 Cab Controls



1	Master Key	11	Brake Gauge
2	Reverser	12	AWS Reset
3	Combined Train Brake and Throttle	13	Horn
4	Depot Whistle	14	Windscreen Wipers
5	Signal Button	15	Pantograph Up
6	Cab Light	16	Pantograph Down
7	AWS Sunflower	17	Shoes Down
8	DRA	18	Shoes Up
9	Manual Sander	19	Headlight/Taillight Switch
10	Speedometer		

### 3.2 Locomotive Keyboard Controls

Key Equivalent	Action
D / A	Decrease or Increase Combined Train Brake and Throttle.
S / W	Move Reverser Forward or Backward.

### 3.3 General Keyboard Controls

Key Equivalent	Action
T	<b>Load/Unload</b> passengers or freight.
H	<b>Lights.</b> Repeatedly pressing will cycle through headlight states where appropriate.
V	<b>Windscreen Wipers.</b> Press once to switch on and again to switch off.
Z	<b>(Expert) Engine Stop/Start.</b> By default engines will already be running at the start of a scenario. Press this button to stop and then again to restart the engine.
Q	<b>(Expert) Alerter.</b> The Alerter is a system used on some trains to ensure that the driver has seen a signal. If the alert sounds (a black/yellow striped symbol is shown on the Driver's display), this must be acknowledged by pressing the Alerter button or the emergency brakes will be applied.
X	<b>(Expert) Manual Sander.</b> 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	<b>Horn.</b> Sound the horn's low tone.
B	<b>Horn.</b> Sound the horn's high tone.
Shift + Ctrl + C	<b>Couple manually.</b>

## 4 Scenarios

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

### 4.1 [378/2] 1. Coming from Clapham

You pick things up in the middle of a run to Stratford, originally starting out in Clapham Junction. Call at all stations en route.

**Duration:** 50 Minutes

**Difficulty:** Easy

### 4.2 [378/2] 2. Quattro Service

You're taking the 378/2 on a full line run from Richmond to Stratford, calling at all stations en route. This scenario requires switching the power source at Acton Central.

**Duration:** 70 Minutes

**Difficulty:** Easy

### 4.3 [378/2] 3. Late For Work!

Take a delayed rush hour service from West Hampstead to Stratford in adverse conditions.

**Duration:** 35 Minutes

**Difficulty:** Hard

### 4.4 [378/2] 4. Stratford Slurry: Part 1

Take on the first part of a full length run from Stratford (London) to Richmond. For now, you will be heading down to Gospel Oak, making passenger stops at all stations on the way. The fog seems to be in for the night and reports are showing that it will only worsen over time. You will need to be extra vigilant tonight.

**Duration:** 25 Minutes

**Difficulty:** Medium

### 4.5 [378/2] 5. Stratford Slurry: Part 2

Time to battle the second part of this Stratford (London) to Richmond stopping service. You will have to contend with a TSR and a delayed service that you will soon catch up with.

**Duration:** 40 Minutes

**Difficulty:** Hard

### 4.6 [378/2] 6. Early Morning Run

You're running a test for a Clapham Junction to Richmond service. Starting off at Dalston Junction, stop at every station en route.

**Duration:** 60 Minutes

**Difficulty:** Medium

### 4.7 [378/2] 7. Camden Showers

Flooding has caused delays towards Stratford, some services have had to run back down the line and you're one of them. Starting at Camden Road head back down to Richmond.

**Duration:** 45 Minutes

**Difficulty:** Hard

## 5 Railfan Mode Scenarios

Railfan Mode provides a unique chance to observe and enjoy the operations of trains without the pressure and involvement of driving them. Railfan Mode scenarios are positioned at various key points along the route and provide camera functionality to sit back and watch the action unfold.

These scenarios are located on the **Drive** screen under the **Career** tab.

### 5.1 [RailfanMode] Gospel Oak

**Duration:** 5 Minutes

**Difficulty:** Easy

### 5.2 [RailfanMode] Highbury & Islington

**Duration:** 10 Minutes

**Difficulty:** Easy

### 5.3 [RailfanMode] Willesden

**Duration:** 15 Minutes

**Difficulty:** Easy

## 6 Signals

### 6.1 Main Signal Head Aspects



Colour light signals are used for controlling running movements. They display aspects by means of red, yellow and green coloured lights.

