

BRITISH RAILWAYS

DRIVERS' INSTRUCTIONS FOR  
MULTIPLE-UNIT DIESEL-HYDRAULIC TRAIN

BUILT BY:	BR (MIDLAND) DERBY
PROPULSION EQUIPMENT BY:	ROLLS-ROYCE LIMITED
CONTROLS BY:	WESTINGHOUSE BRAKE & SIGNAL COMPANY LIMITED

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PROTOTYPE POWER CAR NO. E.50000 AND  
ATTACHED DRIVING TRAILER CAR NO. E.56000

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ROLLS-ROYCE TRANSMISSIONS

TAM 101/4



DRIVERS' DAILY DUTIES

1. Obtain battery selecting (Yale) key, handle for isolating valve switch, vacuum brake handle, and keys to the partitions and cab doors.
2. Check that the detonator cases are intact.
3. Check level of fluid and coolant in tanks.

STARTING THE ENGINES

There are two engines to each power car.

1. Insert battery selecting key and close switch in leading cab. If the battery associated with this cab is not fully charged, the key may be removed and used in any other cab where it will connect the battery of that car to the controls in the leading cab.
  2. Move the drive selector to Neutral. The engines cannot be started with the drive selector in any other position.
  3. Insert handle and close isolating valve switch in leading cab.
  4. Ensure that the hand brake in the leading cab is on.
  - 5a. If the engines are warm they can be started from the leading cab by depressing each starter button in turn until the indicator adjacent to the button shines brightly. Should the button be released before the lamp glows brightly pause for ten seconds before making a second attempt to start the engine. To avoid double starting loads on the batteries, the starter buttons should be depressed in an order that does not cause both engines of a coach to be started simultaneously.
- NOTE: When an engine is running, the indicator lamp adjacent to its individual starter button will shine brightly. If the engine fails to start at the first attempt, the indicator lamp will continue to glow only dimly. The aperture of these lamps can be adjusted to emit an amount of light that can be observed comfortably without distraction from driving.
- 5b. If the engines are cold, they must be started by the local controls from the track side :-

- i. Move the drive selector in the leading cab to Neutral.



- ii. Hold the hand throttle control on the engine at the limit of its anti-clockwise movement.
- iii. Depress the local starter button at the side of the watch panel until the local engine running indicator light shines bright.
- iv. Immediately the engine starts, allow the hand throttle control to return slowly towards the minimum position until the engine is idling

### RUNNING

1. Move the combined deadman's and throttle control handle in the leading cab to speed up the engines slightly until 28 in. of vacuum is obtained in the release reservoir, and the air pressure gauge indicates at least 85 p.s.i.

NOTE: This operation may be performed to hasten the release of the vacuum brake.

2. Partially apply the vacuum brake and release the hand brakes in all driving cabs.

3. Check that the two-position forward-and-reverse selector indicates the direction required and that only the appropriate three direction indicator lamps are shining brightly if the cab is in a power car. If the cab is in a driving trailer, only one direction indicator lamp should be shining brightly.

4. Move the drive selector to Drive.

5. Depress the combined deadman's and throttle control handle at the idling position; release the vacuum brakes; and hold the throttle controller at the half open position until the train moves. If the train is standing on a gradient, the throttle may be partly opened before the brake is fully released.

NOTE: The throttle is infinitely variable and does not have to be opened by notches. Over the first quarter of its movement the throttle controller does not raise the engine speed.

6. Under part throttle conditions, that is up to seven eighths full throttle, Direct Drive will automatically be engaged at 37 m.p.h. With Full Throttle selected the speed at which Direct Drive is engaged is 47 m.p.h. During the transition from converter



to Direct Drive, the engines are momentarily returned to Idling.

7. When the train is retarded, converter drive is automatically engaged at 30 m.p.h. for part throttle operation and 40 m.p.h. for full throttle operation. The engine speed is not reduced to Idling during the transition from direct drive to converter drive.

