



**Unit Controller (UC7)  
Quick Reference  
Operation and Fault Diagnosis**

(To be read in conjunction with label TZ.227)

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This is a **Quick Reference** document covering the features and functions of the UC7 along with connectivity details and fault diagnosis troubleshooting information.

For more detailed information regarding the UC7 functionality and settings refer the documents available on our website [www.temperzone.biz](http://www.temperzone.biz) : -

Download UC7 Client Wiring April 2014

Download UC7 Operation & Installation - Air-to-Air March 2014

Download UC7 Operation & Installation - Hydronics March 2014

Download UC7 Modbus Communications January 2014

Date; 3<sup>rd</sup> November 2014

Issue; 2 (addition of DIP switch settings)

## Introduction

An air conditioning unit control device and system protection that responds to external temperature control signals to dictate unit operation. Introduced into temperzone air cooled and water sourced models from 2013, replacing the previous OUC4 & HWP Protection Board Controllers respectively. These are not an accessory. They are an integral part of each air conditioning system.

## Features/Functions

- Accepts conventional Thermostat Connection (utilising 12V or 24Vac voltages).
- Accepts Modbus controller or BMS controller Connection.
- Accepts 0 – 10Vdc analogue input for capacity control of digital compressor.
- Reverse Cycle Operation.
- Indoor and Outdoor Coil Frost Protection.
- Electronic De-Ice Control.
- High and Low Head Pressure System Protection (cut-out via conventional switches or pressure transducers).
- Rapid Cycling Protection of the compressor(s).
- Loss of Refrigerant Protection.
- High discharge temperature protection.
- Various methods of Head Pressure Control (or limiting). The methodology varies from unit model to unit model.
- Optimised performance across a wide operating temperature range.
- On/Off Fixed or Variable Compressor Capacity Control.
- Fixed or Variable Air Flow (High/Med/Low or 0 – 10Vdc variable indoor and outdoor).
- Dry Mode/Dehumidification in Cooling Cycle
- Quiet Mode for Outdoor Fans.
- DRED compatible.
- EEV (Electronic Expansion Valve) Control.
- Intelligent Control of Crankcase Heater(s).
- Remote On/Off Switching.
- Temperature sensing of Discharge, Suction, Ambient, Outdoor Coil, Indoor Coil and De-Ice of Outdoor Coil.
- System Error/Fault reporting.
- Connection of external Fault Alarm signalling.

## Units with UC7 Fitted

Split System	OSA139-159RKS
	OSA139-280RKT
	OSA139-280RKTG
Air Cooled Package Rooftop Units	OPA186-280RKT
Water Cooled Package Units	HWP35-191 (without T'stat fitted)
	HWP225RKT (without T'stat fitted)

## Controller Options: -

### Conventional Temperature Controller

E.g. **SAT-2.1 24Vac Version** or BMS with switched outputs

This is only suitable for fixed speed compressor control and High/Medium/Low fan speed control - not variable speed.

**Only voltages of 12V or 24Vac can be utilised.**

**The UC7 will not tolerate mains voltage being applied.**

### TZT-100 Temperature Controller

Can control variable capacity compressor (digital directly and inverter via a third party driver board).

Can control High/Medium/Low indoor fan speed selection or indoor fans speed variably using 0 – 10V output.

### BMS Modbus

Offers many control options directly talking to the UC7.

## Inputs Available

Power 230VAC

Conventional Thermostat/Controller: -

(High/Med/Low/Common)

(Compressor/Heat/Common)

**Only voltages of 12V or 24Vac can be utilised.**

HP Switch

LP Switch

Analogue 0 – 10Vdc

Modbus/BMS RS485#1Slave

Modbus/BMS RS485#2 Master

DRED

Remote On/Off

Sensors: -

Discharge Line & Suction Line

Ambient & De-Ice

Outdoor Coil & Indoor Coil

High & Low Pressure Transducer

## Terminals

L/N + Earth

Hi/Me/Lo/C1

Comp/Heat/C2

In#1

In#2

Not labelled

B/A/Ground

+12Vdc/B/A/Ground

D1/D2/D3/Sc Ground

On/G

DL & SL

AMB & DEI

OC & IC

HPT & LPT

## Outputs Available

Three Speed Fan Control

Compressor On/Off

Indoor EC Fan 0 – 10Vdc

Digital Compressor Valve

Reverse Cycle Valve

EEV (Electronic Expansion Valves)

