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

British Rail | Train Crew Manual

Class 47 Locomotives Fault Finding Data

Includes 47401 - 47420 and 47/7

Issue 3
Supersedes Issue 2

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FAULT FINDING DATA FOR CLASS 47 LOCOMOTIVES

1. The usual warning indications are provided on the driving desk together with a subsidiary panel in the engine room, these are DIM when conditions are normal and BRIGHT when there is a fault condition.

Red BRIGHT – diesel engine stopped

Yellow BRIGHT – wheel slip or fault developing in a traction motor

Blue BRIGHT – a general fault indication

Subsidiary Panel:

1.1 Oil Pressure Low – lub. oil pressure below 12 psi.

1.2 Water Pressure/ Level – coolant pressure below 4 psi. or level low

1.3 Water Temperature High – coolant temperature 198°F or above

1.4 Blower Fault – the traction motor blowers have stopped.

1.5 Earth Fault Tripped – traction, auxiliary or ETH (where fitted) current has passed through the frame of the locomotive as a result of faulty electrical insulation.

Note: Indications for the following faults also give a Blue 'general' alarm light on the driving desk:

Low Water Level

High Water Temperature

Blower Fault

Power Earth Fault

In addition there are:-

1.6 A white light on the r.h.s. of the cab to indicate that the boiler (where fitted) is running – DIM when normal, BRIGHT under fault condition.

1.7 A white 'H' indicator light on the driving desk of ETH fitted locomotives, illuminated when the train supply is 'ON'. There is a switch to control the brightness.

1.8 Four repeater lights above the r.h. door in each cab to show the position of the Brake Selector Switch i.e.

Vacuum Passenger	–	Vacuum Goods
Air Passenger	–	Air Goods

2. The electrical systems are protected by either fuses or miniature circuit breakers (MCB):

Fuses

Pump Set Motor 125 amps	– The Triple Pump will stop and the engine will shut down, Water Pressure/Level Indicator BRIGHT.
Blower Motor 125 amps	– The traction motor blowers will stop, blue alarm light BRIGHT on driving desk, Blower Fault light BRIGHT.
Compressor Motors (2) 125 amps	– The appropriate compressor will stop, if main air pressure drops to 65 psi power will be lost and brakes will be applied. Blue alarm light BRIGHT on driving desk.
Boiler 60/63 amps	– Train heating boiler will shut down, white light in driving cab extinguished.
Battery Charge 200 amps Battery Rectifier 400 amps	– No 'charge' to the battery, battery ammeter 'dead'
Heaters (2) 63 amps	– Heating will be lost in the appropriate cab.
Cooker 16 amps or 32 amps	– Cooker not available in No.2 cab, or both cabs when locomotive is so equipped.

CIRCUIT BREAKERS

Control Circuit Breakers CCB1 (positive) CCB2 (negative)	– The engine will stop, all fault indications will be extinguished, brake application, AWS horn sounds and cannot be silenced until change-end switch is put to OFF.
Lighting Circuit Breakers (LCB1 to LCB4)	– LCB1 (positive) LCB2 (negative) – either will extinguish half the interior lights, cab lights, marker lights and control cubicle lights. Also the tail lights at No.1 end and instrument lights No.1 cab. LCB3 and LCB4 protect the other half, the tail lights at No.2 end, instrument lights No.2 cab and the Fuse Test Point. IF A CIRCUIT BREAKER TRIPS IT MAY BE RESET NOT MORE THAN THREE TIMES CONSECUTIVELY.

3. Fuse Changing Procedure.

3.1 Stop the engine.

3.2 OPEN the battery isolating switch.

3.3 Remove the suspect fuse and place on fuse test point, if ruptured i.e. 'blown' the lamp will not illuminate.

3.4 Replace the fuse with one of correct amperage after testing it.

3.5 CLOSE battery isolating switch and restart diesel engine.

ONLY ONE SPARE FUSE SHOULD BE USED, IF THIS RUPTURES THE ASSOCIATED CIRCUITRY IS DEFECTIVE AND CANNOT BE USED.

4. The following switches are provided in the engine room:

4.1 Water Pump Control	– normally at AUTO, in DIRECT the triple pump can be run from the battery with the master switch at OFF.

4.2	Traction Motor Isolation (3)	– normally at IN, in OUT single or pairs of motors may be isolated.
4.3	Exhausters (2)	– OFF, NORMAL or TEST. In the TEST position the exhauster concerned will run off the battery but power cannot be obtained. Engine will stop after 2-3 minutes.
4.4	Engine Maintenance	– NORMAL or MAINTENANCE, the latter position enables maintenance staff to increase engine r.p.m. without power being obtained.
4.5	Brake Selector	– enables the rate of braking appropriate to the class of train to be worked to be selected.
4.6	Earth Isolation	– enables an Auxiliary and/or Power (traction) earth fault relay to be isolated and, in the case of a power earth fault, enables power to be regained. **N.B.** Locomotives 47401 to 47420 have an earth link in place of the switch and this requires a spanner to remove it.
4.7	Compressor Changeover (fitted to those locomotives with electromagnetic start contactors except 47401 to 47420)	– in the NORMAL position the compressors will run according to the position of the brake selector switch i.e. both will run in either Air Passenger or Air Goods, only one will run in Vacuum Passenger or Vacuum Goods. In either vacuum condition the compressors alternate i.e. driving from No.1 cab No.1 compressor runs, driving from No.2 cab No.2 compressor runs. In either CHANGE-OVER position this will be reversed i.e. driving from No.1 cab No.2 compressor will run, driving from No.2 cab No.1 compressor will run. **N.B.** Locomotives 47401 to 47420 – both compressors run in all positions of the brake selector switch.

5. Gauge and Instrument Readings

Main reservoir pressure	– 118 to 140 psi.
Brake cylinder pressure	– zero to 70 psi.
Brake pipe pressure	– 50.5 to 72.5 psi from FULL SERVICE TO RUNNING to 78.5 psi when overcharge is used.
Control Air Pressure	– 70 psi
Charging Air Pressure	– 12 to 15 psi when diesel engine on full load.
Water Pressure	– 15 to 25 psi
Oil Pressure	– 16 to 50 psi
Regulating Air Pressure	– zero to 50 psi according to controller position. Low regulating air pressure will result in low charging air pressure.
Water Temperature Oil Temperature	– 160° to 180°F when engine has reached working – temperature.

