

The information in this booklet must not be given to the public



British Rail

Train Crew Manual

D.M.M.U. Trains

(Except Class 126- White Circle)

Drivers Fault Finding Data

ISSUE 4
Supersedes Issue 3

BR.33056/13
February 1981

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FAULT FINDING INSTRUCTIONS FOR DIESEL MECHANICAL MULTIPLE UNIT TRAINS (EXCEPTING CLASS 126 CARS NUMBERED 51008-51051, 50936, 79088 - WHITE CIRCLE).

1. NOTES FOR THE GUIDANCE OF DRIVERS IF A FAULT OCCURS.

1.1 If a D.M.M.U. train shows only a slight reduction in power no immediate action is necessary. A check on the equipment should be made at the next stopping point. If no obvious defects can be seen the journey may be completed.

1.2 If a severe reduction in power occurs an investigation should be made within 5 miles; at the most convenient stopping point. An immediate stop must be made if there is excessive noise or smoke emitted from any equipment or if the fire alarm bells ring.

1.3 A shortage of power may be accompanied by an engine indicator light becoming extinguished or low engine speed indicated by the driving tachometer if the defect is in the leading power car. Alternatively a shortage of power may be indicated by the engine speed increasing very rapidly after a gear has been selected.

GREAT CARE MUST BE TAKEN TO ENSURE THAT NO SIGNAL ASPECTS OR LINE SIDE WARNING BOARDS ETC. ARE MISSED WHENEVER INSTRUMENTS OR DRIVING COMPARTMENT INDICATORS ARE BEING CHECKED.

1.4 If a complete loss of power occurs an attempt must be made to coast and bring the train to a stand under the protection of fixed signals.

When a train has been brought to a stand as a result of an equipment defect and the necessary Rules have been carried out, refer to the chart with a heading applicable to the indication or defect.

This will show the various possible causes of the trouble and indicate the action to be taken. In some instances the possibilities may be numerous and the simpler defects should be checked before the more difficult ones. When a cause for a defect can be definitely established and it is known that it can be corrected, inform the nearest signalman, station official or the Traffic Control, stating how long it will be before the trouble may be overcome. When the defect has had attention, start

the engines and make a test to ensure that traction power may be obtained and that all systems function. The train may then be worked forward.

If any doubt exists as to the possibility of overcoming the fault, assistance must be requested immediately. When the assisting locomotive or train is provided, the coupling and subsequent operation should be performed as directed in BR.33056/49. If the train can only work forward on reduced power, the nearest signalman, station official or the Traffic Control must be advised of the circumstances.

1.5 At the end of the turn of duty, or before this time when applicable, the defects must be reported and all necessary repairs must be entered in the Repair Book of the defective vehicle. This will greatly assist the maintenance staff at the depot in which the repairs are carried out.

2. INSTRUMENT READINGS

The following chart indicates the readings given by all instruments and indicates the action to be taken if incorrect readings are given when the engines are running;

INSTRUMENT	Reading with engines running at least 10 minutes		ACTION TO BE TAKEN
	Train Standing	Train Moving	
Main reservoir air pressure gauge	80 – 90 p.s.i.	80 – 90 p.s.i.	Report any variations below the minimum or above the maximum
Vacuum brake pipe gauge	0 – 21 in. Hg.	21 in. Hg.	Report any variations from 21 in. Hg. with the brakes released
Vacuum release pipe gauge	0 – 30 in.Hg.	28 – 30 in. Hg.	Report any instances where less than 27 in. Hg. is obtained when running Report all instances where vacuum is seriously reduced when releasing the brakes
Speedometer	0	0 – 70 m.p.h.	Report any defects
Engine tachometer	400 – 450 r.p.m.	400 – 1900 r.p.m.	Report any readings outside these limits with the engines running

3. FINAL DRIVE ISOLATION

In the event of any engine or transmission becoming defective the final drive unit must be isolated as follows:-

- 3.1 Apply the parking brake.
- 3.2 Stop the engine using the local stop button.
- 3.3 Turn the engine isolating switch to ISOLATED/OFF.
- 3.4 Turn the final drive isolating plunger a $\frac{1}{4}$ turn to the ISOLATED position.
- 3.5 With the control circuit switch ON, move the reversing handle from FORWARD to REVERSE and back again three times, pausing for 5 seconds in each position.
- 3.6 Check that the final drive is isolated by turning the cardan shaft by hand.