Crankcase Heater

Outdoor EC Fan

Fault Relay

## Terminals

Hi/Me/Lo/C3

CMC

V2/G

SSR#2

R/V

EXV1 & EXV2

SSR#1

V1/G

FLT

## Typical and Simple Controller Connections

**USE CLIENT WIRING DIAGRAMS AVAILABLE ON WEBSITE**

### Conventional Temperature Controller

E.g. SAT-2.1 24Vac Version or BMS with switched outputs

**Only voltages of 12V or 24Vac can be utilised - the UC7 will not tolerate mains voltage being applied.**

Connected using multiple wires for all functions, (High/Medium/Low Fan, Compressor and Heat functions), to a terminal strip on the unit. Separate wiring within the unit connects via relays to the UC7 board.

### TZT-100 Temperature Controller

Can be connected directly using shielded twisted pair wiring suitable for RS485 communication (part number 201-000-399 available in 100m reels), to the RS485 #2 MODbus terminal connections on the UC7 board; (+12Vdc/B/A/Ground).

### BMS Modbus

Connected directly using shielded twisted pair wiring suitable for RS485 communication (part number 201-000-399 available in 100m reels), to the RS485 #1 MODbus terminal connections on the UC7 board; (B/A/Ground)

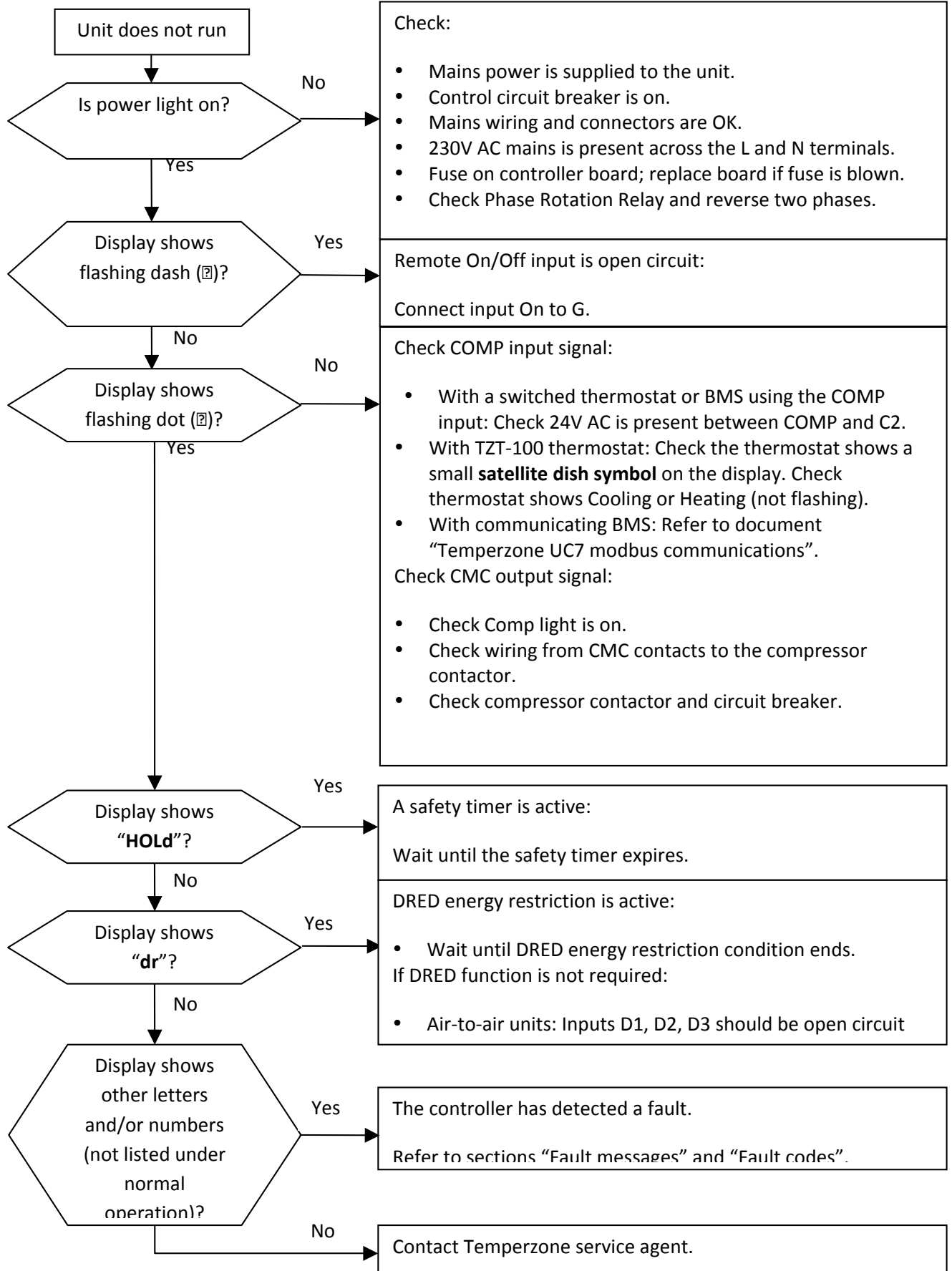
### Other Connections

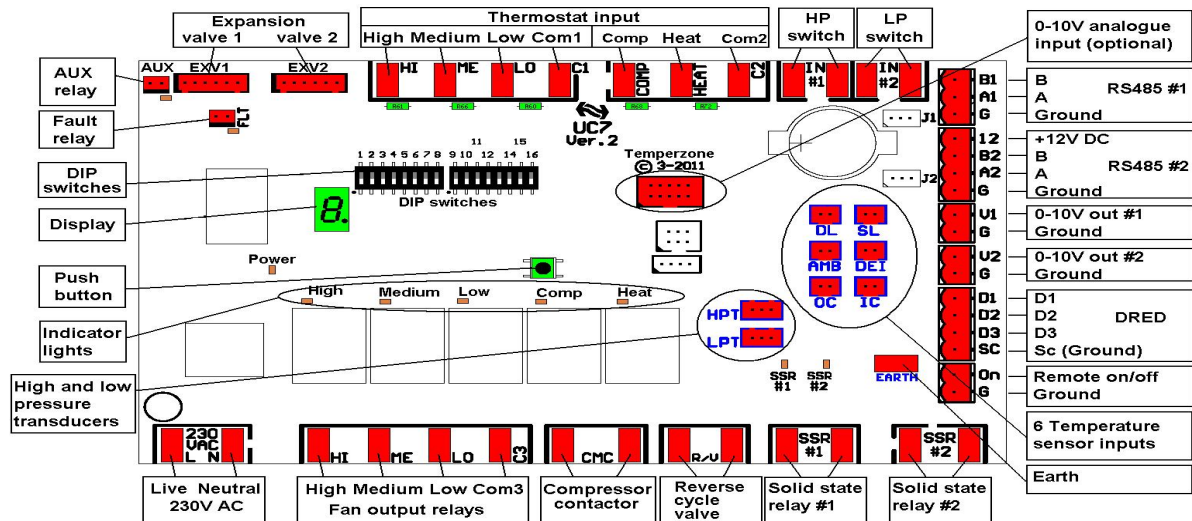
Refer more detailed documents available and downloadable for temperzone's web site [www.temperzone.biz](http://www.temperzone.biz) .

### BMS Monitoring

If the unit is controlled by another device such as TZT-100 then a BMS system may monitor the system and this is connected to another set of terminals on the UC7.