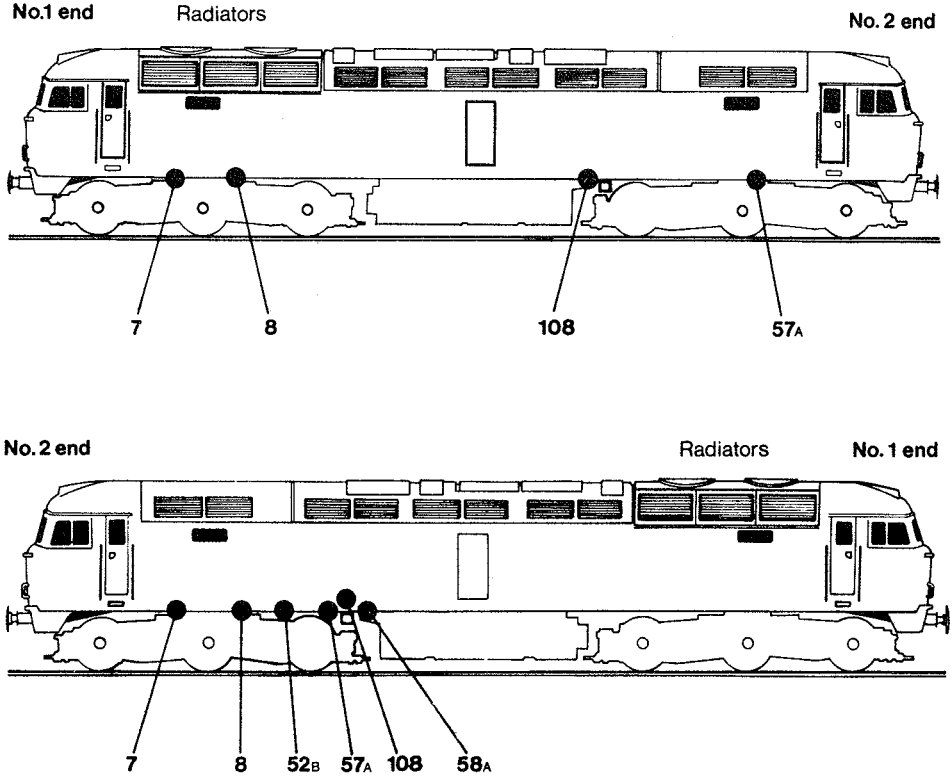
6. Pressure Switch and other settings.

Compressor Governor	– opens at 140 psi to stop compressor(s) closes at 118 psi to retart compressor(s)
Safety Valve	– opens at 150 psi
Control Circuit Governor (not fitted on 47401 to 47420)	– opens at 65 psi to cut off power and initiate a brake application. Closes at 82 psi to enable the brake pipe to be charged and power obtained.
Low Main Air Protection Device (47401 to 47420 only)	– Opens at 65 psi to initiate a brake application Closes at 87 psi to enable the brake pipe to be charged.
Air Brake Pipe Governor	– opens at 45-48 psi to cut off power closes at 58-62 psi to enable power to be regained.
Vacuum Control Governor	– Opens to cut off power if vacuum falls to 12.5 ins or below. Closes at 14.5-15.5 ins to enable power to be regained. **N.B.** only operative under vacuum braked conditions.

Equipment Governor ETH LOCOMOTIVES ONLY	– Opens at 50 psi to cut off power and ETH supply. Closes at 63.5 psi to enable power and ETH to be regained.
Water Pressure Switch (W.P.S.)	– opens at 4 psi to stop the engine, closes at 10 psi to enable engine to be started.
Oil Pressure Switches	– Start oil Pressure switch (S.O.P.S.) closes at 20 psi on starting the engine to 'dim' the red 'engine stopped' light, opens at 16 psi as pressure falls to 'brighten' the light. Run Oil Pressure Switch (R.O.P.S.) closes at 16 psi on starting the engine, opens at 12 psi at pressure falls to stop the engine.
Engine Overspeed Device	– 'trips' if engine r.p.m. exceeds 890 r.p.m.

Exterior equipment

FIG. 1



Key to numbers

Isolating cocks	Switches	Push buttons
7 Bogie, straight air brake	58A Shed/normal lighting	108 FIRE
8 Bogie, auto. air brake	57A Battery isolating	
52B Boiler fuel		

A denotes alternative position
B denotes where fitted

Fig. 2 – Interior Equipment – key to numbers

'A' denotes alternative position – 'B' denotes where fitted

Isolating Cocks

1. Air/Vacuum – Vacuum Isolating
2. Main Reservoir
3. Air Compressor Governor
6. Low Main Air Reservoir Governor
12A. D.S.D.
15. Drivers Brake Valve (main supply)
24. Horn and Windscreen Wipers
31. Control Air
75B. Radiator Shutter (47401 to 47420)
83B. Boiler Air Supply
124A. Control Air Reservoir

Switches

19A. Brake Selector
57A. Battery Isolating
144B. Compressor Changeover

Governors

39. Air Compressor
40. Low Main Air
41. Vacuum Brake Pipe
45. Equipment (ETH)
46B. Exhauster Speed-Up (47401 to 47420)
48. Air Brake Pipe
54B. Compressor Pre-start
80. Vacuum Control

