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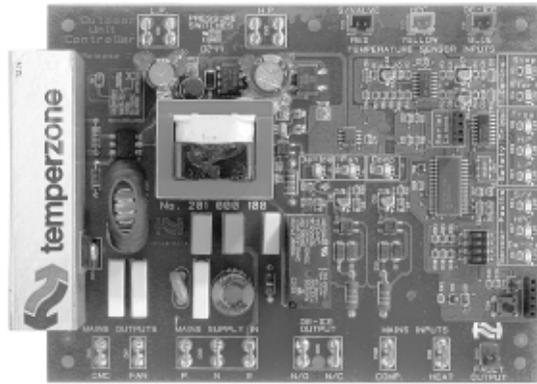


# **OUTDOOR UNIT CONTROLLER (OUC)**

Program 4.0 D

## **Operation and Fault Diagnosis**

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### 5 Jumper

There is a jumper fitted across two pins located next to the Test button. This must remain fitted at all times for normal operation.

### 6 Temperature Sensors Temperature vs Resistance Comparison

Temperature °C	Blue or Yellow Sensor	Red Sensor
- 10	58 kohm	56 kohm
- 5	44 kohm	43 kohm
0	34 kohm	33 kohm
10	20 kohm	20 kohm
20	12.6 kohm	12.5 kohm
30	8 kohm	8 kohm
40	5.2 kohm	5.3 kohm
50	3.5 kohm	3.6 kohm
60	2.3 kohm	2.5 kohm
80	1.15 kohm	1.25 kohm
100	n/a	0.67 kohm
110	n/a	0.50 kohm

Do not test sensors while they are still plugged on to the control board.

### 3.18 Commissioning Mode

By pressing the Test button for a full 10 seconds in any mode the OUC will be set in a 'Commissioning' mode. This reduces many of the running timers (eg Minimum Run and Anti-Rapid Cycle) so that commissioning can be done without continuously being impeded by time delays each time the Comp and Heat signals are switched.

The Commissioning mode is allowed to run for 30 minutes after which time normal operation resumes. The commissioning mode is indicated by the column of LEDs flashing briefly every five seconds. Any fault lights will stay on or flash differently so they will be obvious.

### 3.19 Test Button Functionality

Mode	Press Time	Accessible States	Result
Commissioning	10 sec.	Cooling Heating Dead Zone Thermostat Off	Reduces minimum run & anti-rapid cycle timers. Resets automatically after 30 mins.
Test Function	< 1 sec.	Dead Zone Thermostat Off	Runs 'Test' routine of functions (refer 3.17). Resets automatically.
Inhibition of De-ice Timer	2 sec.	Heating	De-ice cycle allowable as soon as coil reaches -4°C. Resets automatically.
Forced De-Ice	5 sec.	Heating	De-ice cycle starts immediately if coil below 'STOP' temperature. Resets automatically.

## 4 Dip Switch Settings

- DP1** Factory set to **OFF** position to suit ducted units with reasonable and high airflows.  
Can be set to **ON** position if indoor units are ductless or have very low airflows.
- DP2** Factory set to **OFF** position to maintain a head pressure equivalent to 42°C.  
Can be set to **ON** position to maintain a head pressure equivalent to 50°C.
- DP3** Factory set to **OFF** position to prevent a de-ice cycle occurring less than 30 minutes after initial start-up.  
Can be set to **ON** position to allow a de-ice to occur immediately on start-up.
- DP4** Factory set to **OFF** position allows outdoor fan to cut off at minimum speed setting.  
Can be set to **ON** position so outdoor fan continues running at minimum speed setting.

## 1 Introduction

The **temperzone** Outdoor Unit Controller (OUC) is a pre-programmed electronic controller of the outdoor unit's refrigeration system complete with system protection features.

It responds to a 230 volt thermostat or temperature controller signal for the compressor to run and a 230 volt 'Heat' signal that changes the operating mode from Cooling to Heating.

