

BRITISH RAILWAYS  
DIESEL LOCOMOTIVES  
AND RAILCARS

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APPENDIX I TO PART II  
GROUP No. 7

RAILCAR.CO.UK

DRIVERS INSTRUCTIONS FOR OPERATING  
MULTI-ENGINEED DIESEL RAILCARS



DIESEL LIGHTWEIGHT TRAINS

POWERED BY AEC TYPE

150 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 simple guide to enginemen and others concerned in carrying out their duties.

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Part 1.GENERAL DESCRIPTION.

Each power car is provided with two engines. Driving controls are provided at one end only of each power car and each driving trailer car. When the trains are marshalled a driving compartment must be at each end.

TECHNICAL DATA.

Type	2-2-2-2 (1A-A1)			
Weight in running order				
Tractive effort, Total (single power car)				
	<u>1st Gear</u>	<u>2nd Gear</u>	<u>3rd Gear</u>	<u>4th Gear</u>
	6,570 lbs.	3,710 lbs.	2,420 lbs.	1,610 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. 8 $\frac{1}{2}$ ins.			
Minimum curve negotiable	3 $\frac{1}{2}$ chains			
Maximum Speed at maximum engine revs.				
	<u>1st Speed</u>	<u>2nd Speed</u>	<u>3rd Speed</u>	<u>4th Speed</u>
	15.3 m.p.h.	27 m.p.h.	41 m.p.h.	65.5 m.p.h.
Fuel oil capacity	50 gallons per Engine.			
Lubricating oil sump capacity	9 gallons per Engine.			
Cooling water capacity	15 gallons			
Control system	Electro-pneumatic.			
Brake system	Vacuum.			
Warning device	Pneuphonic.			
Sanding	Pneumatic.			



## Gear Ratio:

1st Gear	2nd Gear	3rd Gear	4th Gear
4.28:1	2.42:1	1.59:1	1:1

Engines.

Two six cylinder 11.3 litre horizontal oil engines per power car. A.E.C. type. No. A.220. 150 H.P. at 1,800 R.P.M.

Compression ratio: 16 to 1.

Bore: 130MM = 5.12 ins.

Stroke: 142MM = 5.5907 ins.

Firing Order: 1, 5, 3, 6, 2, 4.

Rotation: Clockwise.

Fuel injector type: CAV. B.D.L. L.150.S.

Fuel injector lifting pressure: 175 atmospheres (2570 lbs/sq.in.)

Fuel pump type: CAV. ~~B.P.E. 6B. TYPE~~  
NLCF 90/60 GLWBI. OR  
NLC E 90/60 GLWAI.

Transmission.

Type: Fluid Coupling. Wilson type gear box. 4 speed epicyclic. (Electro-Pneumatic operated).

Makers: A.E.C.

Reversing arrangement: Axially sliding pinion between bevel gears incorporated in final drive gear box.

Final Drive: gear ratio: 2.81:1.

Auxiliaries.

Battery: NIFE. Type LR.40. 19 Cells: 400 Ampere Hour Capacity. 24 Volt.

Generator: C.A.V. type. G.7A 24/4. 24 Volt. Belt driven.

Starter Motor: C.A.V. Axial Type.

Compressors: Clayton-Dewandre, C.D. Series ~~189. Belt~~ <sup>2 7/8" x 1 3/4"</sup> Type P.C.G.A.189. ~~Belt~~ <sup>GEPT</sup> Driven.

Exhausters: Clayton-Dewandre. Type C.725. Belt driven.

Car heating equipment: Smith's hot air heater.

Windscreen wipers: Pneumatic.

Speedometer: Smiths (Electrical drive).

DRIVERS CONTROLS.

- (1) Battery isolating switch (with removable key).
- (2) Throttle handle (engine speed) incorporating the Deadman's device.
- (3) Change gear selector lever.
- (4) Reversing lever (detachable).
- (5) Engine start buttons.
- (6) Engine stop button.
- (7) Engine indicator lights.
- (8) Air pressure indicator lights.
- (9) Change speed indicator.
- (10) Dual horn control.
- (11) Speedometer.
- (12) Air pressure gauge.

- (13) Vacuum gauge.
- (14) Drivers brake valve (handle detachable).
- (15) Handbrake.
- (16) Sander Switch.
- (17) Car heater switches.
- (18) Marker light switches.
- (19) Windscreen wiper valve.
- (20) Instrument panel light switches.

Part 2.

DRIVERS DAILY DUTIES WHEN IN SERVICE.

- (1) Obtain Battery Switch key, reversing lever, vacuum brake handle and keys of rail car.
- (2) Place Battery Switch key, reversing lever and brake handle on to their spindles and then move brake handle to lap position.
- (3) Check that the hand brake is on and the gear selector lever in NEUTRAL.
- (4) Check that detonator bases are intact.
- (5) 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.)