Release Valves

33. Air/Vacuum Relay (control air)
50. Distributor Control Air Reservoir
79. Vacuum Control Reservoir

Push Buttons

66. Local Engine Stop/Start
108. Fire Emergency

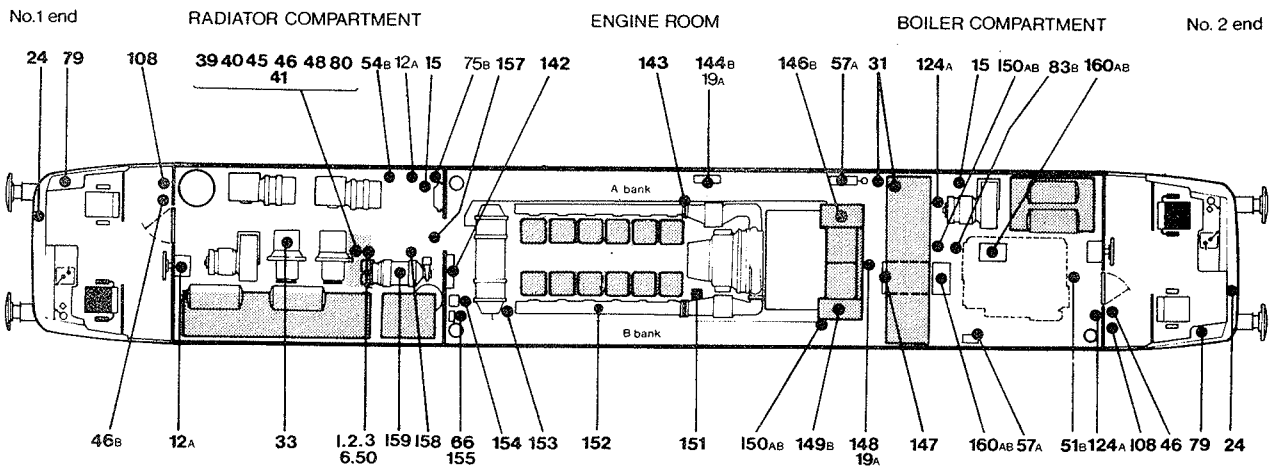
Other Equipment

51B. Boiler Steam Shut-Off Valve
142. Engine Instrument Panel
143. Governor Oil Filter
146B. Alternator Overload Relay (Alternator Auxiliaries Cubicle)
147. Fault Lights & Instrument Panel
148. Switch & Fuse Panel
149B. Train Heat Overload Relay (ETH cubicle)
150AB. Train Heat Circuit Breaker (THCB)
151. Engine Governor
152. Dipstick
153. Engine Overspeed Device
154. Pressure Switches
155. Engine Speed Valve
157. Coolant Level Gauge
158. Fuel Auto-Klean Strainer
159. Triple Pump
160AB. Automatic Voltage Regulator (AVR)

Interior equipment

Key to numbers

FIG. 2



Radiator compartment

FIG.3

No.1 end

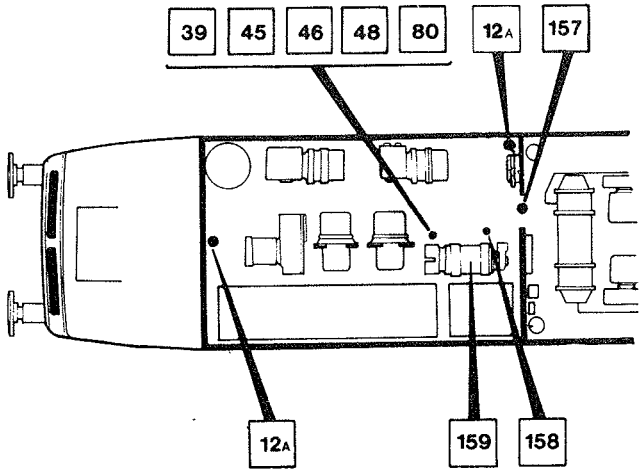


Fig. 3 – Radiator Compartment No.1 end

Key to numbers

Governors on brake equipment frame	Other Equipment
39 Compressor governor	12A DSD isolating cock
45 Equipment governor (ETH)	157 Coolant level gauge
46 Exhauster speed-up (47401-20)	158 Fuel Auto-Klean strainer
48 Air brake pipe governor	159 Triple pump
80 Vacuum control governor	

'A' denotes alternative position

Fig. 4 – Engine Room – Key to Numbers – Fig. 5 – Alternator auxiliaries

19. Brake selector switch
31. Control air isolating cock
57. Battery isolating switch
66. Local engine stop/start buttons
142. Engine instrument panel
143. Governor oil filter
144. Brake selector switch
146. Alternator auxiliaries cubicle (contains AOL-alternator overload relay)
147. Fault lights and instrument panel
148. Switch and fuse panel
149. E.T.H. cubicle (contains THOL-train heat overload relay)
150. Train heat circuit breaker (THCB)
151. Engine governor
152. Dipstick
153. Engine overspeed device
154. Pressure switches
160A. Automatic voltage regulator (AVR)

Engine room

FIG.4

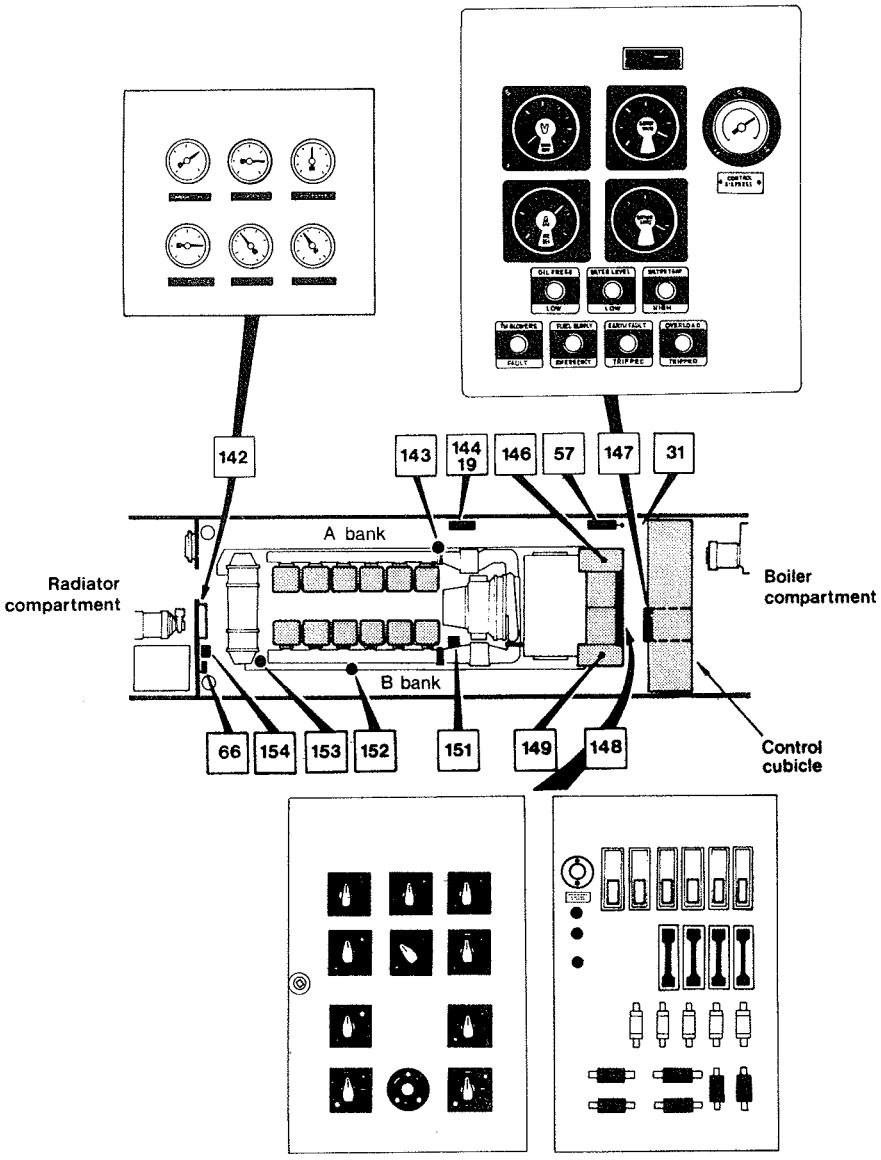
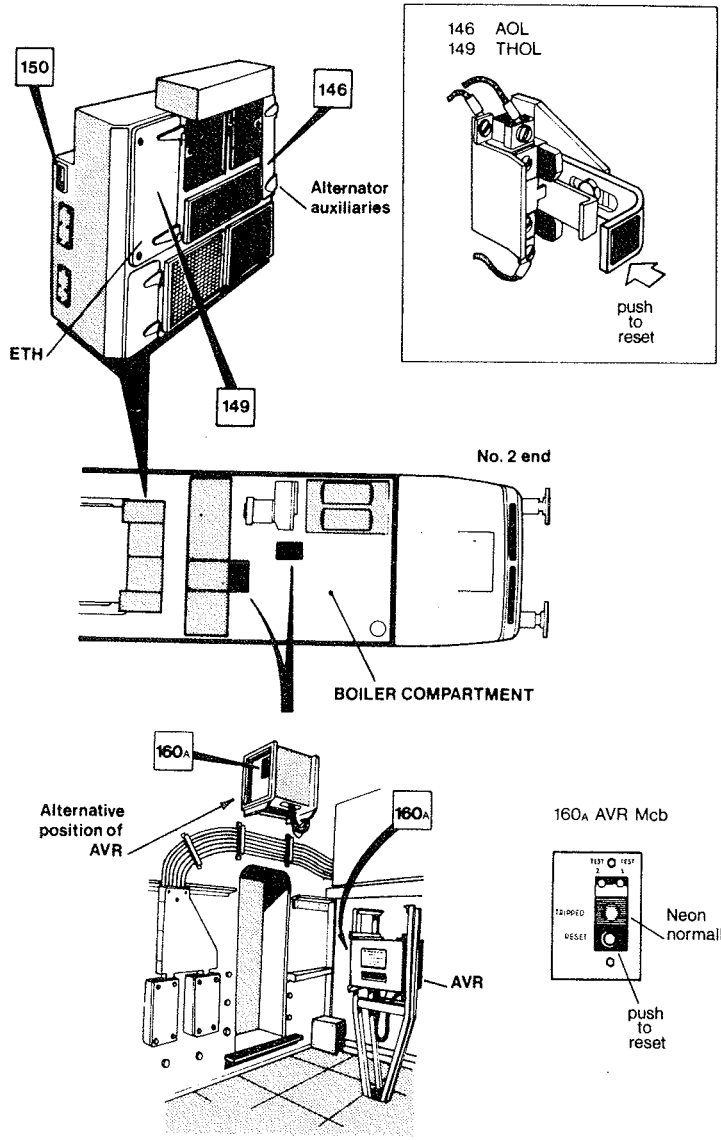