NOTES (1) If it is found that the final drive cannot be isolated as described above i.e. the cardan shaft cannot be turned by hand, it is possible that either the air connections to the controlling piston are defective, or that the sliding dog clutch or the striking fork are damaged. In such circumstances the train may proceed at a maximum speed of 5 m.p.h., to a point where the passengers may be detrained, providing the Guard can confirm that the associated wheels are rotating.

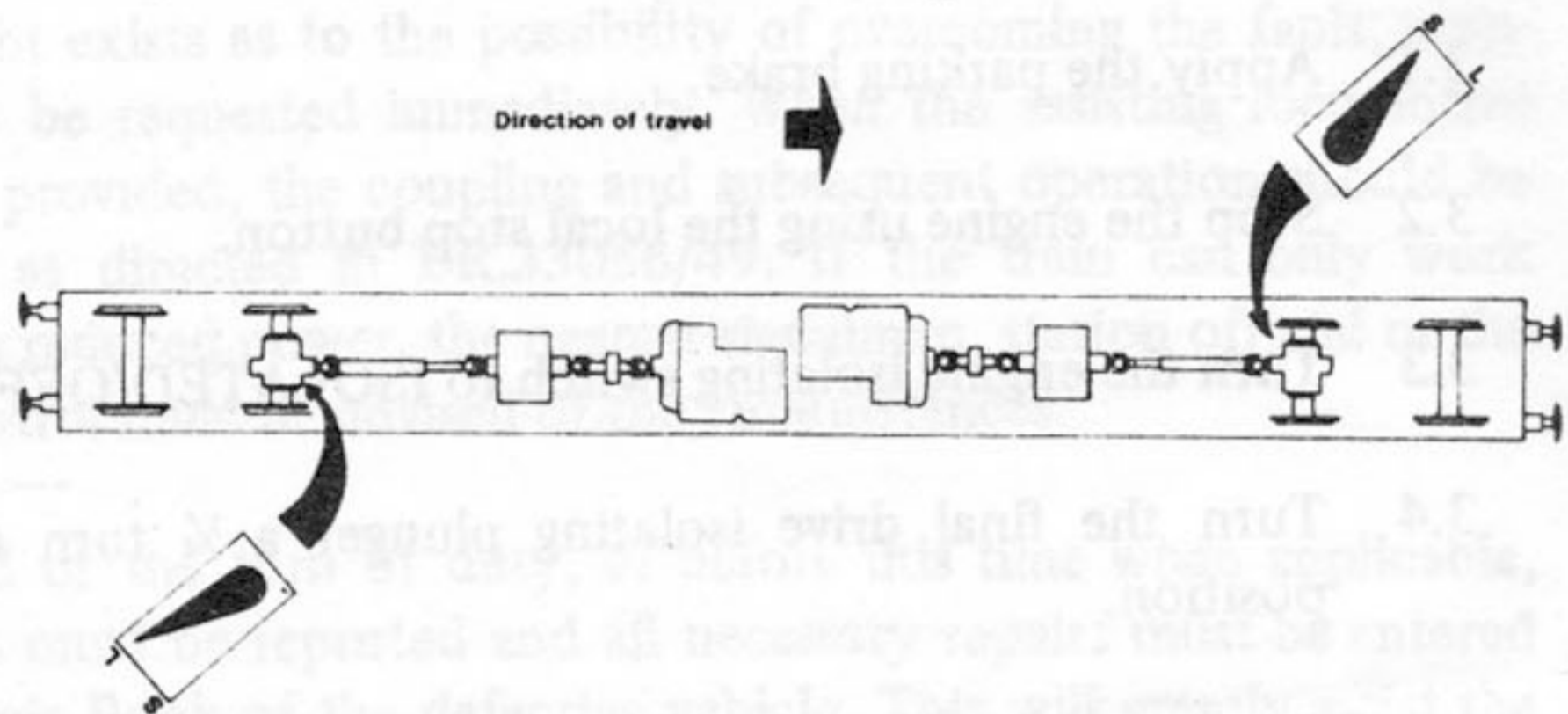
(2) See also page 9 'Effect of No. 7 fuse rupturing'.

