



Indoor Unit Controller (IUC) Quick Reference and Fault Diagnosis

Date: 1 November 2015

Issue: 1

IUC software version: 1.5

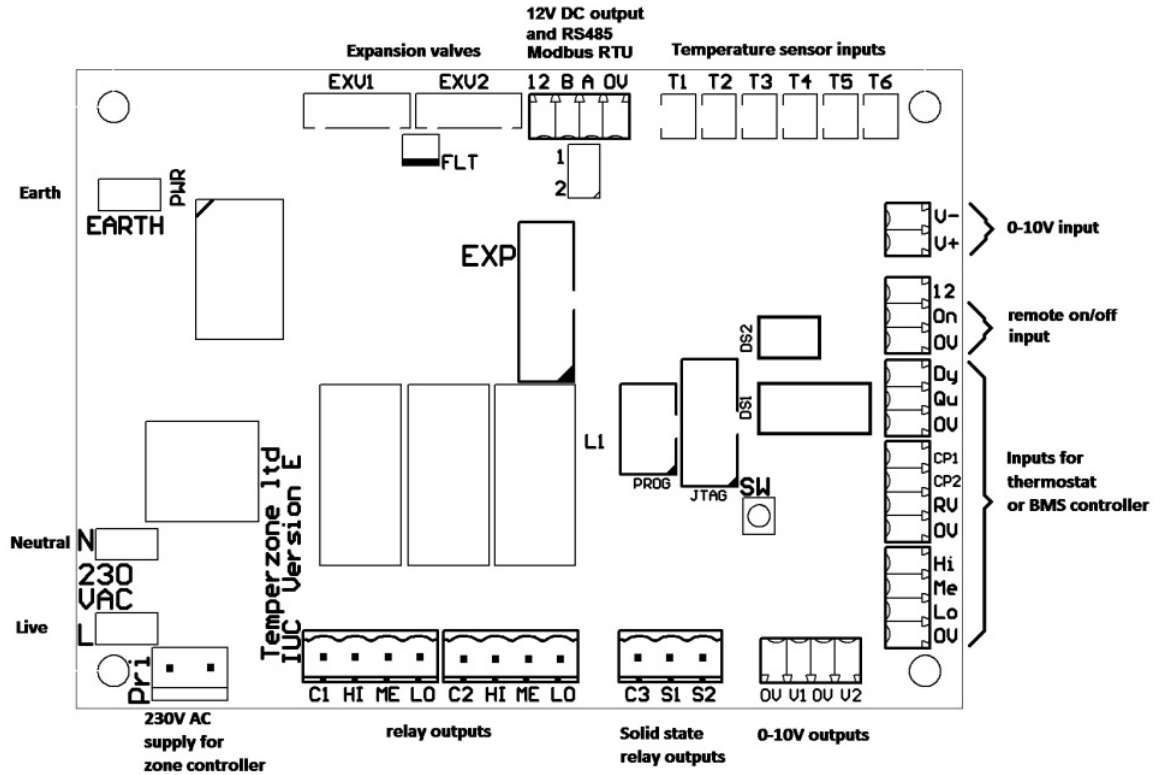
Index

1. Introduction	2
2. List of units with IUC	2
3. Features and functions	3
4. Inputs available	4
5. Outputs available	4
6. Controller options	5
6.1. Temperzone six-zone control system	5
6.2. Communicating BMS monitoring & control	5
6.3. SAT-3 and TZT-100 Temperature controllers	6
6.4. BMS controller with voltage-free relay contacts	7
7. Troubleshooting	8
7.1. Fault codes	9
8. DIP switch settings	10
8.1. Switches DS1-1 to DS1-5: Voltage range of outputs V1 & V2	10
8.2. Switches DS1-6 and DS1-7: Relay functions	11
8.3. Switch DS1-8: Expansion valve model	12
9. Where to find additional information	12

1. Introduction

This is a **Quick Reference** document covering the features and functions of the Indoor Unit Controller (IUC) along with connectivity details and fault diagnosis troubleshooting information.

The IUC is an air conditioning unit communication and control device that provides temperature measurements to -and obeys control signals from- the controller in the outdoor unit. Introduced into temperzone air cooled split system indoor units from 2015. This is not an accessory; it is an integral part of the air conditioning system.