FIG.5

Alternator auxiliaries, ETH cubicle and boiler compartment



INDICATIONS IN DRIVING CAB	POSSIBLE FAULT	RECOMMENDED ACTION
1. Engine STOPS Red 'engine stopped' light BRIGHT	a. Engine Overspeed	Check Overspeed Device [153] , if 'tripped' i.e. plunger 'down' – reset. If device immediately 'trips' again fail locomotive. If device 'trips' when full power is restored reset ONCE MORE and restrict controller position to control r.p.m. If device 'trips' again fail locomotive.
	b. Low Water Pressure (below 4 psi)	Check Water Pressure Light [147] , if BRIGHT check Triple Pump [159] , if RUNNING check coolant pressure [142] and coolant level [157] . If pressure is less than 8 psi engine will not restart unless any leakage can be stopped. If coolant is low fail locomotive. If Triple Pump is STOPPED turn Water Pump Switch [148] to DIRECT, if pump still does not run check Water Pump Fuse [148] .
	c. Low Oil Pressure (below 12 psi)	Check Oil Pressure light [147] , if BRIGHT check oil level in sump [152] . If above 'MAX' on dipstick fail locomotive DO NOT ATTEMPT TO RESTART ENGINE (fuel dilution). If between 'MAX' and 'MIN' attempt local start [66] and observe Oil Pressure Gauge [142] . If pressure exceeds 16psi engine will continue to run when start button is released. If below 'MIN' fail locomotive.
	d. Fuel Starvation	Check contents gauge – usually preceded by period of 'hunting' i.e. engine r.p.m. fluctuates.

INDICATIONS IN DRIVING CAB	POSSIBLE FAULT	RECOMMENDED ACTION
2. Engine STOPS All desk lights OUT Brake application, AWS horn cannot be silenced unless change end switch is put to OFF.	Control Circuit Breaker 'tripped'	Reset CCBI and/or CCB2 [148] and restart engine. If either 'trips' again turn Earth Isolating Switch [148] to AUXILIARIES ISOLATED, reset again and restart engine. If either 'trips' again switch off all non-essential heating and lighting and reset once more. NOT MORE THAN THREE CONSECUTIVE ATTEMPTS TO RESET.
3. Loss of Power Blue Alarm light BRIGHT, reverts to DIM when controller is closed, brake application. LOSS OF MAIN AIR PRESSURE (below 65 psi)	a. Compressor(s) not running	Check 'toggle' on Compressor Governor [39], should be 'up'. If compressor(s) still do not run check Compressor Fuses [148].
	b. Compressor(s) running	Check system for leaks, in particular drain cocks, flexible hoses and cocks etc. Close cocks between locomotive and train to identify location.

INDICATIONS IN DRIVING CAB	POSSIBLE FAULT	RECOMMENDED ACTION
4. Loss of Power, blue 'Alarm' light BRIGHT, reverts to DIM when controller is closed. Brake application LOSS OF BRAKE PIPE PRESSURE (below 45 – 48 psi). Main Air Pressure adequate	a. Control Circuit governor defective	Manually operate 'toggle' [46] , should be 'up'.
	b. Defective DSD or AWS equipment	Isolate DSD [12] or AWS equipment. N.B. The DSD foot pedal must be kept depressed to energise the Feed Cut-Off Valve.
	c. Leakage on Brake Pipe	Check system for leaks, in particular cocks and flexible hoses. Close cocks between locomotive and train to identify location.

INDICATIONS IN DRIVING CAB	POSSIBLE FAULT	RECOMMENDED ACTION
5. Loss of Power, blue 'Alarm' light BRIGHT, reverts to DIM when controller is closed	a. Loss of Train Pipe Vacuum (below 12.5 in.), brake application	Check exhausters (no fuses are provided). The TEST position of the Exhauster Switches [148] may enable them to be run off the battery but NO POWER CAN BE OBTAINED and in addition, on some locomotives, the engine will STOP some 2-3 minutes after the switch has been moved to TEST. Part hoses between locomotive and train to locate fault.
	b. Power Earth Fault	Check Earth Fault Light [147] , if BRIGHT turn Earth Isolating Switch [148] to POWER ISOLATED. If power cannot be regained return switch to NORMAL and examine traction motors for signs of overheating. Isolate the motors/ pairs of motors [148] in turn until power is regained. ONCE IDENTIFIED CHECK MOTOR/PAIR OF MOTORS FOR ROTATION. Do not exceed 1400 amps for more than 5 minutes on series-parallel locomotives, nor 3550 amps for more than 5 minutes on those with all parallel motors. N.B. 47401 to 47420 have no Isolating Switch, isolate motors as described above.