(3) A train may be allowed to continue in traffic with up to one engine in four isolated, or one in two on a single power car. Trains with one power car and one engine isolated must be taken out of service at the first opportunity.

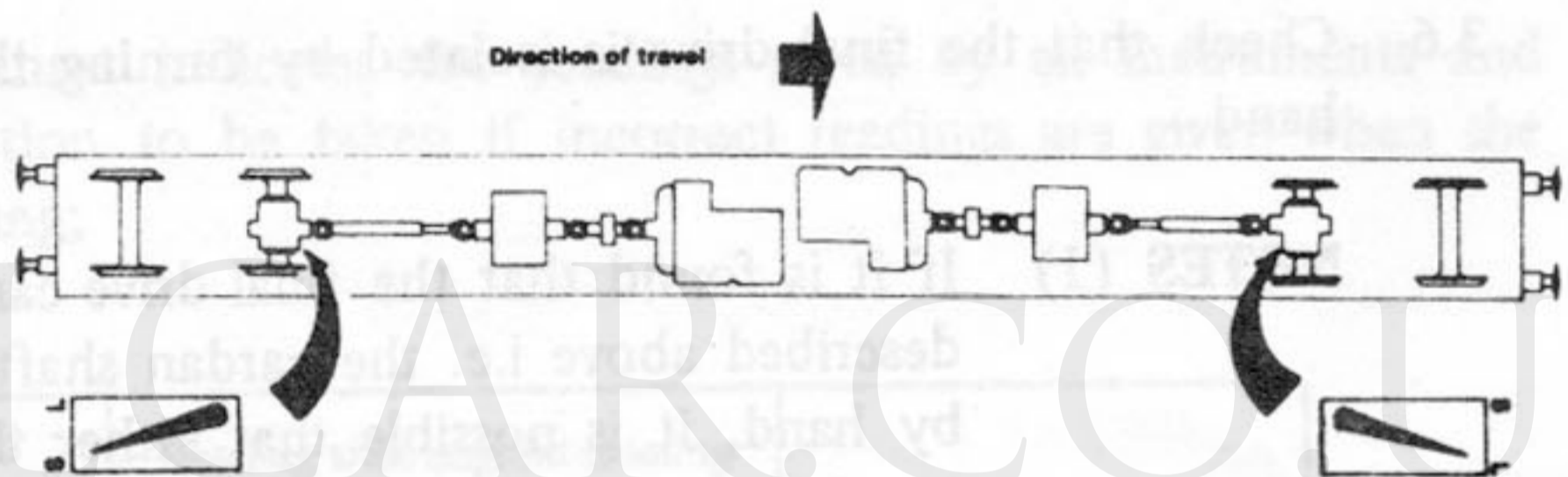
(4) If a final drive is isolated, the AIR & AXLE light for the power car concerned will not illuminate and no indication of engagement of the opposite end final drive will be given in the driving compartment.

The direction of the opposite end final drive can be checked by the pointer on top of the final drive:

(i) Suburban and Cross-Country Sets



(ii) Inter-City and Parcels Cars



(5) If there is any doubt as to the direction of the opposite end final drive then, providing there is more than one power car on the train and the gradient permits, a positive check of direction can be made as follows:-

- (a) Ensure that all engines are stopped.
- (b) Start the remaining engine of the power car concerned.
- (c) Return to the cab, make a holding application of the vacuum brake and release the parking brake.
- (d) Select the direction of travel required, release the vacuum brake, open the power controller and observe if the train moves in the direction selected.