In the interests of fuel economy direct drive should be used as often as practicable, thus where track conditions and time permit the train may be operated at part throttle. To obtain maximum acceleration however it is necessary to remain in converter drive until the torque multiplication approaches units, that is until 47 m.p.h. is reached which is the transition speed under full throttle operation.

NOTE: A free wheel allows the throttle to be returned to Idling so that the train can coast without overrunning the engines.

#### STOPPING THE TRAIN

1. Return the combined deadman's and throttle control handle to the idling position, keeping it depressed.
2. Apply the vacuum brake as required.
3. Just before the train comes to rest, the drive selector should be moved to Neutral. If it is required to accelerate the train again before it is brought to a standstill, the drive selector may be moved to Drive and the throttle re-opened.

#### EMERGENCY BRAKING

If the deadman's handle is released, the engines will be automatically returned to Idling and the transmission automatically returned to Neutral. Also, after a delay of approximately seven seconds, the emergency brake will be automatically applied. These responses occur regardless of the positions of the controls. Control can be regained after releasing the combined deadman's and throttle control handle by returning it to Idling and depressing it.

#### REVERSING

1. The train must be stationary, but it is not necessary to stop the engines.



2. Return the throttle to Idling
3. Move the drive selector to Neutral.
4. Depress the reversing foot valve, which will release the two-position forward-and-reverse selector provided the train is stationary and air pressure is not lacking.
5. Move the forward-and-reverse selector to the direction required.

NOTE: In the cab of the power car there are six direction indicator lamps, a row of three for each direction. When all the final drives are fully engaged in the correct direction, only the three lamps appropriate to that direction will shine brightly; the others will continue to glow dimly. In the driving trailer, there are only two direction indicator lamps, one to each direction.

6. If both forward-and-reverse lamps shine brightly, the associated final drives are not correctly engaged. Move the drive selector to Drive, whereupon the fluid drag in the torque converter may effect engagement. If not, release the vacuum brake and open the throttle slightly to inch the train.

7. If a final drive will not engage correctly, the one not responding can be found by examining the power cars to see in which one a pair of centre or right-hand direction indicator lamps is incorrectly illuminated. In a power car the centre pair of lamps in a row is marked 1 and relates to the final drive nearest the cab. The right-hand pair of lamps is marked 2 and relates to the remote final drive of that car. The left-hand pair of lamps in a power car and the only pair of lamps in a driving trailer are marked T and relate to all the final drives of the train as a whole.

8. A final drive that cannot be engaged must be put into Neutral by reaching under the car and pulling the manual lever into the centre position and pinning it there. Before moving the manual lever, close the two isolating cocks to interrupt the supply of air from the controls, and keep them closed as long as the final drive is pinned at Neutral

9. Stop the engine associated with the final drive pinned at Neutral

10. Provided the final drives are all correctly engaged (or pinned at Neutral) the vacuum brake may be released and the throttle opened to drive the train away on the remaining engines.



STOPPING THE ENGINES

1. Release the combined deadman's and throttle control handle at Idling.
2. Check that the vacuum brake is applied.
3. Press the engine stop button. After a short delay the lamps in the engine control panel should glow dimly instead of shining brightly, thus indicating that the engines have stopped.
4. Move the drive selector to Drive. This prevents unauthorized re-starting from the local controls at the track side.
5. Apply the hand brake.

CHANGING ENDS.

1. Apply the vacuum brake but not the hand brake.
2. The engines may be left running, unless the train is to stand for some time. The injectors in the engines tend to become fouled if they are left idling for long periods.
3. Remove the battery selecting key and the handle from the isolating valve switch.
4. Put the vacuum brake at Lap and remove the handle.
5. Lock the cab doors.
6. Proceed to the other end of the train and unlock the cab. Apply the hand brake if the train is to be left standing for some time.
7. Insert the battery selecting key and close the switch. If the battery associated with this cab is not fully charged, the key may be removed and used in any other cab, so connecting the battery in that car to the controls in the cab which has its isolating valve switch closed.
8. Put the drive selector at Neutral.
9. Insert the handle and close the isolating valve switch.
10. Start the engines if they have not been left running.