INDICATIONS IN DRIVING CAB	POSSIBLE FAULT	RECOMMENDED ACTION
ETH FITTED LOCOMOTIVES ONLY 6. Loss of Power Blue 'Alarm' light BRIGHT, reverts to DIM when controller is closed. ENGINE THEN STOPS AFTER SOME 2 to 3 minutes. N.B. these faults may occur even when the ETH train supply is not in use.	a. Automatic Voltage Regulator MCB 'tripped'	Reset [160A] either by moving switch 'up' or pressing reset button.
	b. ETH Cubicle Door has opened	Check left hand door [149] and that all securing catches are engaged.
	c. ETH Alternator Overload has 'tripped'	Check Train Heat Overload Relay (THOL) [149] in left hand cubicle, reset as necessary.
	d. Auxiliary Alternator Overload 'tripped'	Check Auxiliary Alternator Overload Relay (AOL) [146] in right hand cubicle, reset as necessary.

INDICATIONS IN DRIVING CAB	POSSIBLE FAULT	RECOMMENDED ACTION
7. Blue 'alarm' light BRIGHT No loss of power	a. High Water Temperature (above 198°F)	Close controller, alarm light will not DIM until temperature falls to 158°F. If fault persists work locomotive accordingly. On 47401 to 47420 check radiator fan fuses (see page 27) and that radiator shutters are open together with their isolating cock 75B Remember High Water Temperature can lead to High Oil Temperature which results in Low Lub. Oil Pressure and Engine Stopped.
	b. Low Water Level	Check coolant gauge 157 as soon as possible and if low clear main line as quickly as possible. Remember Low Water Level leads to Low Water Pressure and Engine Stopped.
	c. Blower Motor Fault	Check Blower Fuse 148 . If not ruptured continue in service for not more than one hour, not exceeding 2100 amps on series/parallel locomotives or 4200 amps on those with all-parallel traction motors i.e. keep to GREEN sector of ammeter. On 47401 to 47420 if fuse is good, or blowers do not run when fuse is replaced, then Blower Relay has 'tripped' and can ONLY be reset by maintenance staff. Proceed for not more than one hour not exceeding 1500 amps continuously or 2100 amps when starting.

INDICATIONS IN DRIVING CAB	POSSIBLE FAULT	RECOMMENDED ACTION
8. Unable to regain power on opening controller, Blue light BRIGHT	a. Brake Pipe Governor defective IN VACUUM OR AIR CONDITIONS	Manually operate 'toggle' [48] , should be 'up'.
	b. Vacuum Control Governor defective IN VACUUM CONDITION	Check 'toggle' [80] , should be 'down'. **N.B.** Usually occurs after a brake application
	c. Load regulator has not run back to MAX	Allow more time. If still unable to regain power, stop engine, move master switch to OFF for two minutes, meanwhile rotate governor lub. oil filter [143] , then restart engine.

INDICATIONS IN DRIVING CAB	POSSIBLE FAULT	RECOMMENDED ACTION
9. Partial loss of power/ locomotive does not develop full power	a. Traction Current Limiter not at MAX (where fitted)	Adjust control knob.
	b. Fuel Starvation (usually accompanied by fluctuating amps)	Rotate the fuel 'auto-klean' strainers [158] .
	c. Loss of Regulating Air (should be 50 psi with full controller)	At first opportunity check gauge [142] , then check system for obvious leakage, particularly around the engine and governor [151] and engine speed valve [155] . Check master key has not been left in desk of rear cab.
	d. Loss of Charging Air Pressure (should be 12-15 psi with 50 psi regulating air)	At first opportunity check gauge [142] , then check for isolated fuel pumps. If any are found and repair book is not endorsed accordingly then re-engage checking that there is no leakage of fuel or unusual noises.
	e. No traction motor field diversion (locomotives with electronic speed indication)	Note that power will be normal at speeds up to approx. 35 mph but will then decrease as speed rises. Usually preceded by fluctuation of speedometer needle or no speedometer reading at all.

INDICATIONS IN DRIVING CAB	POSSIBLE FAULT	RECOMMENDED ACTION
10. Train Heat 'ON' light will not illuminate	a. Defective lamp or push button faulty	Check light in rear cab, attempt to obtain train heat supply from that cab.
	b. Train Heat Circuit breaker 'tripped'	Check THCCB [150A] .
11. Train Heat 'ON' light illuminates only when the 'ON' button is kept depressed	a. Control Air Pressure (below 50 psi)	Check pressure gauge [147] . Check control air ingoing and outgoing cocks (where fitted) [31] and reservoir isolating cock [124A] .
	b. Equipment Governor defective	Check 'toggle' [45] should be 'up'.
	c. Jumper connections not properly made	Check train supply jumper cables at both ends of locomotive and throughout train when necessary. Disconnect between locomotive and train to locate fault.
	d. Train Heat 'OFF' button faulty	Check both cabs by pressing 'OFF' buttons.
	e. Train Emergency Switch operated	Guard to check Emergency Switch in each vehicle.
	f. Train Heat Earth Fault Relay 'tripped'	Make two more attempts to establish train heat supply by pressing 'on' button, but if 'ON' light is again extinguished for the third time when 'on' button is released proceed without ETH, advising Guard as soon as possible.

CLASS 47 LOCOMOTIVES – 47401 to 47420

These locomotives, originally numbered D1500 to D1519, are fitted with Westinghouse Dual Air/Vacuum Brakes, a Spanner Boiler and a DC Train Heating Generator.

Current from the Train Heating Generator drives the traction motor blowers, compressors and the radiator fans whilst the other auxiliaries are supplied from the Auxiliary Generator.

Since the layout of equipment, particularly switches and fuses, is different to the conventional Class 47 locomotive the following diagrams are included for ready reference:

Other differences of interest to Drivers are:

A. Both compressors run in ALL positions of the Brake Selector Switch.

B. An Isolating Link, which requires a spanner to remove it, is fitted instead of an Earth Isolating Switch as on conventional locomotives.

