New Electric Locomotives for Southern Region

ELECTRIC locomotives of a new type are (as recorded already in our columns) being delivered to the Southern Region for the Kent Coast electrified service starting in June. The first, No. E5000, was completed in the British Railways workshops at Doncaster early in January. The initial order consists of 13 locomotives, required to handle freight trains of up to 900 tons over the heavily-graded routes of the South Eastern Division of the Region. They will also operate, to express schedules, fully-fitted trains of thirty or more Continental train ferry vehicles, and heavy passenger trains, including the " Night Ferry." These duties demand a locomotive with good adhesion characteristics, a large number of running notches, and a fairly wide range of traction-motor field weakening.

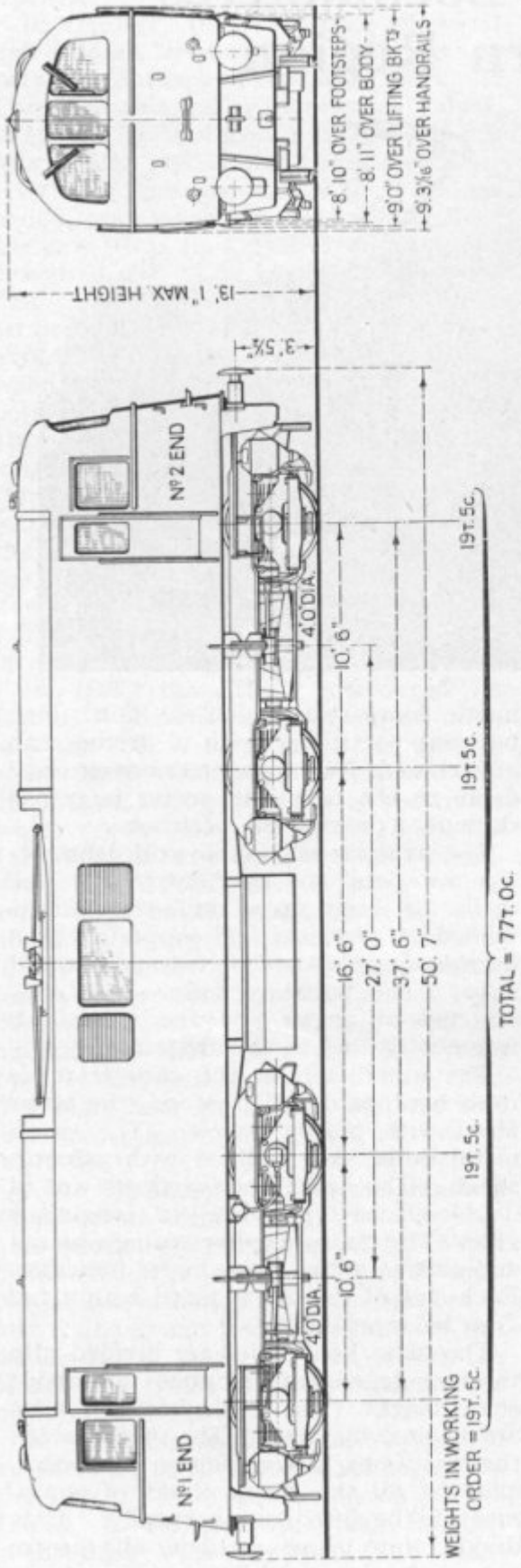
The body design is to the requirements of the British Transport Commission Design Panel in association with the Design Research Unit. The lines are intentionally unelaborate and the curved body sides conform with the British Railways standard coaching stock.

The bodywork is not intended to take any main stresses and is therefore of comparatively light and simple construction. It consists of a central equipment compartment, 38 ft. 2 in. long between partitions, with a driving cab at each end. There are no direct external doors to the cabs and access is gained through a door in the partition.

The cabs are of double-skin construction for sound and heat insulation. The shells are built up of mild-steel sheets welded at all joints and supported by a framework composed of tees, angles and strip. The partition frames are constructed of angles and the whole cab frame is riveted to the underframe.

The inner skin of the cabs is made from hardboard and plywood, the latter faced with plastic panels. The sheet-metal outer skin is lined with asbestos sheet. The front cab windows are of double-glazed type with $\frac{1}{4}$ in. toughened glass. The centre window is single-glazed and carries a two-figure route indicator. Each side of the cab is fitted with a full drop balanced light.

The main body sides are divided into three independent sections of about equal length. The joints between them are covered by straps. The roof between the partitions is completely removable, allowing all the major items of equipment to be lifted out vertically. It is divided into three sections, the centre one containing a well to accommodate



the pantograph in the lowered position.

There is a cast aluminium-alloy entrance door at each corner of the main compartment, adjacent to the partitions, fitted with a full drop light. There is a drop light at the centre of the locomotive on the gangway side. The non-gangway side is largely taken up with louvred air inlets for the booster, traction motor blower, and booster starting resistances.

