porterbrook

Class 159 Diesel Multiple Unit

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Passenger Satisfaction

The Class 158 “Super Sprinter” was the ultimate development of the “Sprinter” concept, a unit specifically designed to provide a fast, efficient and comfortable service for medium to long distance services. The 23 metre long vehicles have end doors and air conditioning allowing a true “Inter – City” ambience. Ride is excellent thanks to the “Series 4” bogies and air suspension also used on higher speed stock.

To retain good route availability despite their increased length the vehicles are slightly narrower than the earlier “Sprinter” vehicles but easily accommodate 2 + 2 seating using comfortable seating with tables and armrests.

The entrance doors are set back from the vehicle ends to avoid excessive stepping distances and this provides additional flexible space at the vehicle ends. Toilets are located in this area to avoid reducing passenger space and careful design of the new toilet for passengers of reduced mobility has allowed this to fit in the same space as the original non-compliant version.

Narrow window pillars combined with the long, open saloon make these ideal vehicles for scenic routes making them a preferred choice for lines such as Kyle of Loch Alsh, the far north line, Central Wales and Settle - Carlisle.

The vehicles were built to achieve the best possible performance from the 400 hp engine available at the time, hence their light weight Aluminium construction. Weighing in at only 38.5 Tonnes per vehicle makes them one of the most efficient DMUs on the UK network. Although designed for long distance work they retain coupling compatibility with the 14X/15X series vehicles and so can be used for strengthening urban services if required.

Many units have had new air conditioning systems fitted, along with passenger information systems and CCTV.

A fully refurbished Class 158 interior will provide a competitively priced train with a passenger environment at least as good as any new DMU and with a better carbon footprint than any DMU, new or old.

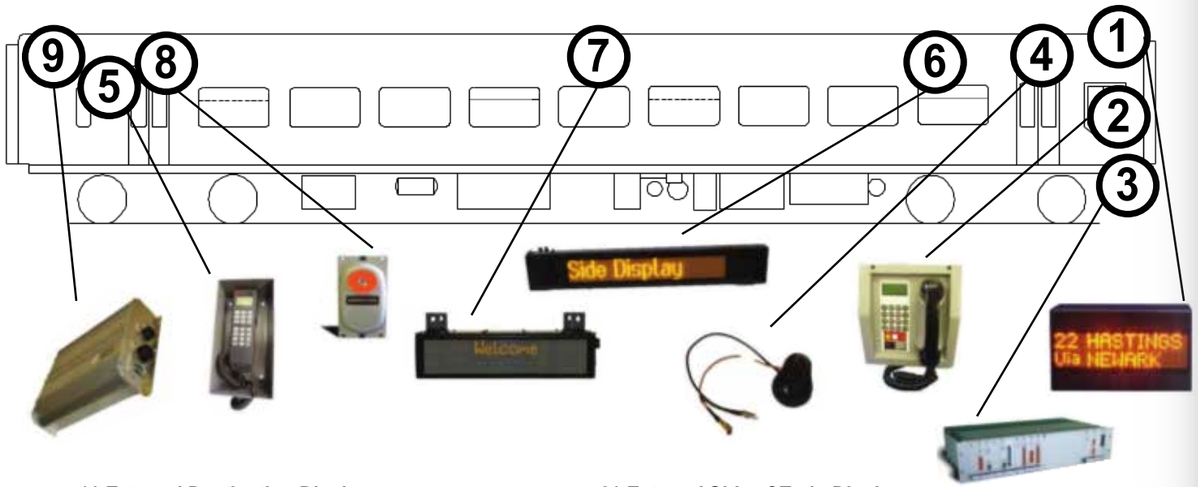
Refurbishment and Modernisation

As might be expected for a vehicle introduced in 1989 the vehicle interiors have been revised and updated to meet the needs of modern-day operators. No major engineering improvements have been necessary, the drive train and bogies remaining as built. .

The vehicle interior as built uses many GRP fittings with square-key locked lighting diffusers. Replacing the luggage rack and lighting system is a way of economically updating the vehicle appearance while further improving its “green” credentials by using low energy lighting such as LEDs..

Although performance is excellent there is a possibility of either further enhancing acceleration or improving fuel economy by fitting a mechanical ZF gearbox in place of the Hydraulic Voith transmission. Where station stops are close together this could save up to 10% on fuel consumption or give improved acceleration.

Passenger Information System



1 | External Destination Display

Installed in each driving vehicle. PRM TSI compliant Yellow LED Ultra Bright sunlight legible with automatic brightness control in single or multi-line.

LED Matrix size can be manufactured to any particular requirements, although many proven existing designs are available from our portfolio. Displayed messages may be static or scrolling.

2 | Drivers Interface Unit (DIU)

Installed in each driving vehicle. Provides the driver interface for PA, Cab to Cab, Passenger Alarms, Radio Systems and controls for the Passenger Information System. Layout and size manufactured to any particular requirements, although many proven existing designs are available from our portfolio.