# Troubleshooting





## Fault Codes

Display	Meaning
LP	Low pressure protection is active
HP	High pressure protection is active
HI-t	High temperature protection is active
FROSt	Indoor coil frost protection is active
HI-SL	High suction line temperature protection is active
Lo-dSH	Low discharge superheat protection active
Hi-dSH	High discharge superheat protection active
OL	Overload protection is active: "IN #2" input is open circuit <b>or</b> COMP signal is off (for units connected to BMS or TZT-100 thermostat)
Display	Meaning
F10	Outdoor fan fault
F11	Indoor fan fault
F12	Low pressure transducer fault (will show as LP)
F13	High pressure transducer fault (will show as HP)
F14	Suction line temperature sensor fault
F15	Discharge line temperature sensor fault
F16	De-Ice temperature sensor fault
F17	Outdoor coil temperature sensor fault
F18	Indoor coil temperature sensor fault
F19	Ambient temperature sensor fault
F20	Superheat is unknown
F21	Thermostat fault (no serial communications)
F22	System 1 or BMS fault (no serial communications)
F23	System 2 fault (no serial communications)
F24	System 3 fault (no serial communications)
F25	System 4 fault (no serial communications)
F26	Invalid DIP switches setting
F27	Invalid fan selection
F28	Invalid economiser selection
F29	Microcontroller temperature exceeds +100 °C
F30	Interval supply voltage out of bounds
F31	A slave unit reports a fault
F32	0-10V input fault
F33	High discharge superheat protection active
F35	Reverse cycle valve fault