2. List of units with IUC

Split Systems

ISDL 66, 87, 116 KYX

ISD 87, 116, 141, 164, 184 KYX

ISD 194, 224, 294, 324 KYX

3. Features and functions

- Monitors indoor coil temperatures.
- Monitors suction line temperatures (cooling mode).
- Monitors return air temperature.
- Monitors supply air temperature.
- Easy connections: Can share wiring with SAT-3 and TZT-100 temperature controllers and the temperzone zone control system.
- Provides 12V DC power for SAT-3 and TZT-100 temperature controllers.
- Can connect to temperzone SAT-2.1 or other thermostat / controller (universal inputs for voltage-free relay contacts).
- Accepts 0 – 10V DC analogue input for system capacity (duty) control.
- Reverse cycle operation.
- Input for dry mode / dehumidification in cooling cycle.
- Input for quiet mode.
- Input for remote On/Off switching.
- Relay outputs for up to two three-speed indoor fans (High/Medium/Low).
- Two 0 – 10V DC outputs for variable speed indoor EC fan motors
- Selection of EC fan maximum speed and speed range with DIP switches.
- Two outputs for Electronic Expansion Valves (EEV).
- System error / fault reporting.
- Connection of external Fault Alarm signalling.

4. Inputs available

Signal	Terminals
Power 230V AC	L / N / EARTH
Modbus RTU serial communications (RS485)	
From outdoor unit controller Shared with SAT-3 / TZT-100 temperature controllers	A / B
Thermostat / controller with voltage-free relay contacts	
Indoor fan speed High / Medium / Low / Common	Hi / Me / Lo / 0V
Compressor1 / Compressor 2 / Heat / Common	CP1 / CP2 / RV / 0V
Dry mode (Dehumidification) / Common	Dy / 0V
Quiet mode / Common	Qt / 0V
Remote On-Off / Common	On / 0V
Temperature sensors	
Indoor coil, system 1 / system 2	T1 / T3
Suction line (when unit is cooling), system 1 / system 2	T2 / T4
Supply air	T5
Return air	T6
0-10V DC input	
Unit capacity (duty)	V+ / V-

5. Outputs available

Signal	Terminals
Three-speed indoor fan control (H/M/L)	Fan 1 Fan 2
	HI / ME / LO / C1 HI / ME / LO / C2
Variable speed EC indoor fan control	Fan 1 Fan 2
	V1 / 0V V2 / 0V
+12V DC power	
For SAT-3 and TZT-100 temperature controllers	12 / 0V
Expansion valves	
Expansion valve 1 Expansion valve 2	EXV1 EVX2
Solid state relays	
Functions to be determined	S1 / S2 / C3
Fault relay	
Fault relay coil	FLT

6. Controller options

Additional wiring diagrams are available on the temperzone website www.temperzone.biz

Available control signal options:

- Inputs for voltage-free relay contacts
- 0-10V DC (system capacity only)
- Modbus RTU over RS485 twisted pair wiring

Examples of suitable controllers:

- SAT-3 or TZT-100 wall thermostat.
The SAT-3 and TZT-100 communicate directly with the controller in the outdoor unit and can make use of the same wires as the IUC, no extra wiring is needed.
- Temperzone six-zone control system
- SAT-2.1 wall thermostat.
The SAT-2.1 must be wired to provide voltage-free relay contact outputs.
- BMS controller with voltage-free relay contact outputs and optional 0-10V capacity control.
- BMS controller with Modbus RTU serial communications over RS485.
These must connect directly to the appropriate BMS port on the controller in the outdoor unit. They cannot use the same wiring as the IUC.