- (6) Final drive gearboxes must not be isolated if the train is standing on, or is adjacent to, track which is equipped with conductor rails.

If a train is on such a track when an engine becomes defective it may proceed, provided the remainder of the equipment is in good order, at a maximum speed of 25 m.p.h. for a distance not exceeding 10 miles until there is an opportunity to isolate the final drive in safety. If the final drive gearbox must be isolated because of damage, or because of the length of run on track equipped with conductor rails, then arrangements must be made for the current to be switched off from the appropriate sections before the isolating fork is used.

4. EFFECT OF FUSES RUPTURING IN A D.M.M.U. POWER CAR

Various fuses are provided in the electrical circuits of D.M.M.U. trains and there are two which can bring a train to a stand in the event of rupture:-

Control fuse – No. 6

Local fuse – No. 7

4.1 Effect of a No. 6 fuse rupturing

The control circuit light (where fitted) and the engine and air/axle lights will be extinguished.

The A.W.S. warning horn will sound, it cannot be cancelled and the brakes will apply after three seconds.

The brakes will be applied by the D.S.D. (if the A.W.S. is isolated or not in use).

The engines will revert to idling speed.

The gearboxes will revert to neutral.

The engines will not stop when the stop button is pressed in the driving compartment.

4.2 Action to be taken if the fuse cannot be changed:-

4.2.1 Apply the parking brake

4.2.2 Remove the control circuit key and move the Reversing handle to NEUTRAL.

4.2.3 Check the train for obvious defects such as overheated electrical equipment or smoke. If defects are found see 4.2.5.

4.2.4 If no defects are visible from normal observation, insert the control circuit key in the rearmost driving cab and turn it to 'on'. Check that the control circuit indicator light is illuminated, or where this is not fitted that the train communication buzzer is operative, to confirm that control has been established.

If fuse blows again on single unit train – request assistance.

If fuse blows again on a train with more than one unit then disconnect the jumper cables between units midway down the train and insert the control circuit key in each portion to locate the fault.

Once defective portion of the train has been identified stop and isolate all engines, isolate all final drives and D.S.D. valves. Note that the FOR and REV E.P. valves must be operated manually.

The train may then be driven from the portion on which control can be established. There will be no buzzer communication between the two portions once the jumper cables have been disconnected although the continuous vacuum brake will remain operative. If the defective portion is leading the Guard must ride in the leading cab to operate the horn and emergency brake valve as necessary, communicating with the Driver by hand signals. If the defective portion is at the rear the Guard must ride in that portion and communicate with the Driver by hand signals or by applying the emergency brake valve.

4.2.5 If there is evidence of overheating or other damage in any vehicle on the train, the No. 6 fuse may rupture in any car in which the control switch is closed and the instruction in 4.3 or 4.4 below, must be observed.

4.3 If in carrying out the instruction in 4.2.3 above, smoke is seen to be issuing from the leading power car of a train which has more than one power car, the instruction in 4.2.4 should not be carried out and the following must be substituted:-

4.3.1 Deal with the fire as necessary and ascertain if it is safe for the train to continue.

4.3.2 Stop the engines. Isolate the driver's safety device and final drive gearboxes of the defective car. Manual operation of the E.P. valves will be necessary in order to isolate the final drive gearboxes. Move the A.W.S. change-end switch to OFF.

4.3.3 Disconnect the jumper cables between the defective (leading) power car and the next car and secure them in their sockets.

4.3.4 Insert the control circuit key, reversing handle and brake handle into their positions in an alternative driving compartment and move the AWS switch to ON.

