

<b>SWT</b> SOUTH WEST TRAINS	DEPOT MAINTENANCE MANUAL CLASS 411, 412, 421 AND 423 ELECTRIC MULTIPLE UNITS	DM 400 SW Issue: 2 Revision: A Date: November 97
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## Section 8

# Heating and Lighting

**JOB DESCRIPTIONS**

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**Section 8 - Heating and Lighting****Job No. Job Description**

803	Train Lighting - Check
804	Cab and Van Heating - Check
805	Cab and Auxiliary Lighting - Check
806	Train Heating - Check
807	Lamp Shades and Tubes - Clean and Examine
815	Toilet Water Heater - Check
816	Thermostats - Test
833	Train Heating - Winter
834	Draining of Carriage Water Systems and Isolation of Toilet Water, Boiler and Hot Water Tank Heaters - Winter



JOB NO. 803

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## TRAIN LIGHTING - CHECK

MATERIALS			
ITEM	DESCRIPTION	QTY/UNIT	BR CAT NO
1	Lamp, 70V 25W 2 Pin		054/039224
2	Lamp, 70V 60W 2 Pin		054/039228
3	Lamp, 65V 40W 3 Pin		054/039289
4	Lamp, 24V 6W SBC		033/080046
5	Tube 4ft, 240V 40W Warm White		054/031568
6	Tube 2ft, 240V 20W Warm White		054/031516

**Safety:-** Auxiliary supply connected.

1. With motor generator running and all lights switched on, walk through the unit and check vestibule, corridor, saloon, shoulder and toilet lamps. Renew defective lamps.
2. Check all fluorescent tubes in saloons and toilets. Renew defective tubes.
3. Check the operation ('On' and 'Off') of the trip and set switches in the guard's van. Report any defects to the Supervisor.

**Note:-** (a) For renewal of fluorescent tubes see MP8-005.

- (b) When renewing lamps ensure that lamps of the correct voltage and wattage are fitted. Also ensure that no part of the lamp carton packing is still attached to any lamp fitted in position.

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## CAB AND VAN HEATING - CHECK

SPECIAL TOOLS		
ITEM	DESCRIPTION	BR CAT NO
1	Freezer Spray	

**Safety:-** Auxiliary supply connected.

1. Switch on all cab, van and guard's compartment heaters or put temperature controllers to 'Maximum' position.
2. If ambient temperature is too high to allow the cab controller to cut in then either spray probe with freezer spray (BRT type) or remove the grille at back of SR2C thermostat and put the test switch to the 'On' position.
3. Check that all heaters warm up.
4. Return test switches to 'Normal'.
5. Switch on the demister and allow to warm up. Rest hand in turn across the junction of the heated and non heated portion of the windscreen. A difference in temperature should be detected indicating that demister is working. Switch off after test.



## CAB AND AUXILIARY LIGHTING - CHECK

MATERIALS			
ITEM	DESCRIPTION	QTY/UNIT	BR CAT NO
1	Lamp, 70V 25W 2 Pin		054/039224
2	Lamp, 70V 60W 2 Pin		054/039228
3	Lamp, 65V 40W 3 Pin		054/039289
4	Lamp, 24V 6W SBC		033/080046
5	Tube 4ft, 240V 40W Warm White		054/031568
6	Tube 2ft, 240V 20W Warm White		054/031516
7	Headlight lamp 12v 55w H4		098/008550

**Safety:-** Auxiliary supply connected.

1. With motor generator set running and all lights switched on, check cab, vestibule, instrument, fuse tester, headlight, route indicator, van and guard's compartment lamps. Renew defective lamps.
2. Test the two spare lamps in route indicator box.
3. Check that the route indicator flexible lead and Niphon plug is undamaged and secure.

**Note:-** When renewing lamps ensure that lamps of the correct voltage and wattage are fitted. Also ensure that no part of the lamp carton packing is still attached to any lamp fitted in position.

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**JOB NO. 806**

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## TRAIN HEATING - CHECK

SPECIAL TOOLS		
ITEM	DESCRIPTION	BR CAT NO
1	Freezer Spray	

**Safety:-** Auxiliary supply connected.

**Note:-** The heating is to be switched on from 1 October to 31 March.

1. Run the motor generator set, switch on lights and put all heater controls to the 'Maximum' position.
2. Ensure all heaters are cut in. If the ambient temperature is too high to allow the thermostats to cut in then the following procedure should be adopted:-

### SR4/TS4 Saloon Thermostats

Connect test box to thermostat and operate to close heater contactor.

### SR2R Saloon Thermostats

Move the test switch to the 'On' position.

### SR2C Compartment Thermostats

Remove the grille at back of thermostat and move the test switch to the 'On' position.

### BRT Compartment Thermostats

Spray roof probe with freezer spray.

3. Check that all heaters warm up.

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4. Remove any temporary links fitted, return test switches to 'Normal' or remove test box.