## Diagnosing and Troubleshooting Fault Codes

Display	Meaning	Possible cause	Possible remedy
<b>LP</b>	Low pressure protection	Lack of refrigerant	Check for leaks and repair, apply correct amount of refrigerant
		Expansion valve is closed	Check expansion valve coil is properly fitted onto the valve body.
		Incorrect DIP switch settings	Correct DIP switch settings
		Loose connector	Properly insert connector to the circuit board
		Damaged valve wiring	Repair wiring
		Faulty expansion valve	Replace expansion valve
		Faulty transducer cable	Repair transducer cable
		Faulty LP switch or LP transducer	Replace LP switch or LP transducer
		Service valve is closed	Open service valve
		Indoor fan does not run or runs too slow (cooling)	Check indoor fan and fan speed setting
		Air filter is blocked (cooling)	Clean filter
		Outdoor fan does not run (heating)	Check outdoor fan, wiring and connections
		Outdoor coil is blocked (heating)	Remove obstruction
		<b>HP</b>	High pressure protection
Incorrect DIP switch settings	Correct DIP switch settings		
Loose connector	Properly insert connector to the circuit board		
Damaged valve wiring	Repair wiring		
Faulty expansion valve	Replace expansion valve		
Faulty transducer cable	Repair transducer cable		
Faulty HP switch or HP transducer	Replace HP switch or HP transducer		
Service valve is closed	Open service valve		
Outdoor fan does not run (cooling)	Check outdoor fan, wiring and connections		
Air filter is blocked (heating)	Clean filter		
Indoor fan does not run (heating)	Check indoor fan, wiring and connections		
Excessive unit charge	Remove excess refrigerant		



Display	Meaning	Possible cause	Possible remedy
<b>FROSt</b>	Indoor coil frost protection	Air filter blocked	Clean or replace air filter
		Indoor damper closed	Check damper, damper operation, wiring and control method
		Indoor fan speed too low	Increase indoor fan speed
		Lack of refrigerant	Check for leaks and repair, add refrigerant
<b>HI-t</b>	High discharge line temperature protection	Lack of refrigerant	Check for leaks and repair, add refrigerant
		Faulty discharge line temperature sensor	Replace sensor (red lead)
<b>HI-SL</b>	High suction line temperature protection	Very high room temperature (cooling)	(Temporarily) Reduce indoor fan speed
		Very high outdoor ambient temperature (heating)	Do not operate the unit in heating mode with high outdoor ambient temperature
		Inadequate insulation on the suction line temperature sensor	Repair sensor insulation
		Faulty suction line temperature sensor	Replace sensor
<b>Lo-dSH</b>	Low discharge superheat protection	Unit is overcharged	Remove excess refrigerant
		Discharge line temperature sensor not properly fitted	Correctly fit the temperature sensor
		Faulty discharge line temperature sensor	Replace sensor
		Incorrect DIP switch settings for the expansion valve	Correct DIP switch settings
<b>HI-dSH</b>	High discharge superheat protection	Lack of refrigerant	Check for leaks and repair, add refrigerant
		Faulty discharge line high pressure transducer	Replace HP transducer
		Incorrect DIP switch settings for expansion valve	Correct DIP switch settings