Signal Aspect	Description	Instruction to Driver
Red light	Danger	Stop.
Single yellow light	Caution	Proceed: be prepared to stop at the next signal.
Double yellow lights	Preliminary caution	Proceed: be prepared to find the next signal displaying one yellow light.
One flashing yellow light	Preliminary caution for a diverging route	Proceed: Be prepared to find the next signal displaying one yellow light with feather junction indicator for diverging route(s).
Double flashing yellow lights	Indication of diverging route ahead of the next but one signal	Proceed: Be prepared to find the next signal displaying one flashing yellow light.
Green light	Clear	Proceed: The next signal is displaying a proceed aspect.

### 6.2 Theatre Type Signals

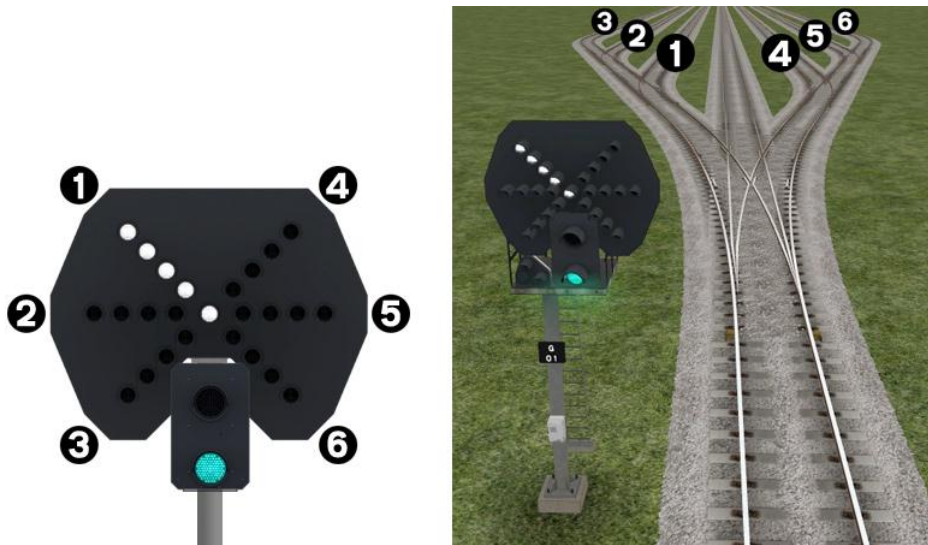


A Theatre alphanumeric route indicator indicates the route to be taken using numbers or letters (or a combination of numbers and letters).

A Theatre indicator is often used to show the arrival platform number.

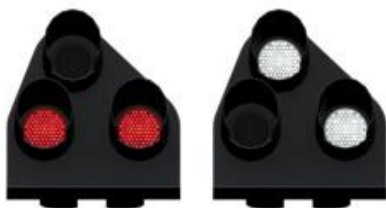
### 6.3 Feather Type Signals

A Feather junction indicator indicates a diverging route to be taken by the angle at which a line of five white lights is displayed. (*Position 1 shown*)



Feather Indication	Instruction to Driver
No Feather Indication	Obey main aspect, straight-ahead route is set
Position 1 indication	Obey main aspect, expect divergence to left
Position 2 indication	Obey main aspect, expect divergence to left more extreme than that for position 1
Position 3 indication	Obey main aspect, expect divergence to left more extreme than that for position 2
Position 4 indication	Obey main aspect, expect divergence to right
Position 5 indication	Obey main aspect, expect divergence to right more extreme than that for position 4
Position 6 indication	Obey main aspect, expect divergence to right more extreme than that for position 5

### 6.4 Ground Signals and Position Light Signals



Ground Signals and Position Light Signals (PLS) display their aspects by means of the position and colour of lights. Ground Signals are always illuminated and can have miniature theatre indicators attached whereas PLS only illuminate to allow a train to pass in to an occupied section of line and are mounted as an addition to a main signal head.

