

B.R.33003/248

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**DIESEL MULTIPLE UNIT
TRAINS WITH 'BLUE SQUARE'
COUPLING CODES AND
MECHANICAL TRANSMISSION**

**PART 2
DRIVING INSTRUCTIONS
INCLUDING STANDARD
PREPARATION AND DISPOSAL
DUTIES**

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**THIS INSTRUCTION IS ISSUED IN THREE PARTS
PART 1 B.R.33003/247
PART 3 B.R.33003/249**

**STANDARD FULL PREPARATION DUTIES FOR
DIESEL MULTIPLE UNIT TRAINS WITH
'BLUE SQUARE' COUPLING SYMBOLS
AND MECHANICAL OR
TORQUE CONVERTER TRANSMISSION**

When commencing duty each Driver must have in his possession and retain throughout his turn:-

- (a) A control circuit, Yale type, key.
 - (b) An A.W.S. change end key, where applicable.
 - (c) A door key.
 - (d) An internal door key.
1. Open the driving compartment door at the leading end, enter, deposit personal belongings and then:-
 - (a) Check that the handbrake is ON.
 - (b) Check that the detonator case is intact.
 - (c) Check that the track circuit shorting bonds are in position.
 - (d) Check the route indicator and reset as required.
 - (e) Check the destination indicator and reset as required.
 - (f) Check that a brake handle and reversing handle are available in the receptacle, but **DO NOT** fit them to the controls at this stage. If not available see 7(g).
 2. Close the control circuit switch with the Yale type key.
 3. Proceed to the first engine then:-
 - (a) Check the fuel level in the adjacent tank.
 - (b) Check that no cables or pipes are attached.
 - (c) Check the fire alarm system by pressing the test button.
 - (d) Check the overriding switch on torque converter cars is in the ON position.
 - (e) Start the engine and make a cursory check whilst doing so that no fuel, water, air or exhaust leakages occur.
 4. Repeat 3 for each engine on the same side of the train.
 5. Pass round the end of the train and repeat 3 on the rear engine.
 6. Proceed towards the front of the train and en route repeat 3 for each engine until the front car is reached.
 7. Proceed to the first intermediate driving compartment (or rear driving compartment when there are no intermediate ones), checking for obvious defects en route. Enter the driving compartment and check that:-
 - (a) The handbrake is OFF.
 - (b) The detonator case is intact.
 - (c) The track circuit shorting bonds are in position.
 - (d) The engine indicator lights are illuminated.
 - (e) The route indicator and destination indicator are both blank unless it is a rear driving compartment, in which case only the destination indicator must be set.
 - (f) The air pressure is increasing.

(g) The brake handle and reversing handle are not fitted to the controls.

(Obtain the brake handle and reversing handle from the receptacle and retain them if NOT available as indicated in 1(f).)

(h) The A.W.S. switch is in the OFF position.

LOCK THE INTERNAL AND EXTERNAL DOORS OF ALL DRIVING COMPARTMENTS BEHIND THE LEADING VEHICLE.

8. Proceed towards the rear of the train checking for obvious defects en route and repeat 7 in each intermediate driving compartment and the rear driving compartment.
9. Return to the leading driving compartment on the ground, on the opposite side of the train and check for obvious defects en route. Enter the leading driving compartment then:-
 - (a) Place the A.W.S. switch in the ON position and press the reset button to silence the horn.
 - (b) Fit the reversing handle and select the direction of travel when the air pressure is 75 p.s.i.
 - (c) Check the final drive indicator lights.
 - (d) Fit the brake handle and place the Driver's brake valve in the **RELEASE** position.
 - (e) Depress the power controller handle and check that 21 in. of vacuum can be obtained in the brake pipe and 28 in. of vacuum can be obtained in the release pipe.
 - (f) With the brake valve in **LAP**, release the power controller and note that the brake pipe vacuum is destroyed by the Driver's Safety Device.
 - (g) With 21" of vacuum, move the brake valve to the ON position and note that the vacuum is destroyed.

NOTES ON PREPARATION AND ENGINE STARTING

3 and 4 car multiple unit Diesel sets carry a vacuum brake handle and a reversing handle, in a receptacle, in each driving compartment.