## 2 Features

The OUC provides the following features:

- Compressor cycling protection
- Minimum run time (3 mins)
- High pressure protection
- Low pressure protection (if LP switch fitted)
- Loss of refrigerant protection
- HP fan speed control
- Indoor coil icing protection
- Run and fault LED indication
- Remote common fault output (if extra relay board fitted)
- Repeat fault lockout protection.

## 3 Operation

### 3.1 Initial Power-Up & System Checks

On initial power-up, the LEDs on the right hand side of the board will flash in a pattern from the outside to the centre and back for 15 seconds. Nothing will operate until this system check is complete. This is then followed by the 1 minute anti-rapid cycle time out.

### 3.2 Power On LED

Indicates power is reaching the controller board. It does not necessarily indicate the board is functioning. If 230 volt is present at 'P' terminal and Power LED is not illuminated then board is faulty and needs replacement.

### 3.3 Compressor Cycling Protection

Prevents the compressor from restarting too quickly. Ensures a minimum of 3 minutes rest from the last stop, to allow the system to equalise. This is not adjustable.

Should a 230 volt signal be received at the COMP terminal during this period then the (fault and De-ice safety,) LEDs on the right hand side of the controller board will flash from **bottom to top** until the cycle has timed out.

### 3.4 Minimum Run Time Protection

Ensures the compressor runs for at least 3 minutes to ensure oil is returned to the compressor after start up. This is not adjustable.

If the 230 volt signal is removed from the COMP terminal during this period, the (fault and safety) LEDs on the right hand side of the controller board will flash from **top to bottom** until the cycle has timed out.

If however the 'Heat' signal is lost in 'Heat' mode or gained in 'Cool' mode during this minimum run time period the compressor will be stopped and the balance of the minimum run time added to the anti-rapid cycle time.

### 3.5 Maximum Starts Per Hour Protection

The Compressor Cycling Protection and Minimum Run Time functions combined will only allow a maximum of 10 starts per hour.

### 3.6 High Pressure Protection

A High Pressure switch is connected to the controller board from which an HP fault is indicated by the red safety trip 'H.P.' LED illuminated/flashing and the compressor will be shut down for at least 3 minutes.

After 3 consecutive trips the compressor will be prevented from running for 30 minutes. This will be repeated after a further 3 trips. After another 3 trips the compressor will be 'Locked Out' from running (the 'HP' LED remains flashing) until power to the board (unit) is removed and restored.

### 3.7 Loss of Refrigerant Protection

On the cooling cycle the temperature at the service valve (suction on cooling) is compared to the temperature of the HPC sensor and should there be insufficient temperature difference, indicating loss of refrigerant, then a fault is indicated by the red safety trip 'L.P.' LED illuminated/flashing and the compressor will be shut down temporarily.

On the heating cycle the temperature at the service valve (discharge on heating) is monitored and should this reach too high a temperature, indicating loss of refrigerant, then an LP fault is indicated by the red safety trip 'L.P.' LED illuminated/flashing and the compressor will be shut down temporarily.

After 3 consecutive trips the compressor will be 'Locked Out' from running until power to the board (unit) is removed and restored.

Note: Some units are fitted with manual reset thermal overloads on the compressor/s. Should an 'L.P.' LED be illuminated, first check that one of these overloads is not tripped as this could be the cause of the 'L.P.' fault signal.

The Service Valve sensor is located, either (i) in a pocket on the pipe between the reversing valve and the service valve on split system outdoor units, or (ii) on the indoor coil of packaged units.

2. By pressing the Test button for 5 seconds an immediate de-ice cycle should occur, even if the 'Start' LED is not illuminated. It will not occur if the ambient temperature is too high (above 12°C) and the 'Stop' LED is illuminated. Normal de-ice function resumes once the de-ice is initiated. This proves that the de-ice control is functioning correctly subject to receiving the signal from the sensor.

If Test 2 is successful, but Test 1 was not, then check the sensor is located correctly in the coil (embedded in the fins). Consider possibility of sensor with incorrect calibration as a possible fault.

Should no de-icing cycle occur in either instance then the OUC board must be treated as faulty and replaced. However if the LEDs illuminate and the relays switch in the correct sequence but de-icing does not occur check the Neutral link at the indoor unit, or possibly a faulty reversing valve.