Display	Meaning	Possible cause	Possible remedy
<b>OL</b>	Overload protection	Indoor fan is overloaded	Check indoor fan. Check airflow is not obstructed
		Outdoor fan is overloaded	Check outdoor fan. Check airflow is not obstructed
		Compressor overheated	Wait until compressor has cooled down sufficiently Check system has correct refrigerant charge Ensure adequate return of compressor lubricating oil
		Check wiring and connections to inputs: IN#2 or COMP & C2	Repair wiring
<b>F12</b>	HP transducer	Refer fault "HP"	
<b>F13</b>	LP transducer	Refer fault "LP"	
<b>F14</b>	Suction line temperature sensor (SL)	Loose connection	Repair connection
		Faulty temperature sensor	Replace sensor
<b>F15</b>	Discharge line temperature sensor (DL)	Loose connection	Repair connection
		Faulty temperature sensor	Replace sensor
<b>F16</b>	De-Ice temperature sensor (DEI)	Loose connection	Repair connection
		Faulty temperature sensor	Replace sensor
<b>F17</b>	Outdoor coil temperature sensor (OC)	Loose connection	Repair connection
		Faulty temperature sensor	Replace sensor
<b>F18</b>	Indoor coil temperature sensor (IC)	Loose connection	Repair connection
		Faulty temperature sensor	Replace sensor
<b>F19</b>	Ambient temperature sensor (AMB)	Loose connection	Repair connection
		Faulty temperature sensor	Replace sensor
<b>F20</b>	Superheat unknown	Check: DIP switch settings low pressure transducer high pressure transducer suction line temperature sensor discharge line temperature sensor outdoor coil temperature sensor indoor coil temperature sensor	

Display	Fault	Possible cause	Possible remedy
<b>F21</b>	Thermostat communications lost	Loose wiring	Repair connections
<b>F22</b>	BMS or system 1 communications lost	Loose wiring	Repair connections
		Master unit or BMS controller off	Turn master unit or BMS on
		Master unit or BMS communications intermittent	Ensure BMS communicates at least once every 5 minutes
<b>F23</b>	System 2 (first slave) communications lost	Loose wiring	Repair connections
		Incorrect DIP switch settings	Correct DIP switch settings
<b>F24</b>	System 3 (second slave) communications lost	Loose wiring	Repair connections
		Incorrect DIP switch settings	Correct DIP switch settings
<b>F25</b>	System 4 (third slave) communications lost	Loose wiring	Repair connections
		Incorrect DIP switch settings	Correct DIP switch settings
<b>F26</b>	Problem reading DIP switches	Excessive electrical noise, very high humidity	Remove mains power, ensure UC7 circuit board is thoroughly dry, re-apply power
<b>F27</b>	Invalid DIP switch settings	Selected combination of indoor- and outdoor- fan is not supported	Correct DIP switch settings
<b>F29</b>	High microcontroller temperature	Find cause of extremely high temperature in the electrical compartment	Wait until the unit has cooled down
<b>F30</b>	Supply voltage out of bounds	Mains supply voltage too low	Check for stable 230V AC mains power supply voltage
		Excessive current draw from UC7 12V DC power (e.g. to thermostat)	Check for short circuits, reduce current drawn from UC7 12 V DC
<b>F31</b>	A slave unit reports a fault	Refer to controller in each slave unit	Check each slave unit
<b>F32</b>	0-10V input	Lost communications to the 0-10V input module	Check 0-10V input module is properly and correctly plugged in. Replace if faulty.
<b>F33</b>	Refer to "high discharge superheat" (shown as "HI-dSH")		

Display	Fault	Possible cause	Possible remedy
<b>F34</b>	Problem with readings from the pressure transducers	Transducer wires swapped	Correct transducer wiring
		Transducers fitted to wrong pipe	Swap transducers
		Incorrect transducer type	Fit correct transducer
		Incorrect DIP switch 2 setting	Check DIP switch 2 setting <b>(Refer to section 4.2)</b>
		Expansion valve closed	Repair EEV wires
		Faulty transducer	Replace transducer
<b>F35</b>	Reverse cycle valve	Unit runs in incorrect mode (cooling instead of heating or v.v.)	Repair wiring to reverse cycle valve
		Faulty reverse cycle valve	Replace reverse cycle valve
		<b>Multiple compressor units only:</b> Coil temperature sensor readings influenced by other refrigeration system(s)	Remove mains power, <b>disconnect indoor- and outdoor- coil temperature sensors from the UC7 controller</b> , re-apply mains power
<b>F36</b>	Invalid DIP switch setting on TZT-100 thermostat	The TZT-100 thermostat DIP switches must be set to: <ul style="list-style-type: none"> <li>• 1-stage operation (even for multiple compressor units!!)</li> <li>• heat-pump equipment type</li> <li>• reverse cycle valve ON for heating mode</li> </ul> <b>(Refer to section 4.7.2.)</b>	

## DIP switch selections Air to Air

Table 1, DIP switch functions for switches 1 to 13.