1 and 2 car sets carry a brake handle and a reversing handle in one driving compartment. These should not be fitted to the controls during preparation, until at least 75 p.s.i. of air pressure has been raised in the main reservoir. This will avoid the **FORWARD** or **REVERSE** directions becoming inadvertently selected before a sufficient pressure of air has been raised.

Whenever a train is diagrammed to be prepared for service, the standard preparation duties, as specified on pages 1 and 2 must be carried out.

Engines starting during preparation (see page 1, item 3(e))

The engines of multiple unit Diesel trains must be started locally during preparation. After carrying out items 1, 2 and 3(a) to (d), the first engine may be started as follows:-

- (1) On B.U.T. engines. Pull the fuel injection pump manual control handle to the "Full fuel" position and hold it there.
- (2) On Rolls-Royce engines. Depress the excess fuel button, then pull the fuel injection pump manual control handle to the "Full fuel" position and hold it there.

- (3) All engines. Press the engine "Local Start Button" and release it immediately the engine fires. If the engine does not fire within 5 seconds, release the button and pause 10 seconds before making a further attempt. If the engine does not start after 3 successive attempts, investigate the cause in accordance with the instructions in Part 3, B.R.33003/249, page 5.
- (4) Immediately the engine starts, return the fuel injection pump governor manual control to the "Engine Idling" position, taking 3-5 seconds to do so.
- (5) When satisfied that the engine is running correctly and that there are no obvious defects or leakages, pass to the next engine as shown on page 1.

SERIOUS DAMAGE TO THE TRANSMISSIONS AND STARTER MOTORS MAY OCCUR IF AN ATTEMPT IS MADE TO START THE ENGINES FROM A DRIVING COMPARTMENT WHEN THE AIR PRESSURE IS INSUFFICIENT TO ILLUMINATE THE FINAL DRIVE INDICATORS.

- (6) When all engines on the train have been started return to the driving compartment and proceed as per item 9 (a) to (g).

Engine starting when the main reservoir pressure is 75 p.s.i. or over
With the handbrake on:-

- (1) Close the control circuit switch with the Yale type key.
- (2) Place the A.W.S. switch in the ON position and press the reset button.
- (3) Fit the reversing handle and select a direction of travel.
- (4) Check the final drive indicator lights. If any do not illuminate, move the reversing handle to the opposite direction of travel. If the indicator light does not illuminate after two further reversals, check the final drives of the affected car.
- (5) With the direction of travel selected and the final drive indicator lights illuminated,
 - (a) Depress the power controller handle and move it to the full power position.
 - (b) Press ONE of the engine start buttons until the appropriate engine indicator lights illuminate.
 - (c) Twin engined cars only. Press the other engine start button until the other engines are started.

DO NOT PRESS BOTH ENGINE START BUTTONS AT ONCE.

If an engine does not fire within 5 seconds, release the button and pause 10 seconds before making a further attempt. If the engine does not fire after 3 successive attempts, investigate the cause in accordance with the instructions in Part 3, B.R.33003/249, page 5.

- (6) Return the power controller handle to the IDLING position when the engines have fired.

NOTE: When working a train consisting of both single and twin engined cars the starting procedure for twin engined cars should be carried out.

TO MOVE THE TRAIN

- (1) Release the handbrake and await the Guard's buzzer code, applying the brake in LAP as necessary and keeping the power controller handle depressed.
- (2) When receiving the Guard's signal:-
 - (a) With the engines IDLING, move the gear selector to the first gear position without pausing in any other gears.
 - (b) Move the brake valve handle to the RELEASE position and note that 21 in. of vacuum is registered on the brake pipe gauge.
 - (c) Move the power controller handle to the FULL POWER position smoothly, according to the rail conditions and permanent speed restrictions through crossings etc.
 - (d) Observe the driving tachometer. When this indicates CHANGE UP:-
 - (i) Move the power controller to the IDLING position and pause for 4 SECONDS.
 - (ii) Select the second gear.
 - (iii) Pause for 3 SECONDS, then move the power controller handle back to the FULL POWER position smoothly and according to the permanent speed restrictions.
 - (e) Observe the driving tachometer and when this indicates CHANGE UP repeat (d) (i) to (iii) above. Repeat (d) (i) to (iii) for changing into top gear.
- (3) When the train is running in fourth gear the required speed should be maintained by moving the power controller as necessary. If a period of coasting is to be performed i.e. when the speed of the train can be maintained without the use of engine power, the fourth gear position must be used and the power controller must be placed in the IDLING position with the handle depressed.