If an extra wire has been run and connected between the 'De-ice' terminal on the outdoor unit and terminal '1' of the indoor unit, then the link between terminals 'N' and '1' of the indoor unit must be removed.

### 3.14 De-Ice Sensor Fault

A fault with the (blue lead) 'De-Ice' sensor, or the sensor not connected will illuminate/flash the red 'De-ice' sensor fault LED. In 'Fault' mode the compressor will not start in heating mode or will shutdown if running. The compressor will operate in cooling mode.

### 3.15 Remote Common Fault Output

Two pins are provided to allow for the connection of an optional relay sub board (**temperzone** item no 201 000 105) that will then in turn provide a 'no volt' set of contacts that can be utilised as a common fault indication circuit.

### 3.16 Repeat Fault Lockout Protection

Faults that are detected, if repeated a number of times, will eventually result in a 'Lockout' of the compressor from operation. Different faults have different fail sequences that will lead to lockout and these are detailed under their respective headings above. Repetitive sensor faults will also result in shutdown and 'Lockout'. Flashing LEDs indicating faults will remain flashing during a lockout of any device to aid in fault diagnosis.

### 3.17 Test Function

Once the initial power-up system check has been completed (refer 3.1) and if neither cooling nor heating modes are active (i.e. dead zone condition), the test button can be pressed momentarily and the controller will enter a test sequence of LEDs and operating functions. Condenser fans and the compressor should run for a few seconds and relays and contactors will be heard or seen switching. At the end of this sequence normal operation will be resumed. **Do not repeat this sequence frequently as it may cause damage to the compressor.**

### 3.13 Outdoor Coil De-Ice Control (Icing In Low Ambients during Heat Cycle)

Amber De-Ice 'Start' LED will illuminate as temperature of coil falls below the lower limit temperature. De-ice may start immediately or wait for the time cycle to be timed out.

Every 30 minutes, from the end of a previous de-ice cycle, the de-ice cycle will be initiated if the coil temperature is below the lower limit. On initial start-up it may be preferable for the de-ice to occur immediately. This preference is achieved by setting Dip Switch 3 to 'ON' (refer Section 4, page 11).

Green 'De-Ice' LED will illuminate indicating de-ice cycle operating. The compressor pauses at the start of every de-ice cycle, the outdoor fan stops and during this pause the reversing valve changes over, the compressor then restarts and the de-icing commences. The indoor fan may also stop if the optional "de-ice" wire has been connected between the indoor and outdoor units or if a thermostat with indoor coil sensor is used.

Amber De-Ice 'Start' LED will go off as the temperature of the coil rises above the lower limit during the de-ice cycle.

Eventually the amber De-Ice 'Stop' LED should illuminate indicating coil temperature has reached the upper limit (unless time termination occurs after 10 minutes and before this temperature is reached).

Green 'De-Ice' LED will go off as de-ice terminates. Compressor pauses at the end of every de-ice cycle. During this pause the reversing valve changes back and then the compressor and fan(s) will restart.

Amber De-Ice 'Stop' LED will go off (if illuminated) as the coil temperature falls below the upper limit after the de-ice cycle has completed.

Normal heating operation is resumed, although amber De-Ice 'Start' LED may illuminate quite quickly after de-ice cycle is completed if conditions are cold enough and the lower limit temperature is reached.

Should an LP switch be fitted, and should an LP fault occur and the red 'LP' LED indicate/flash during de-ice, or within two minutes of restart on heating, the compressor will not shutdown. This is nothing to be concerned about, it simply avoids nuisance tripping.

Time between de-ice cycle repeats.

There are two de-ice test options available should the de-ice cycle not appear to operate correctly. **These two test options are only available when in the heat cycle.**

1. By pressing the Test button for 2 seconds the de-ice timer is inhibited and de-ice should occur whenever  $-4^{\circ}\text{C}$  coil temperature is reached and the amber De-Ice 'Start' LED is illuminated. Normal timer operation and function resumes immediately after de-ice is initiated. This should prove the de-ice control is still functioning correctly and the sensor is reading correctly.

