

New Multiple-Unit Stock for Hastings and Watford Services



Motor and trailer coaches of new diesel-electric train for the London-Tunbridge Wells-Hastings services

IMPORTANT additions to the multiple-unit rolling stock of British Railways entered service recently. In the Southern Region, diesel-electric trains have been inaugurated between London and Hastings, *via* Tonbridge and Tunbridge Wells; and on the electrified suburban lines of the London Midland Region, from Euston to Watford, and from Broad Street to Richmond, new rolling stock is replacing that previously in use.

Six-car sets have been provided for the London-Hastings services. Such units can be coupled together to form a 12-car train, and at present it is planned to build ten sets. The trains can cover the 62-mile journey between Charing Cross and Hastings non-stop in 90 min., and are being used to provide improved timings for both business and holiday trains on this heavily-graded route.

The new trains represent the first application on British Railways of the diesel-electric form of transmission with this type of multiple unit. Another feature new to British Railways is the provision of two-position adjustable seats in the first class compartments. In this design, the seat squab can be pulled out some six inches, the seat back being attached to the seat to give a less upright sitting position.

In each six-car set, power is supplied by two 500-h.p. supercharged diesel engines, one at each end of the train. The make-up of six-car sets is two diesel-electric motor coaches (one at each end) and four corridor trailers.

The construction of the coaches is being undertaken by the Ashford and Eastleigh Carriage Works of the Southern Region, the underframe and bogies being built at Ashford and the coach bodies and interiors being finished at Eastleigh. Because of the restricted loading gauge of the Hastings line between Tunbridge Wells and Crowhurst, it has been necessary to use straight-sided bodies with a width of 8 ft. 0 $\frac{3}{4}$ in. over the panels.

The underframes are of the standard British Railways welded construction, 56 ft. 11 in. over headstocks for the first seven units, and 63 ft. 5 in. over headstocks for all subsequent units. Trailer coach bogies are of standard single-bolster type with inside swing hangers, and are fitted with Hoffman roller bearings; wheels are 3 ft. 6 in. dia. The motor coaches are carried on two of the more recent type of motor bogies with Hoffman roller bearings and 3 ft. 4 in. dia. wheels. Traction motors are in the trailing bogie of the motor coach by reason of the weight of the power equipment at the front end.

Both motor coaches are identical and contain from leading end:—driver's cab, engine room, guard's and baggage van, and second class passenger saloon with vestibules at each end. Of the four trailer coaches, three are second class coaches of the open type and the fourth is a first class side-corridor coach. Each trailer coach has two lavatories.

The controls, consisting of a master controller and brake controller, and auxiliary electrical apparatus, are in the driving compartment, and the layout is similar to that on the latest Southern Region electric multiple-unit stock. The power unit, oil and water coolers, fuel

changeable with, those used on the most recent Southern Region electric stock. The continuous rating of the motors is 205 h.p. each. The auxiliary generator supplies low tension circuits at 90 volts for lighting, control gear and battery charging.

Control equipment consists of electro-pneumatic and electro-magnetic contactors and group switches. All of the power contactors and relays are carried in one case suspended from the underframe. The remaining control gear is carried in the auxiliary cupboard which forms the partition on the offside of the driver's cab. The air reservoirs, air



Open second class saloon in one of the London-Hastings sets

supply unit and filters are in the engine at the rear of the cab. The power unit is three-point mounted on rubber pads, and quick-release pipe fittings are incorporated.

Power is provided by an English Electric pressure-charged 4-cyl. diesel engine set to give 500 b.h.p. at 850 r.p.m., direct coupled to an English Electric six-pole generator of 330 kw. output and an overhung 13.2 kw. six-pole auxiliary generator. The main generator supplies two four-pole, nose-suspended, axle-hung traction motors connected in permanent parallel and mounted on the motor coach rear bogie, which is identical to, and inter-

compressor, brake cylinder, electro-pneumatic brake unit, two fuel tanks and two battery boxes are suspended from the underframe between the bogies. The fuel tanks have a total capacity of 340 gal., enough for about 800 miles.

In the first seven sets, the motor coaches have seats for 22 passengers, the trailer open seconds 52 seats, and the trailer corridor first 42 seats—a total of 242 seats for a six-car unit. In the later sets, the motor coaches have 30 seats, trailer corridor seconds 60 seats, and the trailer corridor first 48 seats—a total of 288 seats. Electric heating is provided and current is supplied from the main



Train of two three-car sets at Stonebridge Park Depot, on the London electrified suburban lines of the L.M.R.



Interior of a saloon coach, showing seating arrangement

generator, a combination of convectors and radiator heaters being used.

The estimated tare weights for the coaches are as follow :—

	Short frame	Long frame
Motor second ...	54 tons 2 cwt.	55 tons
Trailer first ...	28 tons 10 cwt.	29 tons 5 cwt.
Trailer second ...	28 tons 10 cwt.	29 tons 5 cwt.

For the time being, steam-operated services have not been completely super-



Driver's compartment in motor coach of new L.M.R. electric stock

seded. The final stage of the conversion is due to take place in June, 1958, when all steam trains will be eliminated, including those on the branch from Crowhurst to Bexhill West, for which a two-coach unit will be provided. Refreshment car facilities also are to be introduced.

In the London Midland Region, 57 new three-car multiple-unit electric sets are replacing those previously in use on the London suburban services. Each unit has a motor saloon brake, a compartment trailer, and a driving trailer saloon brake, and provides accommodation for 256 passengers. Power is supplied to the trains at a nominal 630-volt d.c. on the third- and fourth-rail system.