If a period of coasting is to be followed by a period of running under power, this must be resumed with the correct gear ratio selected. If the section requiring power to be used is approached at 41 m.p.h. or above, the gear selector should remain in FOURTH GEAR and the power controller should be moved to a power position, as necessary. When power is required after coasting and the speed is less than 41 m.p.h., the correct gear must be selected and after a pause of 3 seconds, the power controller must be moved smoothly towards the FULL POWER position. The correct gears in which to resume powered running after coasting are determined by the road speed at the time of power requirement. These are given in the following table:-

0-15 m.p.h.—1st gear
15-27 m.p.h.—2nd gear
27-41 m.p.h.—3rd gear
41-70 m.p.h.—4th gear

- (4) When the train reaches a sharply rising gradient the full power will probably be required unless the ascent only covers a short distance and the speed of approach is high. If the gradient continues to rise sharply, the speed of the train will be reduced. The reduction in road speed will cause a proportionate reduction

in engine speed as will be seen by the driving tachometer. If the speed falls to 41 m.p.h. a CHANGE DOWN indication will be given. When this occurs, proceed as follows:-

- (a) Return the power controller to the IDLING position.
- (b) Without pausing, select the next lower gear.
- (c) Pause for 3 seconds and then move the power controller handle smoothly back to the FULL POWER position.

The selection of the lower gear may enable the train to be worked without further gear changing on the particular gradient, i.e. with the driving tachometer between the CHANGE UP and CHANGE DOWN positions.

If the gradient is of sufficient severity, the driving tachometer will again indicate CHANGE DOWN when the speed falls to 27 m.p.h., with full power being applied. When these circumstances occur, the procedure in (a), (b) and (c) above must be repeated. The procedure must be repeated again if the driving tachometer gives a further CHANGE DOWN indication, which will occur if the speed falls to 15 m.p.h. with full power being applied.

When severe gradients are being ascended occasions can arise during which the road speed may remain constant with the tachometer indicating, or almost indicating CHANGE DOWN. On these occasions the next lower gear should be selected and there should be no attempt to remain in a higher gear for the longest possible period.

BRAKING

The brakes of D.M.U. cars are of a 'quick release' type, in which a high vacuum reservoir on each vehicle assists the exhausters to release the brakes. A duplex vacuum gauge is provided. The left hand scale of this gauge indicates the brake pipe vacuum and the right hand side indicates the high vacuum. The brake valve is provided with a detachable handle which can only be fitted and removed in the LAP position. After fitting, the handle can be moved between the OFF and ON positions.

To stop the train

- (1) Return the power controller to the idling position and keep it depressed.
- (2) Apply the brake by moving the brake valve handle towards the ON position and then return it to the LAP position when the required vacuum has been destroyed in the brake pipe. Do not make brake applications by moving the handle alternately between the OFF and ON positions.
- (3) When the speed of the train has dropped to between 10 and 15 m.p.h. move the gear selector to the NEUTRAL position.
- (4) After coming to a stand keep the brake applied in LAP as necessary.

NOTE : If the train speed has been reduced by braking due to a signal check, permanent way slack etc., and power is again required, the correct gear must be selected before re-applying power as shown on page 4.

CHANGING ENDS

- (1) With the brakes applied, remove the brake valve handle and reversing handle and place them in the receptacle on 3 and 4 car units. See Note for single and twin units.
- (2) Turn the control circuit key to OFF and remove it.
- (3) Place the A.W.S. switch in the OFF position.
- (4) Set the destination indicator as necessary.
- (5) Set the route indicator to a blank aspect.
- (6) Lock the internal and off side doors.
- (7) Switch off all cab lights.
- (8) Leave the driving compartment, locking the door, and proceed IMMEDIATELY to the opposite end of the train.

THE ENGINES MUST BE STOPPED AND THE MODIFICATIONS TO RULE 126 SHOWN ON PAGE 39 OF THE GENERAL APPENDIX MUST BE CARRIED OUT, IF IT IS NOT INTENDED TO PROCEED IMMEDIATELY TO THE OPPOSITE END OF THE TRAIN. (See below under "Stopping the Engines").