C. The electrically-driven radiator fans are automatically controlled by a temperature sensing device.

D. The radiator shutters are air-operated, also controlled by a temperature sensing device. An isolating cock is provided close to the DSD isolating cock (see diagram 2 page 9 item 75b) for maintenance purposes. Locomotive 47408 has an additional cock in the air system to the radiators which is normally CLOSED. Should the normal supply of air fail then this cock should be OPENED, the shutters will then remain open regardless of temperature.

E. The Radiator Maintenance Switch (see diagram 6 page 25) has a NORMAL position in which the shutters open and close automatically according to temperature and a MAINTENANCE position in which the shutters remain open irrespective of coolant temperature BUT POWER CANNOT BE OBTAINED IN THIS SWITCH POSITION.

This MAINTENANCE position may be utilised as a quick check on the radiator fan fuses since this switch position connects the two motors in series and if both fans run the fuses are proved correct.

F. The r.h. control cubicle contains the compressor fuses i.e. the cubicle immediately above the Fuse and Switch Panels (see diagram 7 page 27). SHOULD IT BE NECESSARY FOR A DRIVER TO ENTER ANY CONTROL CUBICLE THE DIESEL ENGINE MUST BE STOPPED AND THE BATTERY ISOLATING SWITCH MUST BE OPENED.

G. The r.h. control cubicle contains a Traction Motor Blower Relay which 'trips' if excessive current passes to the traction motor blowers and becomes 'latched' until reset by maintenance staff – see Fault 7c. The ETH Earth Fault Relay and Power Earth Relay are 'latched' to provide an indication to maintenance staff.

H. The fuse panel adjacent to the main generator (known as the 800 volt panel) contains two radiator fan fuses and the blower fuse, the actual layout of fuses may vary.

Fig. 6 Key to Notation

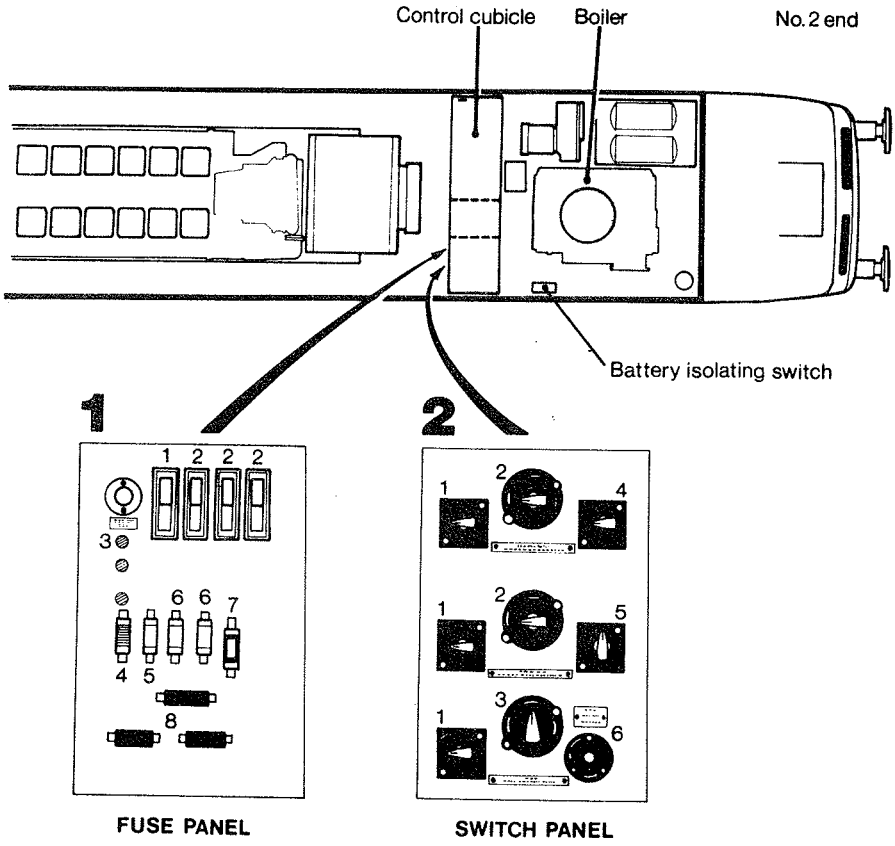
1. **Fuse Panel**
   1. Control Circuit Breaker
   2. Lighting Circuit Breakers (3)
   3. Fuse Tester
   4. Pump Set Fuse 125 amp
   5. Boiler Fuse 60/63 amp
   6. Heater Fuses (2) 60/63 amp
   7. Cooker Fuse 20 amp
   8. Spare Fuses

2. **Switch Panel**
   1. Traction Motor Cut-Out Switches
   2. Exhauster Switches
   3. Boiler Switch
   4. Pump Set Switch
   5. Radiator Maintenance Switch
   6. Wheel Wear Compensator