The general construction of the body

and roof framing is similar to that of the British Railways standard main-line steam stock coaches, which enables many standard components, such as body pillars, rails, cantrails, and roof members, to be used, avoiding the necessity for the provision of new press tools and construction jigs. Many standard fittings are also used in the interior of the coaches, and wherever possible other standard British Railways main-line steam stock components have been adopted to meet the requirements of non-gangwayed suburban electric coaches.

The saloon seat ends are inclined from the floor towards the body sides, so forming a centre gangway with maximum possible width at shoulder height and yet providing the widest possible seating room, this being arranged for two and three passengers either side of the gangway, with seating for six passengers at each transverse partition. Six seats each side are provided in the compartments of the trailer coaches.

Parcel racks of aluminium castings and tubes are provided over seat backs and on transverse partitions. Electric heaters are fitted under all seats with protection grids to prevent litter from accumulating around the heater. The ceilings and transverse partitions above seat backs are finished in decorative plastic panels; the remaining interior panelling is of decorative veneers. The floor is constructed of multi-ply timber panels carried on pressed steel framing members welded to the underframe, the whole being covered with linoleum. In the motor coach, accommodation is provided in the floor for cable conduits, by the use of aluminium panels instead of the multi-ply floor panels in part of the centre portion.

The underframes are the British Railways standard all-welded type with deep main longitudinal centre girder and cantilever transoms to the 7-in. \times 3½-in. channel solebars. The use of this type of underframe, without side truss angles, provides much easier access to the electrical equipment carried underneath the coach and enables the frames to be built in existing jigs used for the construction of British Railways standard steam stock underframes.

Westinghouse electro-pneumatic brakes are fitted, each coach being equipped with one brake cylinder with automatic slack adjuster. A hand brake is also provided

which acts on all wheels and is operated by a wheel in each driver's compartment. The brake rigging is partly compensated on the motor coach with adjustable equalising and compensated rigging on the trailer and driving trailer, and fitted with standard British Railways cast-iron refill brake blocks throughout. Coupling between coaches is by gedge hook and screw coupling.

Both the motor and trailer bogies incorporate the principal design features of that adopted as standard for British Railways main-line steam stock, but having a single centre bolster suspended from inside the bogie frame. The motor coach is fitted with two motor bogies which are mounted on 3 ft. 4 in. dia. wheels, one motor being fitted on each motor axle, with the motor nose resting on a rubber block carried on a bracket welded to the bogie transom. The suspension bolts securing the motor nose to the bracket pass through the mounting and contain the rubber springs which cushion the upward thrust of the motor nose; lateral control of the motor nose is also rubber cushioned.

The trailer and driving trailer bogies are fitted with British Railways standard 3 ft. 6 in. dia. wheels and axles having 7 in. \times 4 $\frac{3}{4}$ in. journals, the journal size of the motor bogie being 10 in. \times 5 $\frac{1}{2}$ in. and 7 in. \times 4 $\frac{3}{4}$ in. The bogie axleboxes are for parallel roller bearings of the Hoffman type. All bogie axleboxes, horn cheeks and bolsters are fitted with manganese steel wearing plates.

The master controller and brake controller are self-contained units mounted on brackets from the front of the cab framing, and contained in the instrument panel on the left of the cab are the pressure gauges, speedometer, window wiper, and dimmer switch. Two large windows are provided in the front of the cab with a roller type of route and destination indicator between them, both windows and indicator being fitted with $\frac{1}{4}$ -in. thick toughened plate glass. The driver is provided with a tip-up adjustable seat and an additional tip-up seat is fitted for the use of drivers under instruction.

A particular feature of these units is the accommodation provided in the driver's compartment, entrance to which is made through a sliding door from the adjacent guard's compartment in the

motor coach and driving trailer coach, no outside doors being fitted to the compartment itself. The guard's compartment in these units is in accordance with the standards agreed for all British Railways coaching stock, and includes many standard components.

Positive and negative shoe-gear is provided on both bogies of the motor coach and on the bogie at the cab end of the driving trailer, all being interconnected by bus lines. On seven motor coaches a new design of shoe-gear is fitted which has been developed to improve current collection, reduce wear and eliminate the noise emitted by normal types of gravity shoe-gear when not in contact with the conductor rail.

Simplex control of the four motors in a motor coach has been adopted, each bogie carrying two motors in permanent parallel, and the two groups being connected in series or parallel by a single control equipment. This system economises in contactors compared with duplex control, in which the two motors in each bogie are controlled separately, each pair being connected first in series and then in parallel during acceleration. Provision has been made for emergency starts with two motors in a motor coach isolated on steep gradients, such as the 1 in 37 of the Primrose Hill flyunder, near Euston.

In 15 of the units the driving trailers are equipped with de-icing fluid reservoirs from which the fluid can be fed to the conductor rails through the shoe-gear. The supply of fluid is controlled by electro-magnetic valves which can be energised by the operation of de-icing pushbuttons at each driving position when the reverser is in either of its "forward" positions. A de-icing relay connected across the electro-pneumatic brake train line opens the circuit to the valves when a brake application is made. Contacts operated by linkage connected to the positive collector shoes are arranged to break the circuit of the associated valve when its shoe is not on the conductor rail.

The coaches are being built in the British Railways works at Eastleigh, and the motor bogies at Ashford. The complete electrical equipment for the trains has been supplied by the General Electric Co. Ltd. All are expected to be in service by September.