UNDER NO CIRCUMSTANCES IS IT PERMISSIBLE TO LEAVE THE IMMEDIATE VICINITY OF A TRAIN, IN WHICH THE ENGINES ARE RUNNING, UNLESS THERE IS ANOTHER COMPETENT PERSON IN ATTENDANCE.

- (9) Upon arriving at the opposite end of the train, unlock the driving compartment door, enter and proceed as for items (1) to (4) on page 3 or as per items (1) to (6) on page 3 if the engines have been stopped.

NOTE : When 1 and 2 car units are used, the reversing handle and brake handle must be taken to the opposite end of the train.

When multiple formations of 1 and 2 car trains are used the brake handle and reversing handle must be left in the receptacle before changing ends. A set of handles from one of the first two driving compartments at the opposite end of the train must be obtained for the purpose of working the train in the opposite direction, after changing ends.

REVERSING

When it is necessary to reverse the train without changing ends proceed as follows:-

- (1) With the engines idling and the brake applied, move the reversing handle to the REVERSE position.
- (2) Note that the final drive indicator lights become momentarily extinguished and then re-illuminate.
- (3) When receiving a signal to move:-
 - (a) With the engines idling and the power controller handle depressed, move the gear selector to the first gear position without pausing in any other gears.
 - (b) Move the brake valve handle to the RELEASE position and note that 21 in. of vacuum is registered on the brake pipe gauge.

- (c) Move the power handle to a position sufficient to move the train at the required speed.
 - (d) When receiving a STOP signal, apply the brake and move the gear selector to NEUTRAL.
- (4) When receiving a stop signal, move the power handle to the IDLING position, apply the brake and select NEUTRAL gear. DO NOT MOVE THE REVERSING HANDLE WHEN THE TRAIN IS IN MOTION.

STOPPING THE ENGINES

- (1) With the power controller handle in the idling position and the Driver's Safety Device applying the brakes:-
- (a) Press the engine stop button until all engines stop.
 - (b) Apply the handbrake and open the control circuit switch.

STANDARD DISPOSAL DUTIES FOR MULTIPLE UNIT DIESEL TRAINS WITH "BLUE SQUARE" COUPLING SYMBOLS AND MECHANICAL OR TORQUE CONVERTER TRANSMISSION

STABLING

When a train is to be stabled in a position from which the next move must be in the opposite direction proceed as follows:-

- (1) Apply the handbrake.
- (2) Switch off the driving compartment heater if in use.
- (3) Press the engine stop button until all engines stop.
- (4) Move the reversing handle to the REVERSE position.
- (5) Open the control circuit switch by means of the Yale type key when all of the final drive gearboxes have reversed.
- (6) Remove the reversing handle and brake valve handle and place them in the receptacle.
- (7) Place the A.W.S. switch in the OFF position.
- (8) Report all known defects in the repair book.
- (9) Switch off the driving compartment lights.
- (10) LEAVE THE DRIVING COMPARTMENT WITH THE INTERNAL AND EXTERNAL DOORS LOCKED.

When a train is to be stabled and the direction of the next move is not known, omit (4) above.

TRAIN HEATING (SMITH'S HEATERS)

The heating of multiple unit trains is normally under the control of the Guard. When working empty trains in which pre-heating of the stock is not required the driving compartment may be heated by operating the heaters of the leading power car. Two heater control panels are provided in the driving compartment from which either or both of the heaters may be operated. To operate either heater proceed as follows:-

- (1) Turn the heater starting switch to the STARTING POSITION. This should illuminate the GLOWPLUG light. If this light

does not illuminate the system is faulty and the switch must be returned to the OFF position. After a period of 45 seconds, the AIR FAN light will become illuminated. After a period of 3½ minutes the GLOWPLUG light will be extinguished. If the fuel does not ignite when the GLOWPLUG light is illuminated the fan and fuel pump are automatically switched off and the switch must be returned to the OFF position.

NOT MORE THAN THREE ATTEMPTS MUST BE MADE TO START THE HEATING APPARATUS.

- (2) When the GLOWPLUG light is extinguished and the AIR FAN light is illuminated, the switch should be returned to the RUNNING position.

To switch a heater off turn the control switch to the OFF position.

DO NOT OPEN THE BATTERY ISOLATING SWITCH UNTIL THE HEATERS HAVE BEEN STOPPED FOR 5 MINUTES OTHER THAN IN EMERGENCIES.

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