BRITISH RAILWAYS DIESEL LOCOMOTIVES AND RAILCARS

****

APPENDIX I TO PART II

GROUP No. 6

DRIVERS INSTRUCTIONS FOR OPERATING MULTI-ENGINED DIESEL RAILCARS

DIESEL LIGHTWEIGHT TRAINS

TWIN OR FOUR CAR SETS

POWERED BY LEYLAND TYPE

125 H.P. ENGINES.

INTRODUCTORY NOTE.

The instructions contained in this booklet are preliminary and may have to be modified as experience is gained in the operation of these railcars. The information contained however should serve as a useful guide to enginemen and others concerned in carrying out their duties.

INDEX

The booklet is set out as follows :-

Part 1.

GENERAL DESCRIPTION.

Each car is powered by two engines. Driving controls are provided at one end only of each car. The train may be made up of twin car sets or as a four car train. When the trains are marshalled a driving compartment will be at each end.

TECHNICAL DATA.

CARS NOS. E.79,000 to E.79,007.
CARS NOS. E.79,500 to E.79,507.

Type	2-2-2-2 (1A-A1)
Weight in running order	27 ton 5 cwt. 0 qrs.
Tractive effort at wheels.	
Single car.	
a. Torque converter drive	(Max.) 8,575 lbs.
b. Direct drive	(Max.) 1,775 lbs.
Wheel base (car)	48 ft. 6 ins.
Wheel base (bogie)	8 ft. 6 ins.
Bogie centre distance	40 ft. 0 ins.
Wheel diameter	3 ft. 0 ins.
Width overall	9 ft. 2 ins.
Length overall	121 ft. 4 ins. (Twin car unit).
Height overall	12 ft. 8⅛ ins.
Minimum curve negotiable	3½ chains.
Max. speed	
a. Torque converter drive	36 m.p.h.
b. Direct drive	60.0 m.p.h.
Fuel oil capacity	112 gallons.
Lubricating oil sump capacity	10 gallons.
Cooling water capacity	26 gallons.
Control system	Electro-pneumatic.
Brake system	Vacuum.
Warning device	Twin pneuphonic horns.
Sanding	Pneumatic.

Engines.

Two six cylinder 9.8 litre horizontal oil engines.	Leyland Motors Ltd. Type 0600/229 B.H.P. 138 (Gross). R.P.M. (Max.) 2000.
Compression ratio:	15.75 to 1.
Bore:	4.8" (122 m/m).
Stroke:	5.5" (139.7 m/m).
Firing order:	1, 5, 3, 6, 2, 4.
Rotation:	Clockwise.
Fuel injector type:	Leyland type N.31.
Fuel injector lifting pressure:	145 atmospheres (2130 lb/sq.in.)
Fuel pump type:	B.P.E.6B.75T. 32056189X.
Injector timing:	26° B.T.D.C.
Weight with engine driven auxiliaries:	1T. 2 cwts. 1 Qtr.

Transmission.

Type:	Lysholme-Smith hydraulic Torque Converter with direct drive and free wheel incorporated.
Makers:	Leyland Motors Ltd.
Torque Ratio (Converter drive)	4.5:1
Torque Ratio (direct drive)	1.1
Final drive gear ratio	3.58:1
Reversing arrangement	Axially sliding pinion between bevel gears in constant mesh in final drive gearbox.

Auxiliaries

Battery:	NIFE. Type LR.23.18. cells. 235 A.Hr. Capacity.
Generator:	C.A.V. G7A24. 24v. clockwise rotation. Belt driven.
Starter Motor:	C.A.V. US.24-13. 24v.
Compressor:	Westinghouse type E.15. Gear driven.
Exhauster:	Clayton-Dewandre. Type 725. Belt driven.
Car heater equipment:	Smith's hot air heater.
Windscreen wipers:	Pneumatic.
Speedometer:	Smith's (electrical drive).

DRIVING CONTROLS IN CABS.

(1) Interlocking isolating switch (with removable key).

(2) Main controller, incorporating the Deadman's Handle.

(3) Reversing switch. } one removable Key only provided for both controls.

(4) Torque converter control switch. }

(5) Engine start buttons.	(8)
(6) Engine stop buttons.	(8)
(7) Engine indicator lights.	(8)
(8) Reversing indicator lights.	(6)
(9) Engine tachometers.	(2)

(10) Car heater switches and main car switches.

(11) Sander switch (foot operated).

(12) Dual horn control.

(13) Speedometer.

(14) Air pressure gauge.

(15) Vacuum gauge.

(16) Driver's brake valve handle.

(17) Hand brake.

Part 2.

DRIVERS' DAILY DUTIES WHEN IN SERVICE.

(i) Obtain cab door key and driver's brake valve handle.

(ii) Place driver's brake valve handle in position in cab from which the train is to be driven and move from lap to running position.

(iii) Check that detonator cases are intact.

(iv) Check that fire extinguishers are intact.

(v) Report all known defects at the end of each turn of duty.
(Make a short inspection of the train at a convenient time and check that the apparatus is generally in good working condition, also check fuel tank level.)

