



INDOOR UNIT CONTROLLER (IUC) Operation Manual

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Note: Information in this document applies to IUC controllers programmed with software version 1.5.

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1. Introduction

The temperzone Indoor Unit Controller (IUC) is used in temperzone Ducted Split Systems. Indoor units with an IUC are identified by the 'X' at the end of the product model, e.g. ISD 164KYX.

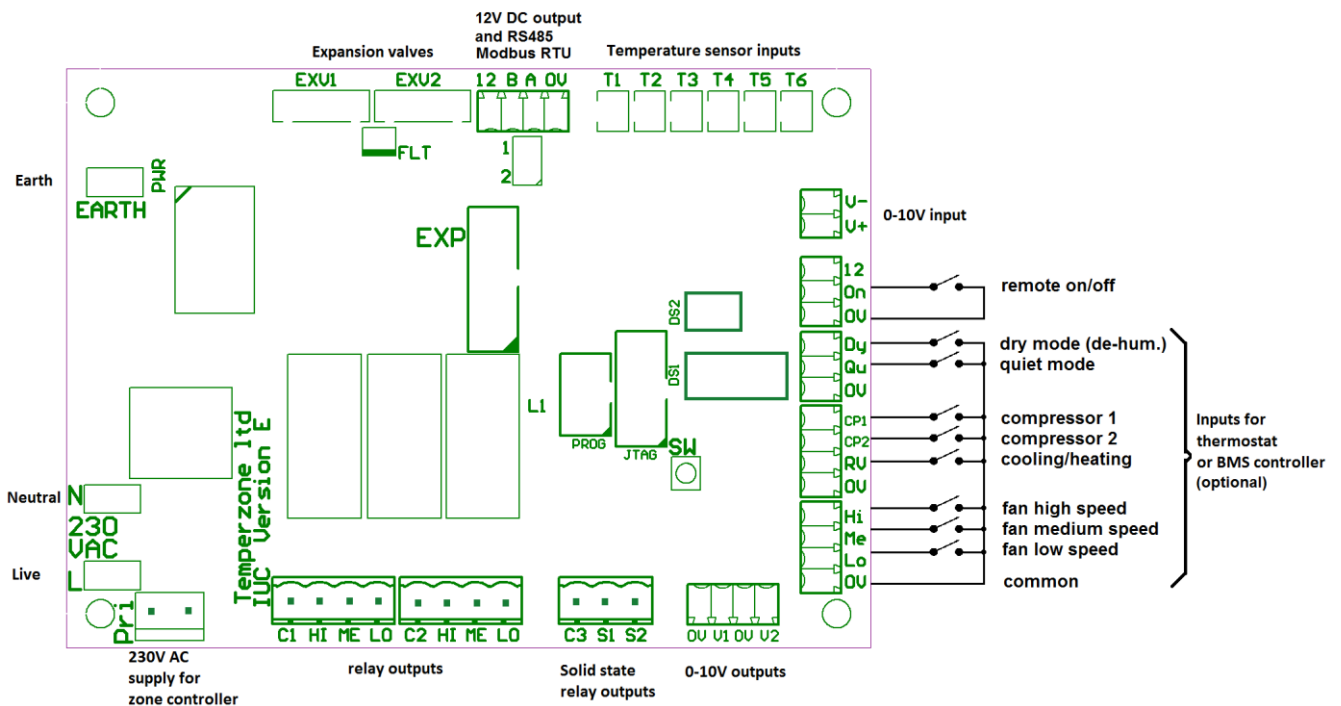
The IUC is an integral part of the air conditioning system. Factory installed in the Indoor unit, the IUC communicates with the UC8 Controller located in the Outdoor unit. The IUC measures temperatures in the indoor unit, controls the indoor fans as directed by the outdoor unit and offers conveniently located connections for thermostats or building management controls. The IUC also can allow adjustment of the indoor fan speed settings.

A wall mounted room temperature thermostat, for example the temperzone SAT-3, can be connected to the same wiring that connects the IUC to the outdoor unit. The interconnecting cable between the indoor and the outdoor unit is a screened twisted pair cable suitable for RS485 serial communications and is available from temperzone.

IUC Features:

- Measures indoor coil-, supply air-, return air- and suction line temperatures (on cooling cycle).
- Allows connection of SAT-3, TZT-100 and other thermostats.
- Ability to connect one or two electronic expansion valves.
- Remote on/off switch terminals.
- Low/Medium/High fan speed control.
- 0 to 10V control of EC Motor/Fan with DIP switch selection of maximum speed and range between highest and lowest speeds.
- Status/Fault LED.