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Part 3.STARTING THE ENGINES.

- (1) Turn the battery isolating switch key to the "ON" position.
- (2) Check that the gear selector lever is in the NEUTRAL position and that the hand brake is ON.
- (3) If 40 lbs. per square in. air pressure is available the engines may then be started from the cab as follows:
- (4) ~~Place reversing lever in forward or reverse position.~~
- 5) Hold the throttle handle in the open position.
- 6) Press each starter button in turn and release it immediately. The indicator lights show that the engine has started.  
NOTE: If an engine does not start within approximately three seconds release starter button and allow engine to come to rest before pressing the button again.
- 7) With the engines running return the throttle handle to idling position and hold until the air pressure has built up to 80 lbs/square in. and until at least 21" of vacuum is obtained.
- (8) Release throttle handle - this will return it to "DEADMAN'S" position and after a 5 second delay the vacuum brakes will be applied.

- (9) If there is no air pressure the engines must be started individually from the side of the car. The procedure is as follows :-
    - (a) Pull fuel-injector pump control lever back as far as it will go and hold.
    - (b) Press the starter button which is located on small panel beside the engine, and release it immediately the engine starts.
    - (c) Release the throttle pump control lever gradually until a fast tick-over results - do not race the engine. As soon as air pressure is available - in about 15 seconds - release the pump control lever. It will then be held in the idling position by air pressure.
    - (d) Start the other engines in a similar manner.
- NOTE: All control devices, e.g. gears, throttle handle (engine speed), reverser, etc., are operated by electro-pneumatic (E.P.) valves therefore DO NOT USE FORCE WHEN MOVING THE CONTROL LEVER OR HANDLES.
- The electrical control system of each car is complete in itself but may be linked to that of another car by electrical jumper connections only.
- Any failure of the air pressure system, resulting in a severe drop in pressure, will shut down the engines and return the gears to neutral.
- The throttle handle is also the DEADMAN'S handle and if it is allowed to spring forward past the idling position after a five second delay the engines drop down to idling speed and the vacuum brakes are applied.



Part 3.STARTING THE ENGINES.

- (1) Turn the battery isolating switch key to the "ON" position.
- (2) Check that the gear selector lever is in the NEUTRAL position and that the hand brake is ON.
- (3) If 40 lbs. per square in. air pressure is available the engines may then be started from the cab as follows:

(4) ~~Place reversing lever in forward or~~

Place reversing lever in the required position for direction of travel, and before starting the engines, to ensure that the reverse gear in the final drives of the train have properly engaged; press the stop button and hold in while the starter button of each engine is momentary pressed in turn.

This allows the engines to inch over without starting, and move the driving shafts sufficiently to ensure that the final drives engage. Release stop button and start engines as shown below.

the air pressure has built up to 80 lbs/square in. and until at least 21" of vacuum is obtained.

- (8) Release throttle handle - this will return it to "DEADMAN'S" position and after a 5 second delay the vacuum brakes will be applied.

- (9) If there is no air pressure the engines must be started individually from the side of the car. The procedure is as follows :-
  - (a) Pull fuel-injector pump control lever back as far as it will go and hold.
  - (b) Press the starter button which is located on small panel beside the engine, and release it immediately the engine starts.
  - (c) Release the throttle pump control lever gradually until a fast tick-over results - do not race the engine. As soon as air pressure is available - in about 15 seconds - release the pump control lever. It will then be held in the idling position by air pressure.
  - (d) Start the other engines in a similar manner.

When air pressure has built up to at least 40lbs/square in. stop all engines, then proceed to driving cab and restart engines as shown in items 1 - 6 on page 6.

CONTROL LEVER OR HANDLES.

The electrical control system of each car is complete in itself but may be linked to that of another car by electrical jumper connections only.

Any failure of the air pressure system, resulting in a severe drop in pressure, will shut down the engines and return the gears to neutral.

The throttle handle is also the DEADMAN'S handle and if it is allowed to spring forward past the idling position after a five second delay the engines drop down to idling speed and the vacuum brakes are applied.



Part 4.

RUNNING.

Starting the Train.

- (1) Before attempting to move the train, check that the hand brakes are off in the other driving compartments.
- (2) Partly apply vacuum brake and take off hand brake.
- (3) With the throttle handle at idling position and the vacuum brake still partly applied, ~~move the reversing lever into the required position.~~

NOTE: The reversing lever is mechanically interlocked with the gear selector lever. The gear selector lever is locked in the NEUTRAL position and cannot be moved until the reversing lever is moved to the FORWARD or REVERSE position.