Part 3.

STARTING THE ENGINES.

(1) Place the interlock isolating switch key into position and turn into one of the two "ON" positions. (In the "ON" position it is not possible to remove key.)

(2) Place torque converter control switch in position and select neutral - "N" position.

(3) Depress throttle handle, which incorporates the Deadman's Handle, and whilst holding down press each engine starter button in turn and check that the indicator lights are extinguished.

(4) If the air pressure is less than 40 lbs./sq.in. move throttle handle to second engine speed and hold in that position until the air pressure builds up to 80 lbs./sq.in., then return throttle to idling position but do not release the DEADMAN'S HANDLE.

(5) When 21 inches of vacuum has been created partly apply vacuum brake, release Deadman's Handle and take off hand brake.

(6) Check that the reverser is in the correct position for the direction of travel: If not, with the vacuum brake still partly applied, remove converter control switch key, place into reverser switch, select required position, then return key to converter control switch and check that the reversing indicator lights are extinguished. If one or more of the lights remain glowing select

converter drive "C" position on the converter control switch, keeping the engines running at idling speed, when all reverser indicator lights should be extinguished. If, however, engagement of reverse gear is still not effected, release the vacuum brake and allow the train to move slightly forward. This should complete the gear engagement and the indicator lights should be extinguished. Return converter control switch to the "N" position.

NOTE - Should the above procedure fail to extinguish the reversing indicator light the appropriate action is detailed under RUNNING - IN TRAFFIC, "Faults in Final Drive".

Part 4.

RUNNING - IN TRAFFIC.

Starting the Train.

(1) Before moving the train, check that the air pressure is built up to 80 lbs/sq.ins. and that the vacuum gauge is indicating at least 21 inches on the reservoir side.

(2) Select converter drive position - "C".

(3) Release vacuum brake and move throttle handle to 1st engine speed. Progressively move throttle handle from 1st to 4th speed with a slight pause in each speed notch.

(4) When the train speed reaches 35 miles per hour, return throttle handle to idling position. After a short pause select direct drive "D" on the converter control switch and then return throttle handle to 4th speed position, pausing slightly at each speed notch. The train speed will gradually increase until the required speed is attained when the throttle can be returned to a lower notch if by doing so running time is maintained.

The brakes must not be applied with the throttle handle in a power notch.

If the driving wheels slip, return throttle handle to idling position and then operate sanders. DO NOT OPERATE THE SANDERS BEFORE RETURNING THE THROTTLE TO IDLING POSITION.

Coasting.

A free wheel is fitted on the output shaft of the torque converter enabling the train to coast in either "C" position or direct drive "D", the train can therefore overrun the maximum running engine speed of 2,000 R.P.M. When this occurs the throttle must be returned to idling speed.

Changing Down from Direct to Converter Drive.

If the speed of the train is reduced for any reason to 35 m.p.h. or below, the torque converter drive should be engaged. Return throttle handle to idling position and move converter switch from "D" to "C" position, then open throttle again as required, making a slight pause in each speed notch.

Engine Failure.

In the event of an engine stopping, the appropriate indicator warning light will glow. The following procedure should be carried out:-

(1) Return throttle handle to idling position, place converter switch to neutral, press starter button for the engine concerned ONCE ONLY. If the engine restarts proceed normally.

If the engine stops again in a drive position, no further attempt should be made to restart it, but proceed with train to terminal or other convenient point with the remaining engines turning.

(2) Check for cause of failure as soon as possible and report the matter for immediate attention.

(3) See section headed "FAULTS IN TRAFFIC" for possible causes of engine stoppage.

Faults in Final Drive.

(1) If any of the reverse indicator lights glow, when running, return throttle handle to idling position IMMEDIATELY, and when the light is extinguished restore throttle to required position to maintain running time.

The train should not normally be driven with the indicator lights glowing.

(2) Faulty operation of the reversing control will be indicated by the appropriate signal lights glowing. If the fault is in either of the two final drives of the leading car, the defective drive will be shown directly, i.e. either No.1 or No.2 reversing light will glow.

If the defective final drive is in a trailing vehicle then the indication will be "General" in the driving compartment, i.e. the appropriate train light will glow in the left hand group.

It will then be necessary for the driver to proceed in turn to the driving compartment of each car comprising the train.

The defective final drive will be located when it is observed that both the "General" and "Local" panel lights are illuminated in the driving compartment of the car concerned.

Isolating Defective Final Drive.

The only immediate action necessary by the driver, to enable the train to be worked to a convenient point with a defective final drive isolated, is to stop the engine concerned by operating the respective local stop button and isolating switch.

In the event of the defective final drive being either one of the two in the leading unit the operation of the battery isolating switch may have the effect of removing control from the remainder of the train. If this is found to be the case the interlock isolating switch on the driver's control panel should be moved to the opposite position.

Stopping the Train.

(1) Return throttle handle to idling (keeping Deadman's Handle depressed).

(2) Place the torque converter switch into the converter drive - "C" position.