Fuse and switch panel

FIG. 6

LOCOMOTIVES 47 401 TO 47 420 ONLY



FUSE PANEL

SWITCH PANEL

Fig. 7

3. **Fuse Panel (800 volt)**

   1 & 2 Spares

   3. Blowers

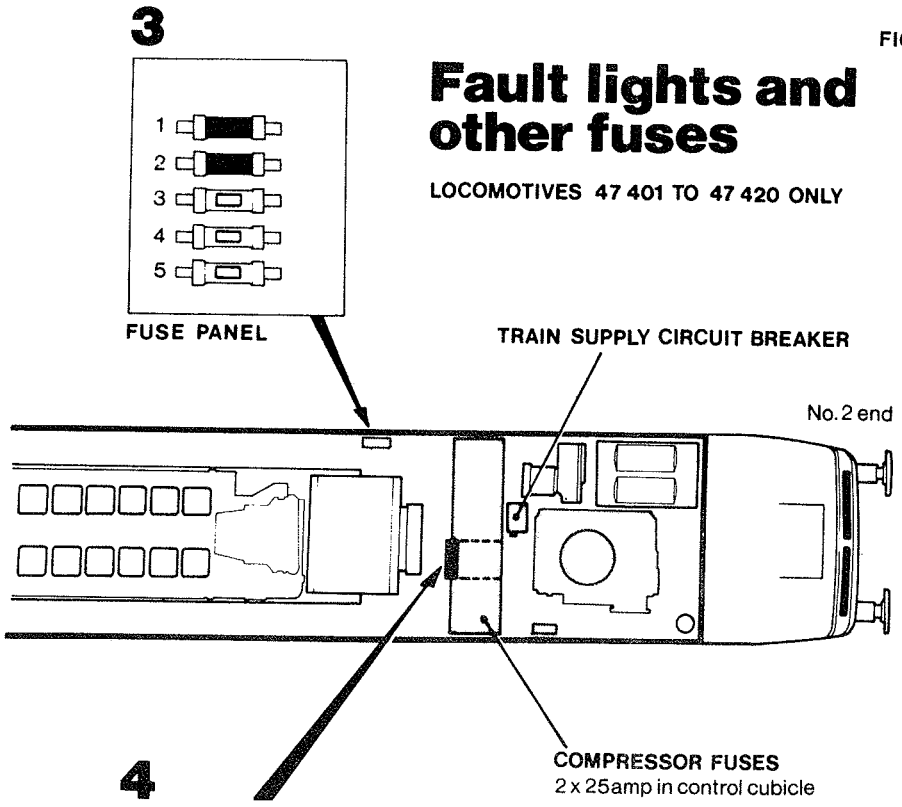
   4 & 5 Radiator Fans

4. **Fault Lights and Instrument Panel**

   1. Main Generator Voltmeter
   2. Auxiliary Generator Ammeter
   3. Battery/Auxiliary Generator Voltmeter
   4. Battery Charging Ammeter
   5. Control Air Pressure Gauge
   6. Lub. Oil Pressure)
   7. Water Pressure) Fault Lights
   8. Water Temperature) Green – Normal
   9. Blowers) Red – Fault
   10. Earth Fault)

Fault lights and other fuses

LOCOMOTIVES 47 401 TO 47 420 ONLY



FAULT LIGHTS AND INSTRUMENT PANEL
Spare compressor fuse behind

CLASS 47/7 LOCOMOTIVES 47701 to 47712

These 12 locomotives have been converted from Class 47/4 for use on the Edinburgh – Glasgow Push/Pull services. They will however be used in normal service i.e. non Push/Pull and to assist Drivers the alterations which affect NORMAL operation are detailed below. Separate Instructions have been issued to cover Push/Pull operation.

1. The fuel capacity has been increased by 570 gallons i.e. from 810 to 1380 gallons by a new auxiliary tank located beneath the locomotive body in place of the former boiler water tank. In the event of the underslung fuel tank being punctured additional shut-off valves are being provided (see diagram b fig. 8) when these have been CLOSED there are two further valves within the Radiator Compartment beneath the Serck Oil Tank which must be set. The left hand valve must be OPENED and the right hand valve CLOSED (see diagram a fig. 8).

2. The Remote Control Equipment, for Push/Pull operation, is located in the former boiler compartment (see diagram c fig. 9).

3. The Main Fire Extinguishing Equipment has been modified, and now contains B.C.F. instead of CO_2. The Fire Extinguisher Push Buttons in the driving cabs will stop the diesel engine (if it is running) and then activate the Firing Head to discharge the Fire Bottle **providing** the Battery Switch is **closed**. The external bodyside push buttons will activate the Firing Head immediately, whether the Battery Switch is open or closed and independent of any fuse or circuit breaker. They will NOT stop the diesel engine.

   The Firing Head incorporates a telltale 'pip' (see diagram d fig. 9) which protrudes when the Fire Bottle has discharged.

   A Fire Circuit Breaker (FCB) is provided below the Remote Control Switch (see diagram c fig. 9); should this 'trip' the fire bells will ring in both driving cabs.

4. A Guard's Brake Valve is being provided in each driving cab to enable a brake continuity test to be undertaken from that point and to enable the brake to be applied in an emergency during any authorised propelling movement. (see fig. 10).

5. The Traction Motor Overload Relays have been removed and the associated reset buttons and fault light have been blanked off.

6. A Headlight is provided at each end and should be illuminated for the direction of travel. A switch is provided on the driver's desk to the left of the main reservoir pressure gauge. (see fig. 10).

7. Driver/Guard communication is being provided which is available for use 'cab to cab' in normal operation (see fig. 10). The push button below the telephone handset will sound the 'buzzer' in both driving cabs. The handset incorporates a 'press to speak' button which must be released immediately to enable the other user to reply.

8. To prevent damage when the Parking Brake has been inadvertently left applied, a protection system has been fitted which brings about a DSD brake application should an attempt be made to move the locomotive under it's own power with parking brake(s) not fully released.

   N.B. The handwheel should be turned fully to the 'Off' position until the Stop is reached, even though the Indicator may display OFF before the Stop is reached.

9. For Push/Pull operation standard RCH train lighting jumper cables have been provided at each end of the locomotive (see diagram e fig. 9). The train crew communication equipment also utilises these cables and may be used if the locomotive is hauling ordinary stock fitted with similar equipment e.g. certain WCML train sets.

10. The ETH Supply has been modified so far as the fault detection system is concerned. For maintenance purposes only two Earth Fault Indicators (one positive one negative) have been provided on the ETH Cubicle with a 'test' button below. The Indicators will be illuminated whenever the Train Heat Alternator is 'generating' and if either dims or is extinguished when the button is pressed this indicates the presence of a positive or negative earth fault. (see diagram f fig. 9).

    A Diode Fault Relay (DFR) has been provided which will stop the diesel engine (and prevent it being restarted) in the event of failure of the diodes on either the Train Heat or Auxiliary Rectifiers. This relay will also operate if an overload occurs on the high voltage circuits connected to the Auxiliary Alternator which is not cleared by de-energising the Train Heat Contactors.

    The Diode Fault Relay is 'latched' i.e. once energised it is held in that position until manually reset. DRIVERS MUST NOT UNDER ANY CIRCUMSTANCES RESET THIS RELAY MORE THAN ONCE. It will be found in the ETH cubicle – item 149 page 13.

Additional duties during preparation:

1. At each end of the locomotive check that the RCH train lighting jumper cables are secure.

2. In each driving cab check that the Guard's Brake Valve is CLOSED i.e. handle at right angles to the pipe.

3. In the former boiler compartment check that:-

   3.1 The Fire Bottle Safety Bolt/Transporter Screw has the long end visible.

   3.2 The 'pip' is not protruding on the Firing Head.

   3.3 The Remote Control Switch is at LOCAL.

   3.4 The Fire Circuit Breaker (FCB) is set i.e. 'down'.

Additional Items to be considered when fault finding :

SYMPTOM	CAUSE	REMEDY
Engine will not turn	Diode Fault Relay (DFR) 'tripped'	Locomotive is a failure unless DFR can be reset at one attempt.
	Fire Extinguisher Firing Head lead not plugged in	Check it is fully home.
Unable to charge brake pipe	Guard's Brake Valve OPEN	Check both cabs, CLOSED at right angles to the pipe
Engine r.p.m. will not increase	Engine Speed Valve (ESV) not energised due to contact not made on Remote Control Switch	Switch to REMOTE and back to LOCAL
Unable to obtain power	Remote Control Switch left in REMOTE	Move to LOCAL
Brake application 5-7 secs after obtaining power, followed by loss of power and brake release	Parking Brake not fully released	Check both cabs, hand-wheels to be turned until Stop is reached irrespective of Indicator showing OFF
Engine stops	Fire Bottle Firing Relay (FBFR) has operated	Check 'pip' on Firing Head, if protruding locomotive is a failure unless Fire Bottle can be renewed. If 'pip' flush with casing attempt to restart engine
	Diode Fault Relay (DFR) 'tripped'	Locomotive is a failure unless DFR can be reset at one attempt.