The reversing lever cannot be moved unless the gear selector lever is in NEUTRAL.

THE GEAR SELECTOR LEVER MUST NOT BE MOVED FROM THE NEUTRAL POSITION UNTIL READY TO START THE TRAIN.

- (4) With the engines idling move the gear selector lever to position 1. This selects and engages 1st gear. Release vacuum brakes and gradually open the throttle, the train will then commence to move. As the speed increases change gear as indicated on the Engine Speed Indicator.

Gear Changing.

- (a) "Changing up": When the Engine Speed indicator shows change up return throttle handle to IDLING position, move gear selector lever to next higher gear position, then after a slight pause open throttle. Change gear progressively in the same manner until top gear is engaged.  
DO NOT MOVE GEAR SELECTOR LEVER UNTIL THE ACTUAL GEAR CHANGE IS TO BE MADE.
- (b) "Changing Down": When the engine speed indicator shows change down, keep the throttle handle in the open position and place the gear selector lever into the next lower gear position.  
DO NOT MOVE THE GEAR SELECTOR LEVER UNTIL THE ACTUAL GEAR CHANGE IS TO BE MADE.

Stopping the Train.

- (1) Return throttle handle to IDLING and hold in that position.
- (2) Return gear selector lever to NEUTRAL. If in 4th gear the lever can be moved direct to neutral. If in an intermediate gear DO NOT pause in any of the other gear positions when making the movement.
- (3) Apply vacuum brakes as required.

NOTE: If the train speed has been reduced, e.g. by a signal check and the signal is placed in the clear position before the train is brought to a stand, release the vacuum brakes immediately and with the gear selector lever still in the same position as when the check was observed, re-open the throttle.

If the engine speed indicator show change down, move gear lever to the next lower gear. The gear change procedure should be carried out as described in Gear Changing, "Changing Down".



Part 4.

RUNNING.

Starting the Train.

- (1) Before attempting to move the train, check that the hand brakes are off in the other driving compartments.
- (2) Partly apply vacuum brake and take off hand brake.
- (3) With the throttle handle at idling position and the vacuum brake still partly applied, Check that the reversing lever is in the required position.

NOTE: The reversing lever is mechanically interlocked with the gear selector lever. The gear selector lever is locked in the NEUTRAL position and cannot be moved until the reversing lever is moved to the FORWARD or REVERSE position.

The reversing lever cannot be moved unless the gear selector lever is in NEUTRAL.

THE GEAR SELECTOR LEVER MUST NOT BE MOVED FROM THE NEUTRAL POSITION UNTIL READY TO START THE TRAIN.

- (4) With the engines idling move the gear selector lever to position 1. This selects and engages 1st gear. Release vacuum brakes and gradually open the throttle, the train will then commence to move. As the speed increases change gear as indicated on the Engine Speed Indicator.

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If the engine speed indicator show change down, move gear lever to the next lower gear. The gear change procedure should be carried out as described in Gear Changing, "Changing Down".



Changing Ends.

The following procedure should be carried out:-

- (1) Put the vacuum brakes ON.
- (2) Stop the engines.
- (3) Remove reversing lever and place vacuum brake handle to lap position and remove handle.
- (4) Open battery switch and remove key.
- (5) Lock cab door and remove key.
- (6) Proceed to other end of train and place handles and lever in their appropriate positions. Close battery switch then move reversing lever to forward position. Before re-starting engines, in order to ensure that reversing gear in the final drives of the train have properly engaged, press stop button and hold in while the starter button of each engine is momentarily pressed in turn. This allows the engines to inch over, without re-starting, and move the driving shafts sufficiently to ensure that the final drives engage. Release stop button and re-start engines in the normal way.

Part 5.STOPPING THE ENGINES.

- (1) Release throttle handle to Deadman's position.
- (2) Check that the vacuum brake is ON.
- (3) Press engine stop button and hold in that position until the engines have stopped.
- (4) Place the reversing lever into the disengaged position.
- (5) Apply hand brake.

STABLING THE TRAIN.

After stopping the engines in the method shown above -

- (1) Place vacuum brake valve to LAP position and remove the handle.
- (2) Remove reverser handle and open battery switch and remove key.
- (3) Shut off car heaters if in use.
- (4) Lock the cab-doors.
- (5) Hand the brake handle, reversing lever, battery switch key and door key to the Running Foreman or other responsible person on duty.

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Changing Ends.