4.3.5 Restart the engines.

4.3.6 Check that the brakes are applied by D.S.D. action then release the parking brake in the leading car.

4.3.7 Drive the train to the next point where the passengers can be de-trained, with the guard in the leading driving compartment and operating the emergency brake valve and horn as necessary.

IMPORTANT: THE BUZZER WILL BE INOPERATIVE IN THESE CIRCUMSTANCES AND THE GUARD SHOULD BE CLEARLY INSTRUCTED THAT HAND SIGNALS WILL BE NECESSARY.

4.4 If in carrying out the instructions in 4.2.3 above, smoke is seen to be issuing from a power car behind the leading one, in a train which has more than two power cars, proceed as follows:-

4.4.1 Deal with the fire as necessary and ascertain if it is safe for the train to continue.

4.4.2 Ascertain the number of power cars in the train on either side of the defective one.

4.4.3 IF A GREATER NUMBER ARE AHEAD OF THE DEFECTIVE CAR, disconnect the jumper cables in front of it and secure them in their sockets. Stop the engines, isolate the driver's safety devices and final drive gearboxes of each car, including the defective one, behind the point where the jumper cables have been disconnected. Manual operation of the E.P. valves will be necessary in order to isolate the final drive gearboxes.

4.4.4 Insert the control circuit key in any driving compartment of a power car between the leading car and the point where the jumper cables have been disconnected, and on which the batteries are being charged.

4.4.5 Restart the engines.

4.4.6 Check that the brakes are applied, then release the parking brake in the leading car.

4.4.7 The train may then be driven from the leading car.

IMPORTANT:

1. The buzzer will not operate from a car behind the point where the jumpers are disconnected.
2. Class 108/1 power cars numbered 50630-50646, 51561-51572, 52037-52065 and Class 108/2 power cars numbered 50599-50629, 50924-50987, 51416-51424, 51901-51950 must not be used to propel or haul a weight in excess of 75 tonnes.

4.4.8 IF A GREATER NUMBER ARE TO THE REAR OF THE DEFECTIVE CAR, disconnect the jumper cables in the rear of it and secure them in their sockets. Stop the engines and isolate the driver's safety devices and final drive gearboxes of each car, including the defective one, in front of the point where the jumper cables have been disconnected. Manual operation of the E.P. valves will be necessary in order to isolate the final drive gearboxes.

4.4.9 Insert the control circuit key, reversing handle and brake handle into their positions in a driving compartment to the rear of the defective car, on which the batteries are being charged and which is the most convenient for the observation of signals etc. Restart the engines.

4.4.10 Check that the brakes are applied, then release the parking brake in the leading car.

4.4.11 Drive the train to the next suitable point where the passengers can be detrained, with the guard in the leading driving compartment operating the emergency brake valve and horn as necessary.

IMPORTANT: THE BUZZER WILL BE INOPERATIVE IN THESE CIRCUMSTANCES AND THE GUARD SHOULD BE CLEARLY INSTRUCTED THAT HAND SIGNALS WILL BE NECESSARY.

4.5 Effect of the No. 7 Fuse Rupturing.

The gearboxes will return to NEUTRAL on the affected car and the engines will return to idling.

The brakes will be applied by the driver's safety device.

The AIR and AXLE lights for the affected car will be extinguished.

The engines will not stop on the affected car, when a STOP button is pressed.

4.6 Action to be taken if the fuse cannot be changed:-

4.6.1 Apply the parking brake.

4.6.2 Check which car has the defective fuse by noting the AIR and AXLE light that is extinguished.

4.6.3 Stop the engines on the defective car manually by operating the solenoid linkage, or by closing the fuel isolating cock, then isolate them.

4.6.4 Turn both the final drive isolating plungers $\frac{1}{4}$ turn to the ISOLATED position on the defective car.

4.6.5 At the E.P. valve box, operate the Forward and Reverse E.P. valve test buttons alternatively, pausing 5 seconds between each operation, until the final drives have locked into neutral. Check the cardan shafts are free to rotate by hand.