3 | Passenger Information System Controller

Installed in each driving vehicle. Communicates via standard train wires or Ethernet network to all PIS equipment throughout the train. Route Database files are uploaded to this unit via a GPRS communications link for automatic broadcast of journey related announcements. Can be supplied 19 inch rack based (half Euro height) or as a sealed bulk head mounting unit.

4 | Dual Antenna

Installed on the roof of each driving vehicle. A low profile dual antenna (GPS and GPRS) enables geographic tracking and data upload/download.

5 | Stewards Handset

Provides PA, Cab to Cab and triggering of recorded messages. Installed at the Stewards Point in each car.

6 | External Side of Train Display

Installed adjacent to each door. Outward facing, side of train display. PRM TSI compliant Yellow LED Ultra Bright sunlight legible with automatic brightness control in single or multi-line.

LED Matrix size can be manufactured to any particular requirements, although many proven existing designs are available from our portfolio. Displayed messages may be static or scrolling.

7 | Internal Saloon Display

PRM TSI compliant, supplied as single or double sided, these displays are suspended centrally or mounted on the bulk head walls in the saloon vehicles. Standard brightness in single colour or multi-colour LED formats. Single or multi-line, high or low resolution.

LED Matrix size can be manufactured to any particular requirements, although many proven existing designs are available from our portfolio. Displayed messages may be static or scrolling.

8 | Passenger Emergency Alarm Communications Unit (PEACU)

Provides emergency speech and emergency brake functions. Includes a loudspeaker/microphone and large red button (latching or non latching) and indicates to the passenger when to speak to the driver. Suitable for installation adjacent to doors, disabled seating locations and within toilet modules.

9 | Saloon Audio Control Unit (SACU)

Installed in each vehicle, this is the PA amplifier and interface to all saloon equipment including loudspeakers, Displays, Passenger Alarms and Stewards Handsets.

Passenger information systems are a requirement for PRM TSI compliance but are also invaluable for any occasional traveller. The system proposed will be compatible with other units allowing the Class 158's inter-working capability to be retained. Enhancements are possible to the system to meet further information requirements and exact display configuration is flexible to customer preference.

Passengers of Reduced Mobility (PRM) Provision

The vehicles require modifications to the layout for operation in 2020 and beyond : -

- Priority seats (if not already fitted)
- Second wheelchair space required (both spaces to be near toilet)
- Call for aid buttons to be fitted in toilet and wheelchair spaces
- Door sounders – required in all external door control panels
- Universal Toilet to be fitted (planned for next overhaul)
- Passenger Information System (if not already fitted)

The first of the "Sprinter "series units have now been converted for PRM compliance, using the same equipment as proposed for Class 158 providing reassurance that the Class 158 modifications will be undertaken efficiently and economically.


Source: Class 156 PRM TSI

The universal toilet was specifically designed for the Class 158, this being the "limiting case" on size. Since this was so critical to the layout of the units a full-size mock up was constructed to demonstrate compliance can be achieved within the tight confines of the end of the vehicle.


Source: Class 156 PRM TSI

Engineering

The drive train of all Class 15X units became a byword for reliability when they were introduced in the 1980s. Since then there has been no need to change the successful Cummins – Voith – Gmeinder configuration, although the engine used in the Class 158 is a more powerful variant than in the rest of the “Sprinter” series.

The ZF gearbox offers better fuel economy on some routes and hence Porterbrook is running a test programme to verify figures and prove reliability. Previous modifications and simulations indicate a fuel saving of 10% will be achieved with the new transmission configured for existing performance. Maintenance intervals for the ZF transmission need to be more frequent, but the cost of the overhaul is less so costs remain constant over the longer term.

The new transmission can also offer enhanced acceleration if required, but at the expense of fuel saving. It should be noted that there is no benefit from the new transmission once the train has accelerated to around 30 mph so for journeys with infrequent stops the modification is unlikely to have a good business case.