(3) Apply vacuum brake.

(4) The train MUST NOT be stopped with the torque converter control in the direct drive "D" position. If this is done the engines will stop and trip out of control, as the train is brought to rest, and they cannot be restarted from the driving cab until all the trip switches have been reset by hand. These switches are on the side of the cars and are only accessible from ground level.

(5) If the train is to stand for a period above two minutes, the torque converter switch should be moved to the neutral - "N" position.

Changing Driving Ends.

It is NOT necessary to stop the engines to carry out this duty.

(1) With the vacuum brake "ON" place the converter control switch to "OFF", and remove key.

(2) Place the interlock isolating switch to "OFF" and remove key.

(3) Release the DEADMAN'S HANDLE.

(4) Place the vacuum brake handle to the "LAP" position and remove handle, lock door and proceed to opposite end of the train with the brake handle and the interlock isolating key and place them in position.

(5) Release vacuum brake, then make a partial application and move the interlock isolating switch key to one of the "ON" positions.

(6) Place converter switch key in reversing switch and select direction required.

(7) Remove key from reverser and, placing it in the converter control switch, move it to "N" position. Hold the Deadman's Handle down.

(8) Check that the final drives engage as indicated in item 6 under "STARTING THE ENGINES"; then proceed as shown under "RUNNING - IN TRAFFIC".

Stopping the Engines.

(1) Check that the throttle handle is in the idling position and that the vacuum brake is "ON".

(2) Place the torque converter control switch key to NEUTRAL.

(3) Press the engine stop buttons in turn and check that the engine warning lights glow, indicating that the engines have stopped.

(4) Place the torque converter switch into the "OFF" position, remove the key.

(5) Place interlock isolating switch to "OFF", remove key, release the Deadman's Handle.

(6) Apply the hand brake.

Part 5.

STABLING THE TRAIN.

If in a dead end, first operate reverser and check that the final drives engage, then proceed as for stopping the engines, but before leaving the train carry out the following :-

(1) Place vacuum brake valve to LAP position and remove the brake handle, also converter and interlock isolating switch keys.

(2) Lock cab doors.

(3) Hand the brake handle, converter and interlock isolating switch keys and door key to the Running Foreman or other responsible person on duty.

Part 6.

FAULTS IN TRAFFIC.

If an engine stops with the gear in a drive position it is automatically tripped out, and it is not necessary for the driver to take any action until he reaches the terminus or other suitable point.

The engines are automatically stopped in the event of the lubricating oil pressure dropping below 7lbs./sq.ins. or the cooling water level dropping below a certain level.

Check water level for the engine concerned, and if low, top up water tanks and look for leaks; if none are apparent, re-set the engine trip switch on the side of the car and restart the engine.

Report defect on completing turn of duty.

If an engine stops and the cause is not apparent, make one attempt to restart the engine, if this is not successful, report the matter as soon as possible.

If the engines are stopped by mishandling the controls all the trip switches must be reset from ground level on each car before the engines can be restarted.

Part 7.

GENERAL NOTES.

Converter Control Switch.

DO NOT place the converter control switch into the converter ("C") or direct drive ("D") positions with the engines stopped, otherwise all the isolating switches in the train will operate and trip the engines out. If this does occur, all the trip switches must be re-set by hand from ground level before the engines can be restarted.

Interlocking Isolating Switch.

This switch controls the supply of current for all the primary train controls from one or the other of the batteries in the car from which the train is being driven. When the switch key is moved to the right, one battery is selected, and when moved to the left, the other battery is selected.

The batteries should be selected alternately to avoid an excessive drain on any one battery.

When the switch in the driving cab is operated all the other interlocking switches in the remaining cabs in the train are rendered inoperative.

Deadman's Device.

The Deadman's Handle is incorporated in the throttle handle.

While the train is running or when standing in a station waiting to start, the Deadman's Handle must be kept depressed.

If the Deadman's Handle is released while the train is running and the throttle handle is in a power notch, all the engines will be brought down to idling speed. The drives throughout the train will go into neutral position and after a five second delay a full brake application will be made.

If the throttle is in the idling position, the drives will go to neutral and after five second delay a full brake application will be made.

After a Deadman's Handle application, if the throttle is still in a power notch, it should be returned to idling position and the converter control switch placed in the neutral position.

After this has been done the train can be operated in the normal manner.

If the Deadman's Handle is released inadvertently when running, the throttle should be immediately returned to idling, the Handle depressed and quickly returned to the power notch which was being used.

Note:-

When the Deadman's Handle has been released, it cannot under any circumstances be again depressed until the throttle handle is returned to "IDLING" position.

Part 8.

TRAIN HEATING.

Heating is by means of hot air suitably ducted into the passenger compartment of each vehicle. The operation of the heater in each car is automatic after switching on. The temperature can be adjusted by a control situated in the driver's compartment which regulates the volume of air passing into the car.

The heat control is a four position switch, namely, "Off", "Half Heat", "Full Heat" and "Cold".

Note. The heater control only operates the apparatus for the individual car to which it is fitted.

NOTES.