**Note:-** (a) For testing of thermostats see Job 816.

- (b) For isolation of heater circuits during summer period see Maintenance Procedure MP8-003.
- (c) On SR2 thermostats the red LED lights when the thermostat is cut in.
- (d) For types and position of solid state thermostats see Data Section.

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**LAMP SHADES AND TUBES - CLEAN AND EXAMINE**

<b>MATERIALS</b>			
<b>ITEM</b>	<b>DESCRIPTION</b>	<b>QTY/UNIT</b>	<b>BR CAT NO</b>
1	Lamp, 70V 25W 2 Pin		054/039224
2	Lamp, 70V 60W 2 Pin		054/039228
3	Lamp, 65V 40W 3 Pin		054/039289
4	Lamp, 24V 6W SBC		033/080046
5	Tube 4ft, 240V 40W Warm White		054/031568
6	Tube 2ft, 240V 20W Warm White		054/031516

**Safety:-** Unit isolated from traction and auxiliary supply.

1. Remove all lamps, and lampshades where fitted.
2. Clean reflectors or shades and refit shades ensuring that they are securely refitted.
3. Examine all lampholders for signs of overheating.
4. Discard all discoloured lamps (ie blackened) and refit all lamps ensuring that only those of correct voltage and wattage are used.
5. Clean each fluorescent tube in situ by wiping with a clean dry cloth.
6. Test all lights in accordance with Job Nos. 803 and 805.

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## TOILET WATER HEATER - CHECK

**Safety:-** Unit initially isolated from traction and auxiliary supplies at start of job. At the relevant point in this job the auxiliary supply will need to be connected (see text).

1. Check cables and connections are secure and undamaged.
2. **Connect an auxiliary supply in accordance with Maintenance Procedure MP9-003** and ensure contactor (where fitted) operates under the control of the thermostat. For elements not controlled by a contactor ensure that the thermostat switches 'On' and 'Off' correctly.
3. Check that an adequate supply of hot water is available from the hot tap.
4. **Disconnect the auxiliary supply in accordance with Maintenance Procedure MP9-003.**

**Note:-** For types and positions of thermostat fitted see Data Section.

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## THERMOSTATS - TEST

**Safety:-** Auxiliary supply connected.

**Note:-** For types and positions of all thermostats see Data Section.

### Compartment and Cab Heater Thermostat Type BRT

1. Set all cab and compartment controllers to 'Cool' or minimum position throughout unit.
2. Allow sufficient time for all heaters to cool down. (It is suggested that the saloon thermostat tests for TS4/SR4 types are carried out while these are cooling down if originally found on).
3. Check that all cab and compartment heaters have turned off.
4. Set each cab and compartment controller to 'Warm' or maximum and check that heaters start to warm up.
5. If any heater is found not to be switching off or on, inform Supervisor.

**Note:-** (a) Whenever a BRT(R) thermostat to BR Cat No. 53/3336 is changed due to a defect, its associated probe must also be changed and returned to the Electronics Repair Centre along with the thermostat.

(b) The BRT(M) thermostat to BR Cat No. 52/4132 is matched to its adjacent power supply. The two MUST BE CHANGED as a complete unit.

(c) Where an SRT thermostat is fitted, the power supply unit used with the BRT(M) thermostat is no longer in circuit, the SRT being fed direct from the 70 V supply (TL wire).

### Compartment and Cab Heater Thermostat Types SR2C, SRT and SRTR

6. Remove grille to expose back of thermostat. Put temperature controller to the maximum position. (The red LED on the thermostat may already be illuminated, or may come on when the temperature controller is put to maximum.)
7. Move the biased test switch to the 'On' position and check that the LED either remains illuminated or comes on.

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8. Move the test switch to the 'Off' position and check that the LED extinguishes.
9. If a 2 kW unipolar switch is fitted in the compartments, when the LED on the thermostat is illuminated, check that the neon on the 2 kW unipolar is illuminated.
10. On completion of the test, release the test switch and allow it to return to the normal position.
11. Any faults should be reported to the Supervisor so the defects can be traced.

#### **Saloon Heater Thermostat Type TS4 and SR4 70 V**

12. Remove the roof ventilator grille. Remove traces of dust from the roof probe sensing head and housing with a dry soft brush. Refit roof ventilator grille.

#### **Instructions for Using Three Probe Thermostat (TS4) Test Box**

13. Trip heater control MCB in auxiliary cupboard.
14. Loosen the two locking screws on the dummy plug and remove it from the test socket fitted to the left side of the TS4.
15. Plug the test lead into the test box and fit the free plug on the other end of the lead to the TS4.

**Note:-** These plugs and sockets are polarised (ie they only fit one way) and no attempt must be made to force a plug into a socket. When correctly aligned the plug is easily connected to the socket.

16. Check that the rotary switch is in the 'Off' position. If not then move the switch to 'Off'. Check that the delay switch is in the 'Out' position.
17. Check that the AIS switch is closed and reset the heater control MCB.
18. **Supply Test**

Check that the supply LED indicator is green. A red LED indicates that the supply voltage is incorrect, ie below 55 volts or above 75 volts. No LED indicates that the supply voltage polarity is incorrect or non-existent. The supply must be corrected before continuing with the tests.