Signal Aspect	Description	Instruction to Driver
Two red lights	Danger	Stop.
No aspect (located on a main aspect)		Obey main aspect.
Two white lights	Caution	The line ahead may be occupied. Proceed cautiously towards the next stop signal, stop board or buffer stops. Be prepared to stop short of any obstruction. The associated main aspect (where provided) may be passed at danger

## 6.5 Entering an Occupied Section of Track

During a scenario your train may be scheduled to enter a platform or section of track that is already occupied by another train or rolling stock. In this situation you should stop at the red signal protecting this section of track as normal. Once your train has stopped press the TAB key on your keyboard to request permission from the signalling centre to enter the occupied section of track. When your train movement is approved the signal will illuminate the two white lights on the position light signal if it has one.

## 6.6 Repeater Signals



A banner repeater signal indicates whether the signal ahead is displaying a proceed aspect or is at danger. Modern fibre optic banner repeating signals, as shown opposite, consist of a rectangular unlit black background displaying a white circle with a black bar.

Signal Display	Instruction to Driver
Horizontal arm	Be prepared to find the related signal at danger
Arm at an upper quadrant angle of 45°	Related signal is exhibiting a proceed aspect

Repeater signals are intended to provide a driver with advance information of a signal that may be obscured on approach. A train does not need to stop at a repeater signal, only at the related signal if it is at danger.

Splitting banner signals provide two banner signal heads combined to form a splitting banner repeating signal. These are used to indicate the aspect of a signal with a feather junction indicator. If the related junction signal is displaying an illuminated feather then the lower banner head displays an arm at an upper quadrant angle of 45°. Alternatively, if the related junction signal is not displaying an illuminated feather and is indicating a straight ahead route then the higher "main" banner head displays an arm at an upper quadrant angle of 45°.

## 7 Speed Signs

### 7.1 Permissible Speed Indicators



These signs display the permissible speed in M.P.H. applicable to the section of line beyond the sign up to the commencement of any subsequent permissible speed section.

Remember to wait for the complete length of your train to pass these signs before accelerating if the permissible line speed is increasing. If the permissible line speed is decreasing then you must reduce your speed before passing these signs.

### 7.2 Permissible Speed Warning Indicators



These signs provide advance warning of a reduction in permissible speed ahead. Permanent AWS Ramps (Automatic Warning System) are often installed in conjunction with these signs. In these cases the driver must cancel the AWS warning when triggered on approach to these signs.



## 8 Safety Systems

### 8.1 AWS (Automatic Warning System)



AWS is provided to give train drivers in-cab warnings of the approach to signals, reductions in permissible speed and temporary/emergency speed restrictions, and to apply the brakes in the event that a driver does not acknowledge cautionary warnings given by the system.

As a train approaches a signal, it passes over AWS track equipment (magnets) which are fixed to the sleepers between the running rails. The magnets are sensed by a receiver mounted under the leading end of the train.

If the signal ahead is displaying a clear aspect (green), a bell (or an electronic ping) sounds in the driver's cab, and the AWS Sunflower indicator displays "all black". No action in respect of the AWS is required of the driver.

If the signal is displaying a caution or danger aspect (yellow, double yellow or red), a horn sounds in the driver's cab and the display shows "all black". The driver has to acknowledge the warning by pressing the "AWS Acknowledgement" push button. When the driver operates the push button, the horn is silenced and the AWS Sunflower changes to a segmented yellow and black circular display. If the driver fails to acknowledge the warning horn within a set time period, the brakes are applied automatically.

Where AWS equipment is provided on the approach to reductions in permissible speed and temporary/emergency speed restrictions, the cab equipment always operates in a manner equivalent to the approach to a signal displaying a caution or stop aspect. The driver receives a warning and has to respond to it accordingly; otherwise the brakes are applied automatically.

## 9 Credits

As usual with all projects there is a long list of people to thank. So in no particular order here are the stars of the show.

Jeff Douglas  
Danny Leach  
Adam Rose  
Peter Why  
Adebenga Adeleye  
Jordan Searle  
Derek Siddle

Colin Ross  
Kevin McGowan  
Ben Jervis  
Jade Ellen  
Stuart Galbraith  
QA Department

Beta Testers

Thanks for all the feedback, comments and suggestions throughout the creation, testing and completion of this project.