The following procedure should be carried out:-

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- (2) Stop the engines.
- (3) Remove reversing lever and place vacuum brake handle to lap position and remove handle.
- (4) Open battery switch and remove key.
- (5) Lock cab door and remove key.
- (6) Proceed to other end of train and place handles and lever in their appropriate positions. Close battery switch then move reversing lever to forward position. Before re-starting engines, in order to ensure that reversing gear in the final drives of the train have properly engaged, press stop button and hold in while the starter button of each engine is momentarily pressed in turn. This allows the engines to inch over, without re-starting, and move the driving shafts sufficiently to ensure that the final drives engage. Release stop button and re-start engines in the normal way.

REVERSING THE CARS.

If it is necessary to reverse the cars without changing ends, proceed as follows:-

When the train has been brought to a stand -

- (1) STOP THE ENGINES.
- (2) Move reversing lever to reverse position.
- (3) Inch over the engines as shown in item (6) under changing ends.
- (4) Restart engines in the normal manner.
- (5) When the reversing movement is completed before moving the reversing lever to forward position again STOP THE ENGINES.

Part 5STOPPI

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Part 6.TRAIN HEATING.

Heating is by means of hot-air suitably directed into the passenger compartment of each vehicle. The operation of the heater is automatic apart from switching on and operating the heat control.

To operate the heater:

- (1) Turn heater switch in a clockwise direction to FULL HEAT, (not Reduced Heat) position. This supplies current to the glow plug (an Element) and a green light on the Indicator Panel should be illuminated.

After a period of 30 seconds another illuminated green light on the Indicator Panel denotes that the heater fan and fuel pumps are working.

In approximately  $3\frac{1}{2}$  minutes the Glow Plug indicator green light will be automatically extinguished and a red light will come on indicating that the heater is working.

If the oil fails to ignite in the above period the fan fuel pump is automatically switched off, and it is then necessary to return the control switch to OFF and restart.

- (2) To reduce heat, the switch should be turned anti clockwise to "Reduced Heat" position. To Cold position the switch should be turned in an anti-clockwise direction past the OFF position to Cold.

- (3) The heaters when operating are controlled by a Thermostat to shut off when the temperature reaches  $105^{\circ}$  Centigrade. If this occurs all heater panel lights will be extinguished and it is necessary to restart the apparatus if further heating is required.

Part 7.FAULTS IN TRAFFIC.

If there is indication that an engine has stopped while the train is running, before attempting to restart ensure at the next train stopping point that the engine has stopped. Attempt to restart by depressing the appropriate starter button, not more than three times. If this fails to restart the engine proceed to terminal point on remaining engines where the final drive should be isolated until such time as it can be checked by maintenance staff.

*if this fails do not attempt to restart heater start heater.*

*Return switch to off position & do not attempt to restart.*

*One should be taken not to go beyond the position of the heater and shut down*

*3) If the switch is in the full heat position of the heater and it fails to start (to be extinguished) then one attempt only may be made to restart the heater*

NOTES.

Wheel sleep - use of sanders & saws

Are buffers you driver not built

stand for engine in members of fitting  
shops.

manufacturing of trams? Can they be

made up DTTD or must they

be made up DTDT. Put this in one

part I page 1. as a second paragraph redrawn

? Low water shot dam.

Length of engine	5'-3 $\frac{1}{8}$ "
Width -	4'-6 $\frac{1}{4}$ "
Height -	1'-9 $\frac{5}{8}$ "

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NOTES.

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- (1) Turn heater switch in a clockwise direction to FULL HEAT (not Reduced Heat) position.

This supplies current to the glow plug (an Element) and the glow plug light on the Indicator Panel should be illuminated.

If this fails return switch to OFF position and do not attempt to restart.

After a period of 30 seconds the air fan light will be illuminated on the indicator panel denoting that the heater fan and fuel pumps are working.

In approximately  $3\frac{1}{2}$  minutes the Glow Plug indicator light will be automatically extinguished. A red light will have come on indicating that the heater is working.

If the oil fails to ignite in the above period the fan and fuel pump is automatically switched off, and it is then necessary to return the control switch to OFF and restart. Not more than three attempts should be made to start the apparatus.

- (2) To reduce heat, the switch should be turned anti-clockwise to 'Reduced Heat' position; care should be taken not to go beyond this position or the heater will be automatically shut down. To cold position the switch should be turned in an anti-clockwise direction past the OFF position to Cold.

- (3) If the switch is in the Full or Reduced Heat position and the heater cuts out (all indicator lights will be extinguished) Return switch to OFF then ONE attempt only may be made to restart the heater.

ST Blayton  
Motor Power Supply



(1) Turn heater switch in a clockwise direction to FULL HEAT, (not Reduced Heat) position.

This supplies current to the glow plug, (an Element) and the glow plug light on the Indicator Panel should be illuminated. If this fails return switch to OFF position and do not attempt to restart.

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