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**19. Probe Test**

Check that all three probe LED indicators are green. A red LED indicates that the particular probe resistance is outside its operating range and must be changed. See instructions.

20. Move the rotary switch to positions 1 to 9 and from positions 9 to 1 consecutively, pausing a few seconds in each position. A green light indication in every position indicates correct operation. A momentary red, followed by a green indication, may occur in some test positions.

A red light in any position indicates incorrect operation.

If a red indication is given on both occasions that the rotary switch is in a particular position (ie moving from 1-9 and 9-1) the TS4 thermostat must be changed (see Instruction). It is possible that a red light may only occur once in a particular position. In this case, it is permissible for the TS4 to remain in service.

**Note:-** Replacement TS4s should also be tested with the test box.

21. With the rotary switch back in position 1 switch the delay switch to the 'In' position and move the rotary switch to position 2. Check that the indication given changes from red to green in 10-15 seconds (ie the heater contactor should pick up after a delay of 10-15 sec). Move the switch back to position 1 and check that it changes to green within 5 seconds. If the delays are longer than those stated above, change the TS4.

22. Trip heater control MCB and uncouple the test lead from the TS4. Refit the dummy plug in the test socket and tighten the locking screws. It is important that these screws are tightened to prevent the dummy plug coming loose under vibration. The TS4 will NOT operate if the dummy plug is not in position.

23. Reset the MCB.

**Note:-** Any suspected fault on the test box MUST be reported immediately.

24. If the thermostat tests are satisfactory, but there is still no heat in the vehicle, then the heater circuits must be checked.

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**Saloon Heater Thermostat Type SR2R**

25. Open auxiliary cupboard to expose thermostat.
26. Move the biased test switch to the 'On' position and check that the LED either remains illuminated or comes on, and the heater contactor either remains closed or closes.
27. Move the test switch to the 'Off' position and check that the LED extinguishes and the heater contactor opens.
28. On completion of test, release the test switch and allow it to return to the 'Normal' position.
29. Any faults should be reported to the Supervisor so the defect can be traced.

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## TRAIN HEATING - WINTER

**Note:-** This Job is to be carried out when the temperature falls to -4°C or below and remains below zero for a 24 hour period or more or when snow is forecast or falling.

1. Ensure all stock available for service is berthed with all heating cut in and left on.

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## DRAINING OF CARRIAGE WATER SYSTEMS AND ISOLATION OF TOILET WATER, BOILER & HOT WATER TANK HEATERS - WINTER

MATERIALS			
ITEM	DESCRIPTION	QTY/UNIT	BR Cat No
1	Tank Drained-Water Heater Temporarily Isolated label	As req	
2	DP 132-1 De-icer	500ml	007/140760

**Safety:-** Unit isolated from traction and auxiliary supply.

**Note:-** This job is to be carried out when the temperature is likely to fall to a minimum of -1°C or when snow is forecast or falling on all vehicles when a unit is in a Depot, or en-route to or from a repair centre, and other times or locations at the discretion of the Engineer.

### 1. Drain tanks and pipes

The positions of drain cocks are as follows:-

Cold water tank	Below the hot water tank (the header tank isolation cock should be left in the open position).
Hot water tank	Below the hot water tank.

### Catering Vehicles

Boiler	Adjacent to boiler.
Water tank	Adjacent to water tank (Can be operated from inside the vehicle).
UV Steriliser	Below steriliser.
Hot water tank	In toilet cupboard.

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### **Isolation of Toilet Water, Boiler and Hot Water Tank Heaters**

2. Isolate Toilet water heater by switching off the Arrow switch in the heater cupboard and fixing a Tank Drained label (see Materials item 1) to the switch.
3. Isolate the boiler by removing fuse PF3 30A
4. Isolate the hot water heater by isolating the switch and fixing a Tank Drained label (see Materials item 1) to the switch.
5. When both hot and cold tanks have been drained, both basin taps or foot valve and lavatory flush must be operated to drain any remaining water from the pipes. When the system has been completely drained, all drain cocks must be closed.
6. Remove as much water as possible from the lavatory pan by means of a mop or plunger or use an application of DP 132-1 (see Materials item 2) at a rate of 500ml per pan per application. **DO NOT USE COMMON SALT.**

**Note:-** Underslung tanks on catering vehicles are fitted with anti-frost heaters. It will NOT be necessary to drain these tanks during this period provided that the anti-frost heaters are switched on. Any vehicle which the anti frost heaters cannot be used must be drained when the temperature is likely to fall to a minimum of -1°C on all vehicles which are intended to be outberthed for an extended period or are en-route to or from a repair centre.

### **Vehicles from Overhaul by a Third Party**

Vehicles despatched from Overhaul will have all tanks empty.

If these vehicles are put into service whilst the temperature is likely to fall to a minimum of -1°C then the electrical isolation and labelling as per items 2, 3, and 4 must be carried out.