NOTE: Final drive gearboxes with manual isolating handles should be isolated as follows:-

(a) Manually isolate each final drive gearbox by moving the isolating handle until it becomes locked in the NEUTRAL position.

(b) Check the cardan shafts are free to rotate by hand.

4.6.6 Isolate the driver's safety device in the affected car.

4.6.7 Return to the leading driving compartment, release the parking brake and after receiving the guard's hand signal, proceed under reduced power.

NOTE: If the defective fuse is in the leading power car, the control circuit key should be inserted in another power car driving position if the remaining running time is to exceed ½ hour or if any lighting or the train heaters are to be used. This is because the batteries of a car with a defective No.7 fuse will not be charged.

IMPORTANT:

Final drive gearboxes must not be isolated if the train is standing on or adjacent to track which is equipped with conductor rails. If a train has a ruptured No.7 fuse and is standing on or near such track, it must be driven at a speed not exceeding 25 m.p.h. to a point where the isolating fork can be used without risk of contact with conductor rails. The distance of such a movement must not exceed ten miles. If a final drive gearbox must be isolated due to damaged equipment or because of the length of run on the electrified track, then arrangements must be made for the power must be switched off from the appropriate sections before the isolating fork is used.

4.7 Effect of a Lighting Fuse Rupturing.

It is unlikely that all frontal lighting of a D.M.M.U. train will become extinguished at the same time, because the various sections are protected by more than one fuse. If, however, all frontal lighting is extinguished the provisions of the Rule Book, Section H. 7.1 must be carried out.

FAULT and Indication. where Applicable	POSSIBLE CAUSE	RECOMMENDED ACTION
<p>1. Indicator light not illuminated when C.I.S. key is turned to 'on'. NOTE: On units not fitted with this indicator light check train communication buzzer when C.I.S. key is 'on'. If buzzer does not sound check 1A, 1C & 1D.</p>	<p>A. Battery isolating switch 'off'. B. Defective lamp. C. No. 6 fuse defective. D. Flat battery.</p>	<p>Check and turn to 'on' as necessary. Carry on with starting procedure, report defect. Transfer C.I.S. key to the switch in another cab, report defect. If only one power car on the train - request assistance. If more than one isolate engines, final drives and D.S.D. on defective car. NOTE: It will be necessary to operate the FOR and REV E.P. valves manually when isolating the final drives.</p>
<p>2. Engine will not turn when local start button is pressed.</p>	<p>A. Engine isolating switch at 'off' B. Fire alarm two-pole switch has been operated. C. Cooling water level low. (not applicable to all units) D. No. 7 fuse defective. E. Starter motor defective.</p>	<p>Check defect book for reason. Do not return switch to 'on' without authority of maintenance staff. Check defect book for reason. Do not return switch to normal without authority of maintenance staff. Examine the engine and cooling system for obvious defects. If system cannot be 'topped up' isolate the engine and final drive. Neither engine will start on that car. If fuse cannot be replaced and only one power car on the train request assistance. If fuse cannot be replaced but there is more than one power car then isolate engines, final drives and D.S.D. on defective car. NOTE: It will be necessary to operate the FOR and REV E.P. valves manually when isolating the final drives. Isolate that engine and final drive.</p>