A false floor over the whole area of the body provides a space for all the cable and pipe runs. The main floor in the equipment compartment is composed of aluminium treadplate, while the floor between the entrance doors and the cab is of wood plank construction. The cab floors are covered with linoleum.

The underframe is a fabricated structure consisting essentially of two longitudinal members, spaced closely together on each side of the locomotive centre line, two dragbox assemblies, and two main cross members at the bogie centre lines. Brackets to carry the battery boxes and other details are cantilevered out from the main longitudinals. There are no solebars in the accepted sense, but light channel-section members, independent of the main underframe over their middle portion, act as supports and bottom stiffeners for the body sides. The top of the underframe, which is flat, is covered by steel plates, $\frac{1}{8}$ in. thick, continuously welded in position, to form a dust-tight underfloor seal.

The main characteristics of the new locomotives are as follow :—

Weight in working order	...	77 tons
Radius of minimum curve	...	4 ch.
Nominal supply voltage	...	675 volts d.c.
Maximum service speed	...	90 m.p.h.
Gear ratio	...	76 : 22
Traction motor voltage	...	675 volts
1 hr. rating of motors ...	...	638 h.p.
1 hr. rating of locomotive	...	2,552 h.p.
Tractive effort, nominal max.		43,000 lb. at 25 per cent. adhesion
Tractive effort, 1 hr.	...	20,000 lb. at 47 m.p.h
Control voltage		110 volts
Control air pressure ...	...	70 lb. per sq. in.
Generator rating (continuous)		945 kW., 1,400 amps, 675 volts
Cooling air	...	6,500 cu. ft. per min.
Auxiliary generator ...	...	9.2 kW., 83.5 amps, 110 volts

The centre of the equipment compartment is occupied by the motor-generator booster set, comprising three machines : booster motor, booster generator, and overhung auxiliary generator. The small auxiliary generator provides control circuit and battery charging supplies and is a 110 volt d.c. machine with no bearings.

The electrical control equipment is mounted in two frames. The larger one, containing the main line-breaker and current limiter, booster notching camshaft, resistance shorting and traction motor contactors, the reverser and field tap switch for Nos. 1 and 2 traction motors, and associated relays, is positioned at the No. 1 end of the equipment compartment. It contains also a small control panel for line voltage control switches and fuses.

The smaller frame at the No. 2 end contains the booster field regulating camshaft, resistances and associated relays, with the reverser and field tap switch for Nos. 3 and 4 traction motors. Both frames are completely encased with dust-tight removable panels and doors.

The generator of the large-capacity single-booster motor-generator set is connected in series between two parallel pairs of traction motors wound for full line volts. The output of this machine is 945 kW at 1,750 r.p.m. and the motor of the set has a continuous rating of 1,360 h.p. at 675 volts. The armatures of both machines are identical and interchangeable although the frames and field systems are necessarily different.

The motor and generator armature shafts each carry a heavy flywheel to provide kinetic energy to help maintain the speed of the set during normal supply interruptions. Each flywheel has a powerful electro-pneumatically operated rim brake which can be used to stop the set quickly.

The master controller has two handles :—the master switch which has four positions : off, forward, neutral, and reverse ; and the main controller handle which has five positions : off, run-back, hold, notch-up, and run-up. An off-side controller, of simplified form, performs starting and setting-back operations. This controller has no run-up position.

The master controller has an interlocking device between the two handles and neither can be moved from the off position until a small key is inserted in the controller and turned. This key is similar to that used for the multiple-unit trains and diesel-electric locomotives.

Photo] [*S. Creer*

No. E5000 passing Balham on a test trip with 12 coaches from Victoria to Newhaven on February 13

The locomotives are fitted with compressed-air brake equipment and the system is one in which the vacuum brake, when in use on the train being hauled, is compressed-air controlled. Provision has been made for the haulage of Continental stock using an air brake on the train, and this feature also enables dead multiple-unit stock to be hauled, should this be necessary.

The layout of the two cabs is identical. There is an adjustable tip-up seat for the driver on the left-hand side, with a simple tip-up seat on the opposite side for a second occupant of the cab. Desks are fitted on both sides, that on the driver's side embracing the main controller and driver's brake valves. A sloping instrument panel contains air pressure and vacuum gauges, a speedometer, ammeter, and notch indicator. A two-level deadman's pedal is arranged in

a recess in the desk, enabling the locomotive to be driven from either the seated or standing position.

The desk on the right-hand side mounts the hand brake wheel, and contains a simplified controller and a brake valve. A deadman's pedal is below the desk, thereby enabling the locomotive to be driven from this side when necessary for shunting and, particularly, setting-back movements. An indicator light and switch panel is arranged between the two desks underneath the route-indicator box.

Other fittings include compressed-air operated window wipers, sun visors, a pigeon hole for timetables and train-heating switch box and indicator. Electric heaters are fitted under the seats, and there is an air extractor in the cab roof. Provision is made in the layout of the cab for the installation at a later date of British Railways standard a.t.c. equipment.