6.1. Temperzone six-zone control system

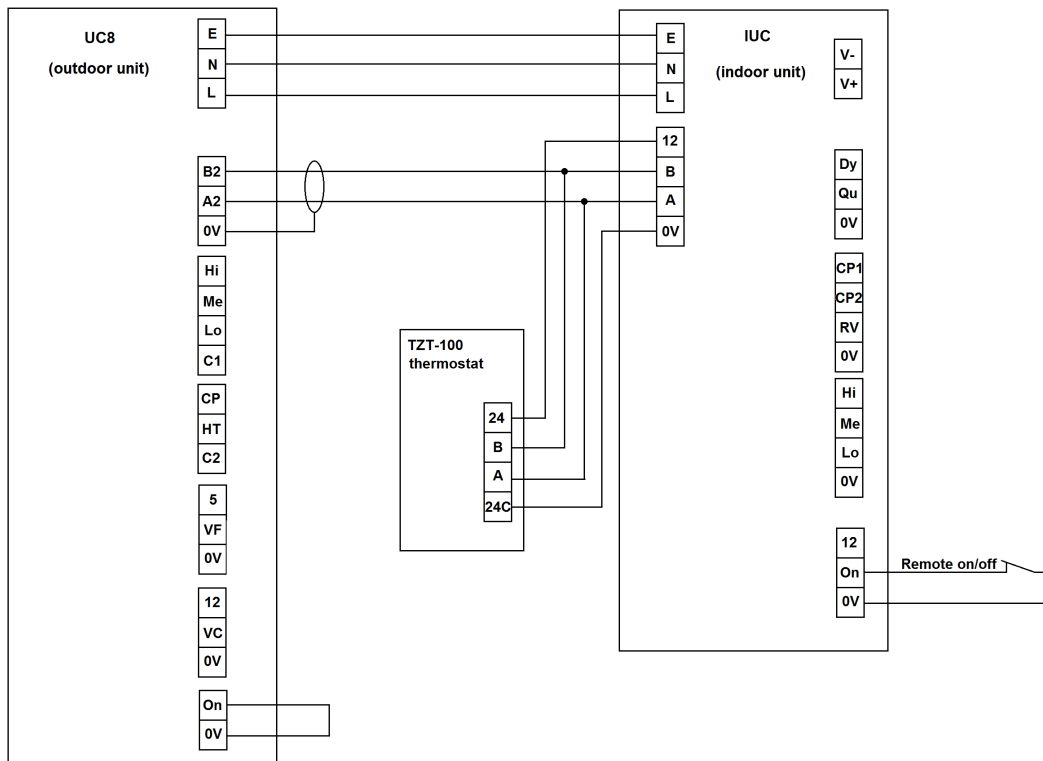
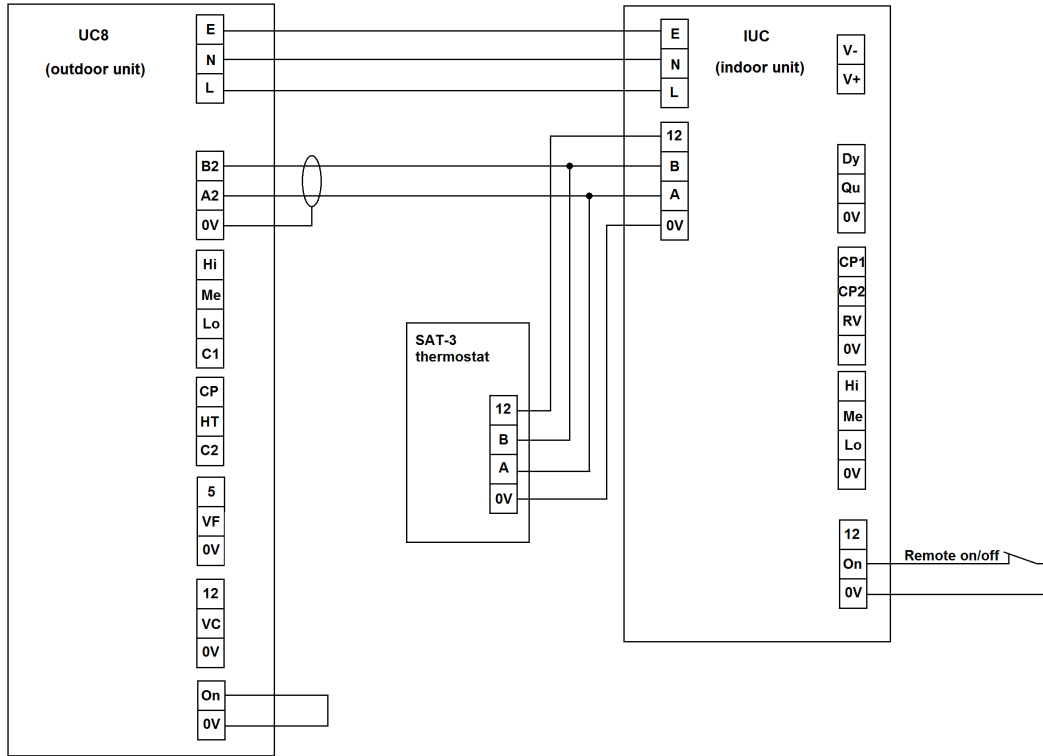
Refer to documentation provided with the six-zone control system.