### 3.8 Low Pressure (Switch) Protection (if fitted)

If an optional Low Pressure Switch is connected to the controller board, an LP fault is indicated by the red safety trip 'L.P.' LED illuminated/ flashing and the compressor will be shut down for 3 minutes.

After 3 consecutive trips the compressor will be 'Locked Out' from running until power to the board (unit) is removed and restored (the 'LP' LED remains flashing during lockout).

### 3.9 Service Valve Sensor Fault

A fault with the (red lead) 'Service Valve' sensor or the sensor not connected will illuminate/flash the red 'S/V' sensor fault LED. In 'Fault' mode the compressor will not start or will shutdown if running.

### 3.10 Indoor Coil Icing Protection

The 'Service Valve' sensor (Suction service valve on cooling cycle) is also used as a protection for indoor coil ice up. At a pre-set low limit it shuts down the compressor for 15 minutes and the 'Frost' safety trip LED will illuminate/flash. After 4 consecutive trips the compressor will be 'Locked Out' from running until power to the board (unit) is removed and restored.

### 3.11 Head Pressure Fan Speed Controller and Sensor

#### Cooling Mode

Controls the outdoor fan speed in the cooling cycle to maintain a condensing temperature that can be set by Dip Switch 2 to either  $42^{\circ}\text{C}$  or  $50^{\circ}\text{C}$ .

The sensor is located in a return bend pocket on the outdoor coil.

The outdoor fan can be set to run continuously at minimum speed setting or set to cut off (via Dip Switch 4). Continuous will give a more settled operation but could in very cold outdoor ambient conditions lead to insufficient head pressure. The choice of setting is therefore at the installers discretion. The factory setting is for cut off.