2. Inputs and outputs



2.1. Temperature sensor inputs T1 to T6

The IUC can be used to report up to six temperatures using standard temperzone temperature sensors. Most indoor units do not need all six sensors, a typical small indoor unit usually has only four sensors: T1, T2, T5 and T6.

- T1** indoor coil 1 temperature
- T2** suction line 1 temperature (cooling mode)
- T3** indoor coil 2 temperature
- T4** suction line 2 temperature (cooling mode)
- T5** supply air temperature
- T6** return air temperature

Inputs that are not used should be left open circuit.

2.2. Thermostat inputs

The following set of inputs allows control of the unit with a thermostat or other type of controller that provides voltage-free dry relay contacts. Terminal '0V' is the common for all inputs.

The inputs are directly referenced to unit earth, they are not electrically isolated.

Dy	Dry mode (de-humidification)
Qu	Quiet mode
CP1	Compressor 1
CP2	Compressor 2
RV	Cooling / heating
Hi	Indoor fan High speed
Me	Indoor fan Medium speed
Lo	Indoor fan Low speed

Inputs that are not used should be left open circuit.

Note:

If the IUC is connected to an outdoor unit with UC8 controller, then inputs CP, RV, Hi, Me and Lo work in parallel with corresponding inputs on the UC8. In other words: One is free to choose whether to control the unit from the indoor- or the outdoor- unit.

2.3. Remote on/off input 'On'

The remote on/off input ('On') can be used to switch the entire unit off, e.g. by means of a time clock.

The input should be connected to a voltage-free dry relay contact. Terminal '0V' is the common terminal. The input is directly referenced to unit earth, it is not electrically isolated.

In order to turn the unit ON the input must connect to 0V. If this input is not used it should be shorted (looped).

Note:

If the IUC is connected to an outdoor unit with UC8 controller, then the unit can be turned off using either remote control input. For the unit to be enabled (On) **both** the remote on/off input on the IUC **and** the remote on/off input on the UC8 must be "on" (looped). One is free to choose whether to control the remote on/off signal at the indoor- or the outdoor- unit; the 'unused' input should remain shorted.

2.4. 0-10V capacity control input V+/V-

Duty of a variable capacity unit (e.g. with digital scroll or variable speed compressor) can be controlled by an appropriate 0-10V analogue control signal connected to inputs V+ and V- on the IUC.

Terminal V- is the reference signal (usually 0V), terminal V+ should receive the 0-10V control signal.

Notes:

The 0-10V input is not electrically isolated.

If the IUC is connected to an outdoor unit with UC8 controller then unit capacity can be controlled using either inputs V+/V- on the IUC or input VC on the UC8. The input that is to remain unused should be left open-circuit.

2.5. Modbus RTU serial communications port

Terminals A and B should connect to the corresponding Modbus port on the outdoor unit. For the UC8 that is terminals A2 and B2.

The cable between the indoor and outdoor units should be a shielded twisted pair wire suitable for computer serial communications. The cable shield should connect to terminal 0V at the UC8 only and NOT connect at the IUC (to avoid creating an earth loop).

2.6. Relay outputs HI, ME, LO, C1, C2

The IUC provides two double pole relays. The relay contacts are brought out on terminals HI, ME, LO, C1 and C2. Terminal C1 is the common for the left set of terminals, C2 is common for the right set of terminals. These terminals are electrically isolated from all other circuits, and thus can be used to switch low or high voltages as required.

Typically outputs HI, ME and LO are used for control of one or two single-phase three-speed or single-speed induction motors for the indoor fan(s). For a three-speed single-phase fan one should connect terminal C1 to 230V AC mains live while terminals HI, ME and LO connect to the appropriate speed-tappings of the fan. The fan neutral wire should connect directly to mains neutral. A second three-speed fan can be connected in the same way to the other set of terminals.

The IUC can also be configured with the relays available for general purpose use. For more information on this contact Temperzone.

2.7. 0-10V analogue outputs V1 and V2

The IUC provides two 0-10V outputs on terminals V1 and V2. Terminals '0V' are the reference for these outputs. The outputs are directly referenced to unit earth, they are not electrically isolated. Typical uses for these outputs are control of variable speed fans and/or proportional damper position.

2.8. Expansion valve control outputs EXV1 and EXV2

Up to two electronic expansion valves can be connected using connectors EXV1 and EXV2.

The expansion valves must be 6-wire 12V DC uni-polar types. Suitable valves are Sanhua DPF series and Carel E2V series.