6.2. Communicating BMS monitoring & control

A BMS system using Modbus RTU communications over RS485 must connect directly to the BMS port on the outdoor unit controller (UC6 plug-in board or UC8 terminals A1 and B1).

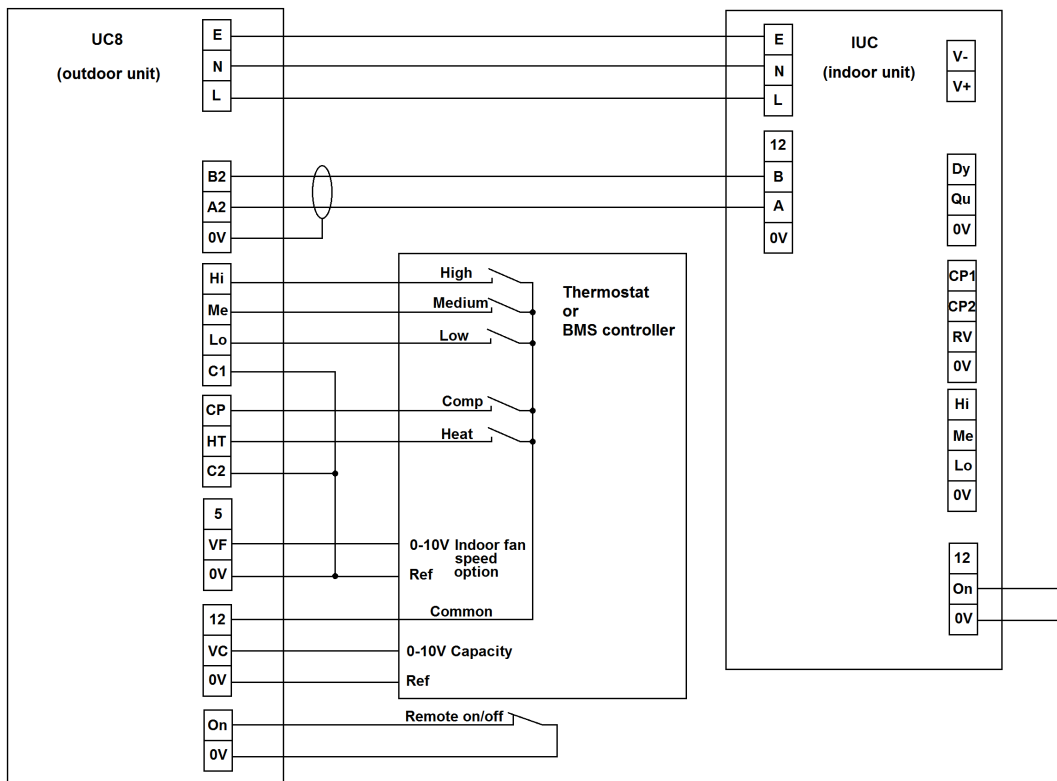
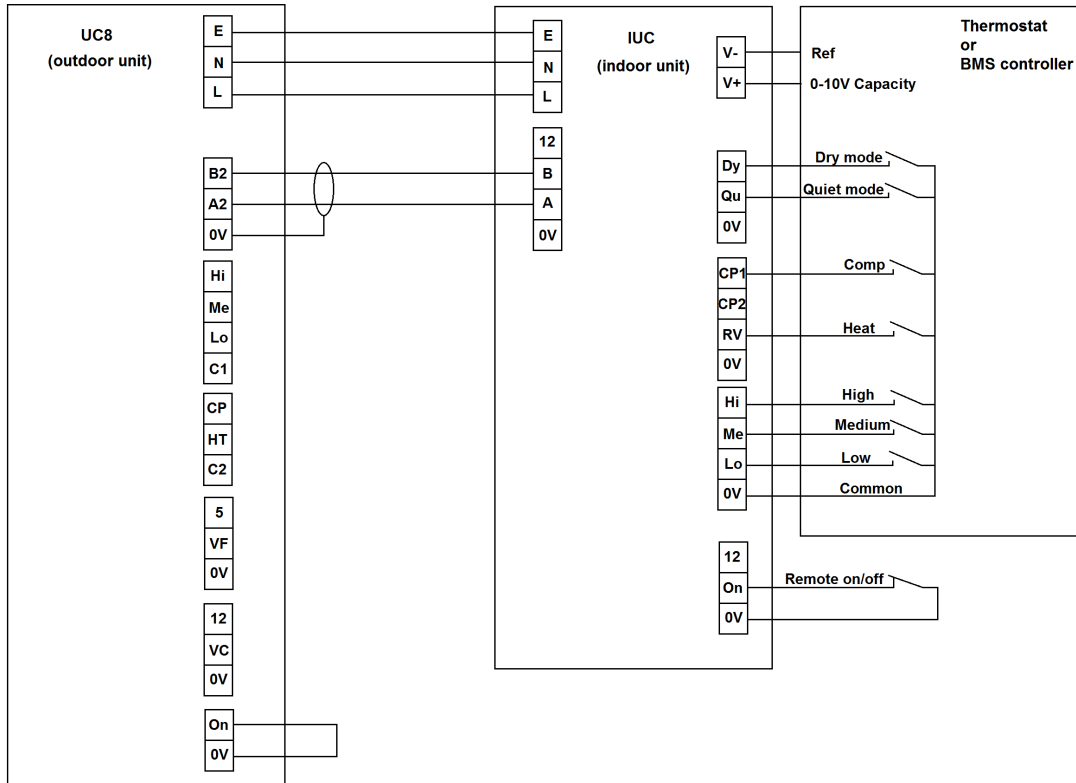
6.3. SAT-3 and TZT-100 Temperature controllers