FAULT and Indications where Applicable	POSSIBLE CAUSE	RECOMMENDED ACTION
3. Engine turns but will not fire when local start button is pressed.	Fuel starvation.	<p>Check fuel level gauges and that fuel cocks are open. Pull flexible engine control cable to the full extent and after 10 seconds make a further attempt.</p> <p>When possible, bleed the fuel system by opening the bleed screw on the fuel injection pump and operate the manual lever. When fuel flows free of air bubbles close the bleed screw.</p>
4. Engine fires but stops when local start button is released.	<p>A. Low oil pressure</p> <p>B. Cooling water level low. (not applicable to all units).</p>	<p>Examine the engine for obvious defects and check dipstick level. If sump cannot be 'topped up' isolate the engine and final drive.</p> <p>Examine the engine and cooling system for obvious defects. If the system cannot be 'topped up' isolate the engine and final drive.</p>
5. Air pressure fails to build up, or is lost when running.	<p>A. Unloader valve defective.</p> <p>B. Leakage on the system.</p>	<p>To locate fault close air cocks between cars. Examine the unloader valves on all power cars and fit blanking-off nut on defective valve.</p> <p>Check reservoir drain cocks, coupling cocks and flexible pipes. Air system defective on power car. If the fault cannot be rectified and there is only one power car on the train:-</p> <p>(i) Stop both engines and turn engine isolating switches to 'off'. (ii) If sufficient air pressure is available isolate the final drives (see NOTE) and request assistance.</p> <p>If the fault cannot be rectified but there is more than one power car on the train:-</p> <p>(i) Stop both engines and turn engine isolating switches to 'off'. (ii) If sufficient air pressure is available isolate the final drives (see NOTE), close air isolating cocks at each end of the defective car and proceed. Air pressure will not be available on this car for horns and windscreen wipers.</p> <p>NOTE: If the final drives cannot be isolated the train must not exceed 5 m.p.h. in either direction to a point where it can be taken out of traffic. (see NOTE 1 page 3)</p> <p>Air system defective on trailer car If the fault cannot be rectified close the air isolating cocks at each end of the car and proceed. Air pressure will not be available on this car for horns and windscreen wipers.</p>

FAULT and Indication where Applicable	POSSIBLE CAUSE	RECOMMENDED ACTION
6. Engines will not start when cab start button is pressed.	A. Reversing handle at 'off'. B. A.W.S. change-end switch at 'off' (where applicable). C. Defective start button D. Jumper cable disconnected or not fully home. E. See faults 1, 2, 3 and 4	Put handle to FOR or REV. Put switch to 'on'. Attempt to start from another cab. Ensure all jumper cables are fully home and secure.
7. Air and axle light not illuminated.	A. Air pressure below 60 p.s.i. B. Defective lamp C. No. 7 fuse defective D. Final drive sliding dog clutch not engaged. E. Jumper cable disconnected or not fully home.	See fault 5. Check appropriate air and axle light in another cab, report defect. If fuse cannot be replaced and only one power car on the train request assistance. If fuse cannot be replaced but there is more than one power car then isolate engines, final drives and D.S.D. on defective car. NOTE: It will be necessary to operate the FOR and REV E.P. valves manually when isolating the final drives. With engines idling and the train stationary, try to engage the final drive by moving the reversing handle to the other direction and back again. If the final drive still will not engage, the associated engine must be isolated and, if possible, the defective final drive must be isolated. NOTE: If the final drive cannot be isolated the train must not exceed 5 m.p.h. in either direction to a point where it can be taken out of traffic (see NOTE 1 page 3) Ensure all jumper cables are fully home and secure.