FIG. 8

Fuel shut-off valves

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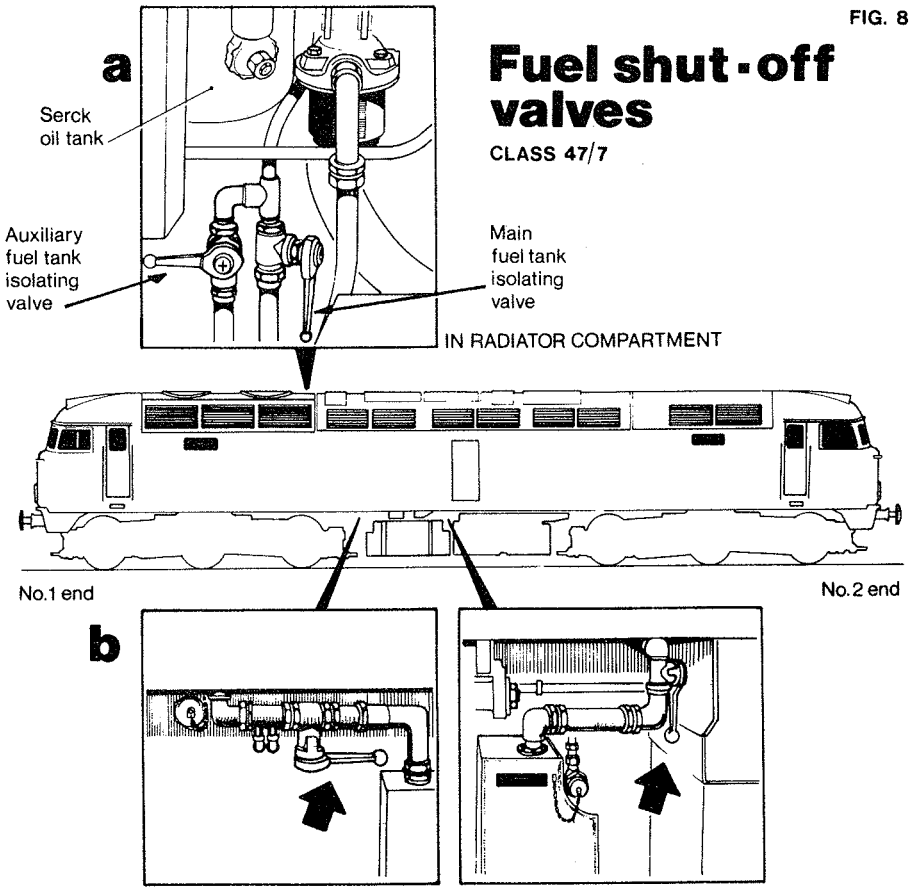

EXTERNAL AUXILIARY FUEL TANK ISOLATING VALVES

Remote control and other equipment

FIG.9

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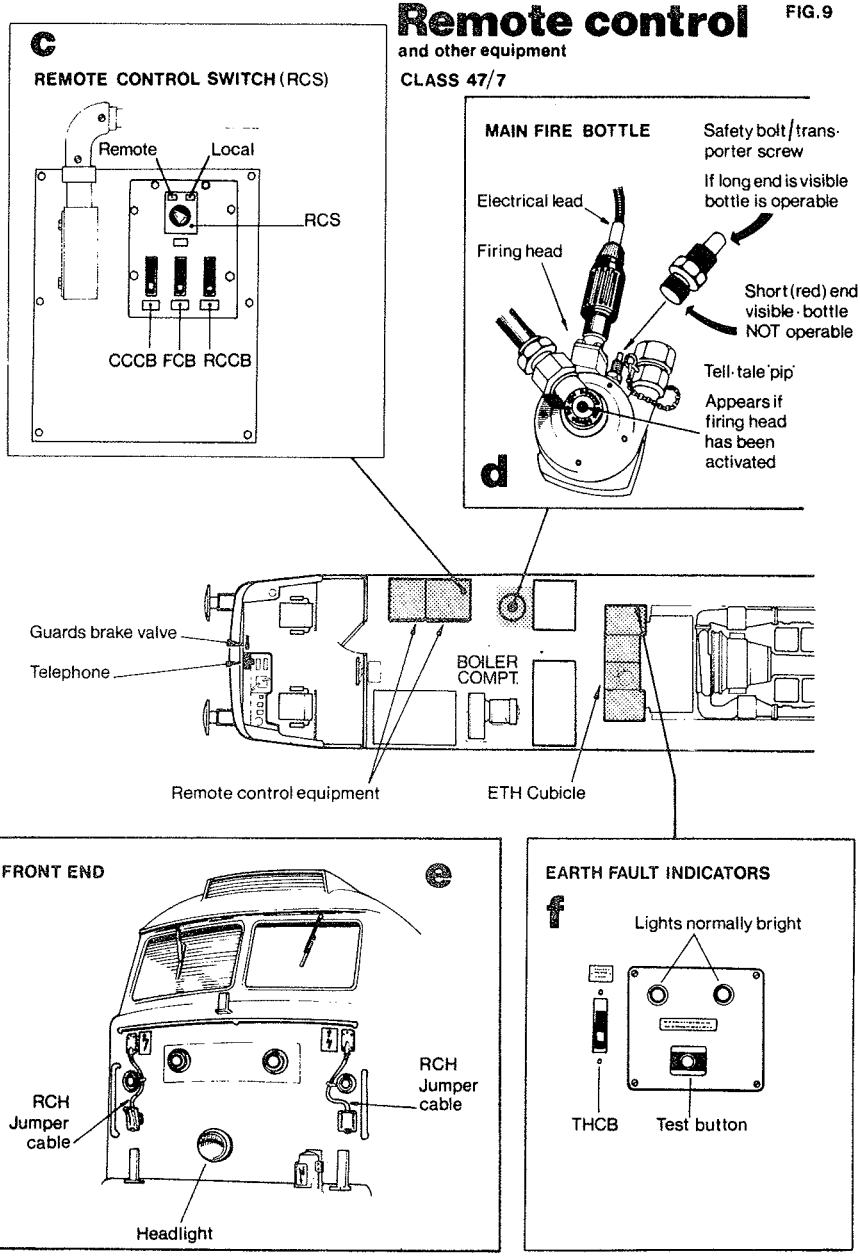

Driving cab

FIG. 10

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