11. Apply the vacuum brake. Release the hand brake if it has been applied.
12. Move the forward-and-reverse selector to required direction. Check that the final drives are all indicated as being properly engaged.
13. Move the drive selector to Drive and drive the train away.

#### STABLING THE TRAIN.

1. Stop the engines.
2. Apply the hand brake.
3. Remove the battery selecting key and the handle from the isolating valve switch.
4. Put the vacuum brake at Lap and remove the handle.
5. Lock the cab and partition doors.
6. Hand the battery selecting key and the handles for the isolating valve switch and the vacuum brake to the Running Foreman or other responsible person.
7. Report any defects.

#### FAULTS IN TRAFFIC

1. If there is an indication that an engine has automatically shut-down whilst the train is running, do not attempt to re-start before confirming at the next stopping point that the engine is in fact not responding to the controls.
2. If the engine has stopped and cannot be re-started, pin the associated final drive at Neutral (as described) in Para. 8 under reversing). Then proceed on the remaining engines until the one shut-down can be checked by maintenance staff.

#### ASSISTING A DISABLED TRAIN

1. Assistance by a Rolls-Royce-Westinghouse Diesel-Hydraulic Railcar Train
  - i. Provided the control and vacuum brake systems are working, the disabled train may be coupled in the normal way to another of the same type.



Follow the Appendix Instructions for the working of Multiple Unit Diesel Trains - Coupling and Uncoupling.

- ii. If the disabled and the assisting trains together exceed six power cars, the starter button and indicator lamps for the first engine will also be connected to the thirteen engine of the combined train. The second button and lamp will be connected to the second and fourteenth engine, and so on.
- iii. If a starter button connected to two engines is depressed, both engines will be cranked. It is sufficient for one of them to start to cause the indicating lamp to shine brightly. So, if there are more than six power cars, the driver must walk the length of the combined train to ascertain that all sound engines are running before driving away. If one of two engines connected to a starter button is not running, the local starter button on the watch panel can be used. No harm would result from using the button in the cab, but there would be no indication that it had been successful.
- iv. The combined train may be driven from the leading cab in the normal way, provided the final drives of the faulty propulsion units in the disabled-train are pinned at Neutral.

## 2. Assistance by a Locomotive or a train of a Different Type

- i. Stop all engines in the disabled train.
- ii. Pin all final drives at Neutral (as described in Para. 9 under Reversing)
- iii. Remove the battery selecting key and the handle from the isolating valve switch.
- iv. Connect only the vacuum brake hose to the assisting locomotive or train.
- v. Put the vacuum brake in the disabled train at Lap and remove the handle.
- vi. Isolate the deadman's emergency brake in the disabled train by closing the relevant cock in each of its cars.



### 3. Failure of Control Equipment

- i. If the battery in the leading car has become discharged, remove the battery selecting key and use in another cab as described in Para. 1 under Starting The Engines.
- ii. If there is no response to the controls although a well charged battery has been selected, remove the handles for the isolating valve switch and vacuum brake and proceed to the other driving cabs in turn and endeavour to regain control. Before driving away, pin at Neutral (as described in Para. 8 under Reversing) the final drives of any propulsion units still not responding to control.

### GENERAL NOTES

#### COUPLING AND UNCOUPLING

1. Put the drive selector at Neutral
2. Stop the engines.
3. Remove the battery selecting key and handle for the isolating valve switch.
4. Couple or uncouple
5. Start the engines as described under Starting the Engines.
6. Check that all indicator lamps indicate correctly and that all controls are working.
7. Drive the train away as described under Running.

#### DRIVERS IN COURSE OF TRAINING

Drivers in course of training are only allowed to operate the controls and brake on passenger lines under the direct supervision of an instructor.