FAULT and Indications where Applicable	POSSIBLE CAUSE	RECOMMENDED ACTION
<p>8. Engine light is extinguished.</p>	<p>A. Engine stopped through loss of coolant, low oil pressure or fuel starvation.</p> <p>B. Defective lamp or low lub. oil pressure on engines where run oil pressure switch is not provided.</p> <p>C. Operation of fire alarm system, fire bell rings.</p>	<p>Confirm at the next convenient stopping point that the engine has in fact stopped. Attempt to restart the engine not more than THREE times. See fault 3, 4A and 4B. Isolate engine and final drive if unable to rectify.</p> <p>If, on examination, the engine is found to be running suspect lamp and check by depressing 'test' button in another cab.</p> <p>If lamp still does not illuminate suspect low lub. oil pressure, light will illuminate when power controller/throttle is opened.</p> <p>Turn C.I.S. key to 'off' immediately the train is brought to a stand and carry out procedures detailed in the Train Crew Manual BR.33056/7.</p>
<p>9. Loss of train pipe vacuum, or vacuum fails to build up when the brake handle is at OFF/RELEASE. CHECK PANEL LIGHTS</p>	<p>A. Defective D.S.D. valve or D.S.D. electrical circuit.</p> <p>B. No.6 fuse defective (ALL PANEL LIGHTS EXTINGUISHED)</p> <p>C. No.7 fuse defective (AIR & AXLE LIGHT EXTINGUISHED ON DEFECTIVE CAR)</p>	<p>Isolate D.S.D. valves in turn until defective one is located, then de-isolate those not defective.</p> <p>NOTE: If the D.S.D. electrical circuit is defective, all D.S.D. valves on the train will draw air. This may not be audible on the rear units until those ahead are isolated. The power controller handle must be kept depressed during the check.</p> <p>If there are other D.S.D. valves on the train check that they are working correctly and proceed. If all D.S.D. valves on the train are isolated then the Guard or another competent person must ride in the driving compartment.</p> <p>Transfer C.I.S. key to the switch in another cab. See Section 4 page 6 if fuse ruptures again.</p> <p>If fuse cannot be replaced and only one power car on the train request assistance. If fuse cannot be replaced but there is more than one power car then isolate engines, final drives and D.S.D. on defective car. NOTE: It will be necessary to operate the FOR and REV E.P. valves manually when isolating the final drives.</p>

FAULT and Indications where Applicable	POSSIBLE CAUSE	RECOMMENDED ACTION
9. (continued)	D. Leakage on train pipe	<p>Check flexible hoses, passenger communication valves and emergency brake valves in driving compartments and guards' compartments.</p> <p>Check if an A.W.S. change-end switch is at 'on' in another driving compartment (this will cause a brake application even though the A.W.S. warning signal has been acknowledged in the leading driving compartment).</p> <p>If the fault cannot be rectified isolate the defective car by placing train pipes onto their dummy couplings.</p> <p>If the defective car is leading the train must be driven from another cab.</p> <p>NOTE: (i) Pull release cords on defective car to release brakes. (ii) If the train pipe is defective on the car with the only D.S.D. valve on the train, then the D.S.D. is inoperative and the Guard or another competent person must ride in the driving compartment.</p>
	E. Leakage on release pipe.	See fault 10.

FAULT and Indications where Applicable	POSSIBLE CAUSE	RECOMMENDED ACTION
10. Loss of release pipe vacuum, or vacuum fails to build up.	<p>A. Exhausters not working</p> <p>B. Leakage on release pipe of power car or trailer car.</p> <p>NOTE: When units are in multiple it may be necessary to uncouple the release pipes between units to find out which has the defective car.</p>	<p>Check all exhauster driving belts and drain cocks.</p> <p>(i) Leakage on release pipe of power car. If only one power car on the train – request assistance. If more than one power car – isolate defective car by placing release pipes onto their dummy couplings and then proceed. If the defective car is leading the train must be driven from another cab with the Guard in the leading cab to operate the communication buzzer, horn and emergency brake valve as necessary. If circumstances permit the defective unit may be positioned at the rear of the train.</p> <p>(ii) Leakage on release pipe of trailer car. Isolate defective car by placing release pipes onto their dummy couplings. If the defective car is leading the train must be driven from another cab with the Guard in the leading cab to operate the communication buzzer, horn and emergency brake valve as necessary. If circumstances permit the defective unit may be repositioned at the rear of the train.</p>
11. Tachometer reading out of step with speedometer reading in all gears.	Defective fluid coupling	Isolate associated engine and final drive.
12. Tachometer reading out of step with speedometer reading in any one gear.	Gearbox brake band slipping.	<p>Toggle brake bands as first convenient opportunity as follows:-</p> <p>(i) Ensure that air pressure is at maximum.</p> <p>(ii) Stop all engines.</p> <p>(iii) Keep D.S.D. depressed and select the defective gear at least six times, pausing each time the gear is selected to ensure correct operation of the brake band slack adjuster.</p>