A SAT-3 or TZT-100 temperature controller can be connected directly to the RS485 Modbus RTU terminal connections on the IUC board (12 / B / A / 0V). Use shielded twisted pair wiring suitable for RS485 communications; part numbers 201-000-026 (length 10m) and 201-000-034 (length 20m).

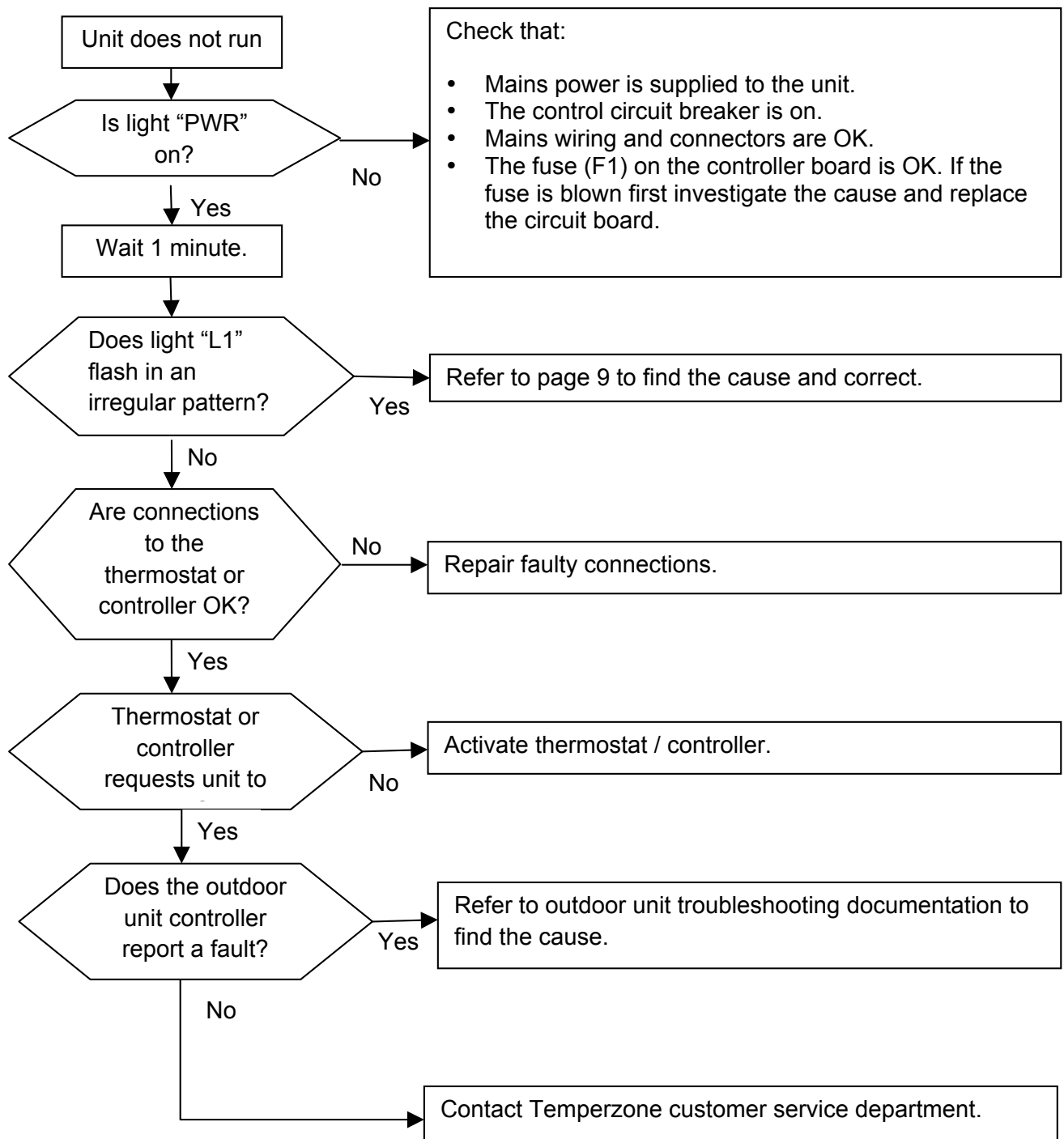


6.4. BMS controller with voltage-free relay contacts

A thermostat or BMS controller with voltage-free relay contacts can connect directly to inputs provided on the IUC. It is also possible to connect to the UC8 in the outdoor unit. The following two diagrams illustrate the two options.



7. Troubleshooting



7.1. Fault codes

Light “L1” on the IUC circuit board is used to indicate status of the controller. Use the following table to determine the status. A dot (.) represents a short flash, a dash (-) represents a long flash.

LED blinking pattern		IUC status
- -	Regularly and slowly flashing on and off	No faults
.	Single short flashes	Sensor T1 fault
..	Double short flashes	Sensor T2 fault
...	Triple short flashes	Sensor T3 fault
- .	One long flash followed by one short flash	Sensor T4 fault
- ..	One long flash followed by two short flashes	Sensor T5 fault
- ...	One long flash followed by three short flashes	Sensor T6 fault
- - .	Two long flashes followed by one short flash	The circuit board is too hot
- - ..	Two long flashes followed by two short flashes	Problem with the supply voltage
- - ...	Two long flashes followed by three short flashes	No Modbus communications
Any other pattern		Internal problem

8. DIP switch settings

The IUC circuit board has two sets of DIP switches:

- DS1 has 8 switches
- DS2 has 4 switches

The switches must be set correctly for the unit to operate correctly.

The switches of DS2 provide specialised functions, leave these switches set to the factory settings as indicated on the indoor unit wiring diagram. If changes to DIP switches DS2 are necessary contact Temperzone customer service.

A change made to a DIP switch becomes effective only after cycling mains power off and on again. The following sections provide information how to set the DIP switches.