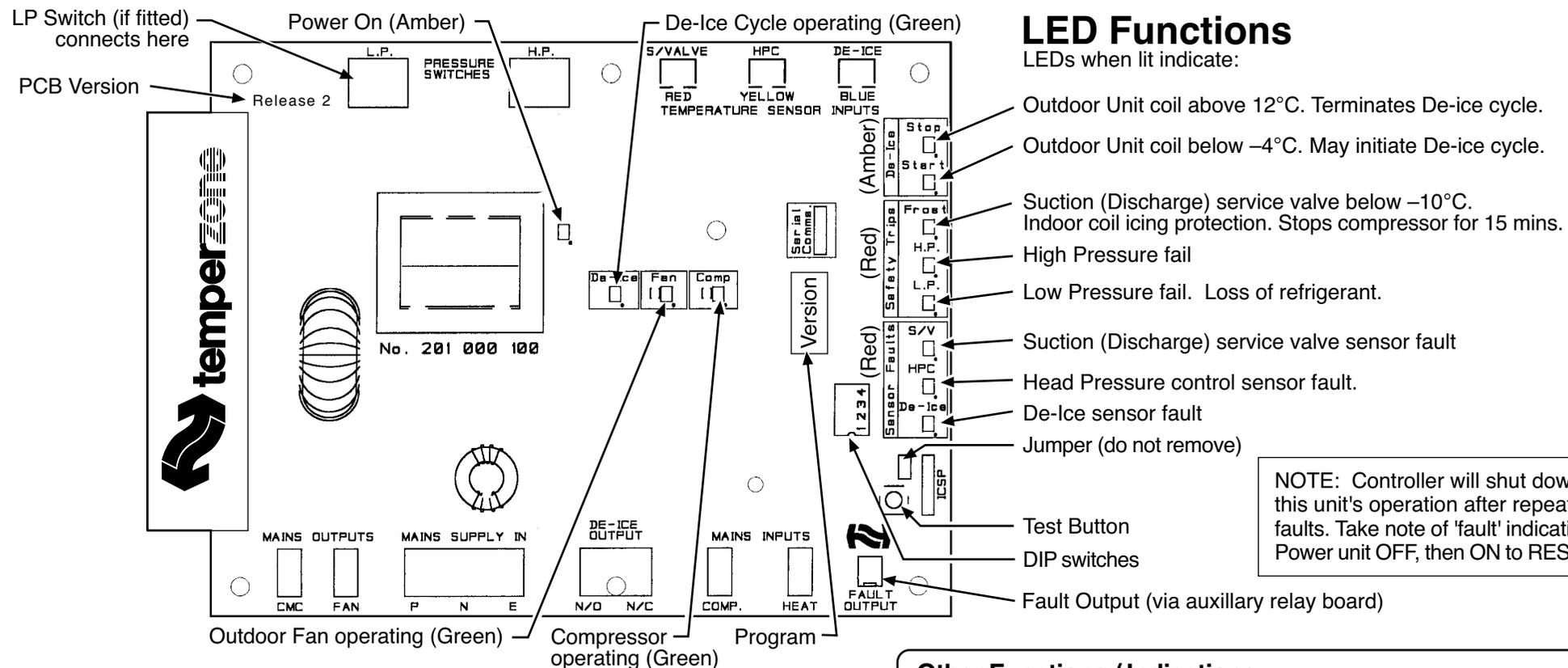
#### Heating Mode

Reduces the outdoor fan speed when on the heating cycle in high ambients to limit the head pressure and avoid nuisance 'HP' trips.

The sensor utilised is the 'Service Valve' sensor.

### 3.12 Head Pressure 'HPC' Sensor Fault

A fault with the (yellow lead) 'HPC' sensor, or the sensor not connected will illuminate/flash the red 'HPC' sensor fault LED. In 'Fault' mode the compressor will not start or will shutdown if running.



## LED Functions

LEDs when lit indicate:

- Outdoor Unit coil above 12°C. Terminates De-ice cycle.
- Outdoor Unit coil below -4°C. May initiate De-ice cycle.
- Suction (Discharge) service valve below -10°C. Indoor coil icing protection. Stops compressor for 15 mins.
- High Pressure fail
- Low Pressure fail. Loss of refrigerant.
- Suction (Discharge) service valve sensor fault
- Head Pressure control sensor fault.
- De-Ice sensor fault
- Jumper (do not remove)
- Test Button
- DIP switches
- Fault Output (via auxillary relay board)

NOTE: Controller will shut down this unit's operation after repeated faults. Take note of 'fault' indication. Power unit OFF, then ON to RESET.

### Features

- Compressor Cycling Protection (3 mins)
- Minimum Run Time (3 mins)
- High Pressure Protection
- Low Pressure Protection (if LP switch fitted)
- Loss of Refrigerant Protection
- Head Pressure Fan Speed Control
- Indoor Coil Icing Protection
- Outdoor Coil De-Icing (Heat Cycle)
- Run & Fault LED Indication
- Remote Common Fault Output
- Repeat Fault Lockout Protection

### DIP Switch Settings

(Factory standard settings are to OFF position)

1	OFF	<b>Ducted Indoor units</b>
	ON	Ductless Indoor units
2	OFF	<b>HP control to maintain 42°C</b>
	ON	HP control to maintain 50°C
3	OFF	<b>No De-ice on start-up for 30 min.</b>
	ON	Immediate De-Ice on start-up allowed.
4	OFF	<b>Outdoor fan low temp. cut off</b>
	ON	Outdoor fan low temp. continuous

### Other Functions / Indications

System Check	When power is switched on, LEDs on right side will flash in a pattern from outside to centre and back for 15 seconds.
Anti Rapid Cycle Timer Running	During this 3 min. cycle LEDs flash from bottom to top if signal received on COMP terminal. (Compressor not allowed to run)
Minimum Run Timer Running	During this cycle LEDs flash from top to bottom if signal is removed from COMP terminal. (Ensures compressor runs no less than 3 mins)
Test Button	In Heat cycle, press for 2 sec. to initiate a de-ice cycle if/when 'Start' LED lit. Resumes normal operation automatically.
	In Heat cycle, press for 5 sec. to initiate a de-ice cycle – even if 'Start' LED not lit. Resumes normal operation automatically.
	In any state, press for 10 sec. to run Commissioning mode (reduces some timers); resets automatically.