2.9. Fault relay output FLT

A standard temperzone fault relay board (FRB) can be connected to connector FLT. The output is normally off and becomes active when the IUC software detects a fault, such as a missing temperature sensor, lack of communications or other problem. For more information on fault status refer to chapter 4.

3. DIP switches DS1 and DS2

The IUC circuit board has two sets of DIP switches: DS1 has 8 switches, DS2 has four switches. The DIP switches must be set correctly for the unit to operate correctly. The following sections provide information how to set the DIP switches.

3.1. DIP switches DS1-1 to DS1-5: Output voltage ranges of V1 and V2

DS1 switches 1 to 5 can 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. (RANGE is the voltage difference between HIGH- and LOW-level).

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

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

If an output is configured not to use the range function then the setting of switches DS1-1 to DS1-5 has no effect on the output voltage. Refer to section 3.4: DIP switches DS2-1 to DS2-4.

Note:

When a combination of DIP switch settings would give a LOW output voltage of 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:

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

DIP switches 4 and 5 are set for output voltage RANGE 6V (ON and ON).

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

Note: STOP is always 0V.

3.2. DIP 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. 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 relay control. Must NOT be used for three-speed induction motor fan control! The fan motor may be damaged!

The two direct individual control options for the relays are intended for the control of single speed fans, contactors, electric heaters, open/close dampers, etcetera.

3.3. DIP switch DS1-8

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

3.4. DIP switches DS2-1 to DS2-4

DS2 switches 1, 2, 3 and 4 select configurations for 0-10V analogue voltage outputs V1 and V2. The table below shows all possible options. The meanings are as follows:

- | | |
|------------------------------|---|
| MB direct | <p>The output is directly controlled by the corresponding modbus register. In this case the register value directly sets the output voltage in a linear fashion: 0.01V per count, 0 = 0V, 1000 = 10V.</p> <p>Intended for control of 0-10V dampers or valves and for continuously variable speed fans in some specific applications, such as when the unit is controlled by the temperzone six-zone controller.</p> |
| MB scaled | <p>The output is controlled by the corresponding modbus register but scaling is applied according to the settings of DIP switches DS1-1 to DS1-5. Refer to section 3.1 for more information about the scaling function.</p> <p>Intended for control of continuously variable speed fans.</p> |
| MB stepped | <p>The output is controlled by the corresponding modbus register but stepping is applied. The stepping function can be used in applications where it is of advantage to avoid certain fan speeds that otherwise could lead to unwanted mechanical (audible) resonances.</p> |
| MB scaled and stepped | <p>The output is controlled by the corresponding modbus register, scaling and stepping is applied, refer to chapter 3.1.</p> |
| HML inputs scaled | <p>The output is controlled by the High-Medium-Low inputs on the IUC circuit board. The scaling function is applied.</p> |

Switch				V1 configuration	V2 configuration	Notes
2-1	2-2	2-3	2-4			
				MB direct	MB direct	
•				MB scaled	MB direct	
	•			MB stepped	MB direct	
•	•			MB scaled and stepped	MB direct	
		•		HML inputs scaled	MB direct	
•		•		MB scaled	MB scaled	
	•	•		MB stepped	MB scaled	
•	•	•		MB scaled and stepped	MB scaled	
			•	HML inputs scaled	MB scaled	
•			•	MB stepped	MB stepped	
	•		•	MB scaled and stepped	MB stepped	
•	•		•	HML inputs scaled	MB stepped	
		•	•	MB scaled and stepped	MB scaled and stepped	
•		•	•	HML inputs scaled	MB scaled and stepped	
	•	•	•	HML inputs scaled	HML inputs scaled	
•	•	•	•	MB direct	MB direct	DS1-1 to DS1-5 select the IUC Modbus device address.

3.5. Re-definition of the DS1 DIP switches 1 to 5

With DS2-1, -2, -3 and -4 all set to the ON position the output voltage range function is not used. In this case the function of DIP switches DS1-1 to DS1-4 is changed to allow selection of the IUC Modbus device address. This enables the use of the IUC in installations with multiple indoor units.

Default device address is 60.

Switch				IUC modbus device address
1-1	1-2	1-3	1-4	
				60
•				61
	•			62
•	•			63
		•		64
•		•		65
	•	•		66
•	•	•		67
			•	68
•			•	69
	•		•	70
•	•		•	71
		•	•	72
•		•	•	73
	•	•	•	74
•	•	•	•	75

4. LED status indication

The LED on the IUC circuit board is used to indicate status of the IUC. 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
--	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

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