8.1. Switches DS1-1 to DS1-5: Voltage range of outputs V1 & V2

DS1 switches 1 to 5 control the output voltage range of analogue outputs V1 and V2: DS1 switches 1, 2 and 3 set the HIGH level output voltage. DS1 switches 4 and 5 set the output voltage RANGE.

The RANGE is the voltage difference between the HIGH- and the LOW- level.

DIP switch			Output voltage HIGH V(high)
1-1	1-2	1-3	
			6.5V
•			7.0V
	•		7.5V
•	•		8.0V
		•	8.5V
•		•	9.0V
	•	•	9.5V
•	•	•	10V

DIP switch		Output voltage RANGE V(high) – V(low)
1-4	1-5	
		2V
•		3V
	•	4.5V
•	•	6V

When a combination of DIP switch settings gives a LOW output voltage that is less than 2.3V then the IUC automatically limits the LOW output voltage to 2.3V. This may be required to prevent a fan controller from stopping a fan when low speed is requested.

Example:

Switches 1, 2 and 3 are set for HIGH voltage 7.0V (ON, OFF, OFF).

Switches 4 and 5 are set for output voltage RANGE 6V (ON, ON).

LOW output voltage would be $7V - 6V = 1.0V$ but this level is not allowed, the controller will provide 2.3V instead. The MEDIUM output voltage is unaffected and will be $(7.0 + 1.0) / 2 = 4.0V$.

Notes:

- STOP is always 0V.
- The MEDIUM output voltage is always midway between HIGH and LOW voltages without taking into account any potential limiting of the LOW voltage.
- When the IUC is connected to a UC8 controller in the outdoor unit then it is also possible to set the voltage range of outputs V1 and V2 at the outdoor unit. This may be convenient when access to the indoor unit is restricted. To use this option switch on UC8 DIP switch 5 for output V1 and/or UC8 DIP switch 6 for output V2, then cycle mains power to the outdoor unit off and on again. The voltage ranges can then be adjusted using the “H” and “L” special modes of the UC8, for more information refer to the UC8 documentation.
- If the outdoor unit has a UC8 controller and the SAT-3 thermostat is used then the voltage range of outputs V1 and V2 can be set using the fan speed setup modes available on the SAT-3 and the settings of DIP switches DS1-1 to DS1-5 are ignored. Refer to the SAT-3 installer manual for more information.

8.2. Switches DS1-6 and DS1-7: Relay functions

DS1 switches 6 and 7 select the functionality of the HI-ME-LO relays:

DIP switch		Function
1-6	1-7	
		Modbus control via Hi-Me-Lo transfer function. Intended for three-speed fan control.
•		Modbus direct control. This option gives full control over each individual relay via one modbus register Error! Reference source not found. Intended for general purpose relay functions. Caution: Must NOT be used for three-speed induction motor fan control! The fan motor may be damaged!
	•	The three relays are controlled directly by the signals present at inputs Hi-Me-Lo, but only one relay will ever be on at any time (even if more than input is made active). Intended for three speed fan control.
•	•	The three relays are controlled directly by the signals present at inputs Hi-Me-Lo. If more than one input is made active then also more than one relay will be on. Intended for general purpose relay functions. Caution: Must NOT be used for three-speed induction motor fan control! The fan motor may be damaged!

The two options for the general purpose relay functions are intended for control of single speed fans, contactors, electric heaters, open/close dampers, etcetera.

8.3. Switch DS1-8: Expansion valve model

DIP switch DS1 switch 8 selects the electronic expansion valve (EXV) model:

DIP switch DS1-8	EXV1 and EXV2 model
	Sanhua DPF series, 12V DC uni-polar coil, 2000 steps
•	Carel E2V series, 12V DC uni-polar coil, 480 steps

9. Where to find additional information

For more detailed information regarding the IUC functionality and settings refer the documents available on our website www.temperzone.biz

Disclaimer:

Information given in this document is believed to be correct at the time of writing. Temperzone assumes no responsibility for any errors that may appear in this document. Information in this document is subject to change without notice and should not be construed as a commitment by Temperzone. In no event shall Temperzone be liable for incidental or consequential damages arising from use of this document or the software and hardware described in this document.