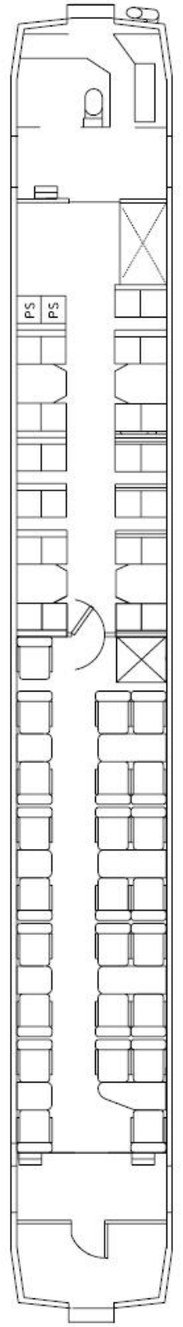
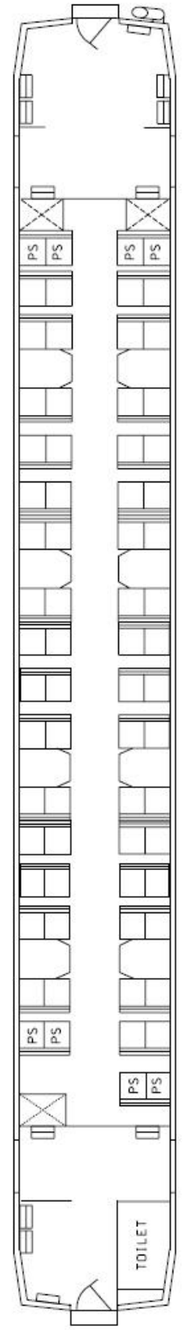
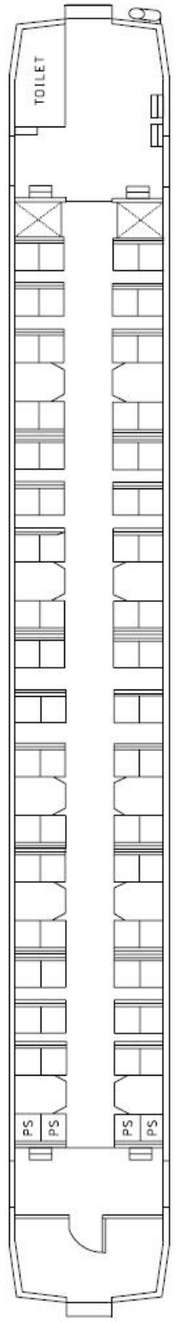
Technical Information

159 Data Sheets

Basic information

	DMCL	MSL	DMSL
Class	159 Super Sprinter		
Sub class	0		
Manufacturer	BREL- Converted from 158 at Rosyth Royal Dockyard pre-service		
Number of vehicles	22	22	22
Route availability	RA1		
Power	DMU- Diesel Engine on each vehicle Engine: Cummins NTA855R3, 400 hp at 1900 rpm Voith T211rz hydraulic and Gmeinder GM190 final drive transmission		
Hardware			
Length	22.16m	22.16m	22.16m
Width	2.70m		
Height	3.73m		
Gauge	Standard UK rail gauge (1435mm)		
Axle load	9.62t tare	9.62t tare	9.62t tare
Coupling compatibility	BSI auto or bar Couplers. Compatible with 14x, 15x and 170 vehicles		
Performance			
Maximum Speed	90 mph		
Acceleration	Unknown		
Braking Capability	Unknown		
Braking System	Disc Brakes		
Other features			
e.g. In-cab radio system, CCTV, other passenger-enhancing facilities.	GSMR Radio, R2P CCTV System with Remote Viewing Access, Arrowvale OTMR with remote access and download capability to Nexala. SA Viewcom/Axion Passenger Information System 12 at Seat 240V computer/mobile phone charging points in 1st Class		

	DMCL	MSL	DMSL
Day to day operation			
Door configuration	4 doors per vehicle. Twin–leaf swing-plug		
Seating Configuration	2+2 standard, 2 + 1 First Class		
No. of seats	23 First 28 Standard 3 Tip up	70 Standard 10 Tip Up	72 Standard 6 Tip up
Floor space for standing	?	?	?
Toilets	1	1	1

	DMCL	MSL	DMSL
Layout Diagram			

Build dates

Unit	DMCL	MSL	DMSL	Year of Manufacture	Previous numbers (if changed)
159001	52873	58718	57873	1992	
159002	52874	58719	57874	1992	
159003	52875	58720	57875	1992	
159004	52876	58721	57876	1992	
159005	52877	58722	57877	1992	
159006	52878	58723	57878	1992	
159007	52879	58724	57879	1992	
159008	52880	58725	57880	1992	
159009	52881	58726	57881	1992	
159010	52882	58727	57882	1992	
159011	52883	58728	57883	1992	
159012	52884	58729	57884	1992	
159013	52885	58730	57885	1992	
159014	52886	58731	57886	1992	
159015	52887	58732	57887	1992	
159016	52888	58733	57888	1992	
159017	52889	58734	57889	1992	
159018	52890	58735	57890	1992	
159019	52891	58736	57891	1992	
159020	52892	58737	57892	1992	
159021	52893	58738	57893	1992	
159022	52894	58739	57894	1992	

Heavy Maintenance

Activity	Commencement	Duration	Nature of activity	Responsible party
C4				
C6	7-8 years over lease duration			
Paint	7-8 years over lease duration			
Engine overhaul				Lessee
Gearbox overhaul				Lessee
Wheelset				Lessee

Modifications

Modification	Duration	Nature of activity	Responsible party
Base Offer			
Enhanced Offer			

Information not supplied

Any information not supplied because of a lack of availability must be listed here under the 'reasonable endeavour' clause of the competition commission's ruling.

- Max. acceleration
- Braking performance
- Modification commencement dates
- Modification durations