Switch		Function	
<b>1</b>		<b>Indoor air flow (also refer to chapter 9: Dry mode)</b>	
OFF		Variable indoor air flow: Indoor fan performs a warm start when unit starts heating. Indoor fan stops during de-ice cycles. Indoor fan speed may vary from thermostat request.	
ON		Fixed indoor air flow: Indoor fan follows thermostat request even when heating starts. Indoor fan continues during de-ice cycles. Indoor fan speed follows thermostat request.	
<b>2</b>		<b>Compressor type</b>	
OFF		Fixed capacity.	
ON		Digital scroll.	
<b>3</b>	<b>4</b>	<b>Outdoor fan selection</b>	
OFF	OFF	Three speed fan: HI/ME/LO relay outputs	
ON	OFF	Single speed fan: HI relay output	
OFF	ON	0-10V EC fan: V1 output	
ON	ON	Reserved: Do not select	
<b>5</b>	<b>6</b>	<b>Indoor fan selection</b>	
OFF	OFF	Three speed fan: HI/ME/LO relay outputs	
ON	OFF	Single speed fan: ME relay output	
OFF	ON	0-10V EC fan: V2 output	
ON	ON	Select this option when the UC7 does not control the indoor fan. Reserved: Do not select	
<b>7</b>	<b>8</b>	<b>Electronic expansion valve operating mode</b>	
OFF	OFF	No electronic expansion valves (e.g. accurators, TX valves...).	
ON	OFF	One valve or two parallel electronic expansion valves (as required), positions always identical. If the unit is capable of advanced dry mode operation then this setting is the 'High Efficiency Mode'. Reserved, do not select	
OFF	ON	Advanced Dry Mode. This option must be selected only on units suitably equipped. Dry mode has no influence on the unit when heating.	
ON	ON		
Switch		Function	
<b>9</b>	<b>10</b>	<b>Electronic expansion valve type</b>	<b>How to recognise the valve type</b>
OFF	OFF	Dunan DPF series Zhe Jiang Sanhua DPF series Carel E2V series (& E3V series with unipolar coil) Reserved, do not select	removable black coil
ON	OFF		non-removable metal coil
OFF	ON		removable red coil
ON	ON		
<b>11</b>	<b>12</b>	<b>System number (for units with multiple compressors)</b>	
OFF	OFF	1 (master system, select this for single compressor units)	
ON	OFF	2 (slave system)	
OFF	ON	3 (slave system)	
ON	ON	4 (slave system)	
<b>13</b>		<b>Function of DIP switches 14, 15 and 16</b>	
OFF		Standard DIP switch functions; refer to table 2.	
ON		Custom DIP switch functions; refer to table 3.	

Table 2, Standard DIP switch functions for switches 14, 15 and 16.

Switch		Function
<b>13</b>	<b>16</b>	<b>Quiet mode option</b>
<b>OFF</b>	<b>OFF</b>	Disabled
<b>OFF</b>	<b>ON</b>	Enabled (D1 input)
Switches 14 and 15 <b>MUST</b> be set to <b>OFF</b> . Do <b>NOT</b> set switches 14 and 15 to <b>ON</b> .		

Table 3, Custom DIP switch functions for switches 14, 15 and 16.

Switch				Function
<b>13</b>	<b>14</b>	<b>15</b>	<b>16</b>	Custom options
<b>ON</b>	<b>OFF</b>	<b>ON</b>	<b>ON</b>	Enable all of the following options: Quiet mode (D1 input) Dry mode (D2 input) All other custom configuration options for air-to-air units are reserved and must not be selected.

## DIP switch selections Variations for Hydronic Units (Water to Air)

Switch		Function		
<b>3</b>		<b>Thermostat type</b>		
<b>OFF</b>		Thermostat provides COMP and HEAT signals (heatpump type)		
<b>ON</b>		Thermostat provides COOL and HEAT signals (not recommended!) <b>Note!</b> The TZT-100 thermostat is automatically detected regardless of the setting of DIP switch 3. The TZT-100 thermostat <b>must</b> be set to COMP & HEAT type operation.		
<b>4</b>		<b>Hydronic unit type</b>		
<b>OFF</b>		Reverse cycle or cooling only. For cooling only: Leave the HEAT input disconnected and disable heating mode on the thermostat.		
<b>ON</b>		Cooling + electric heating.		
<b>11</b>	<b>12</b>	<b>System number</b>		
<b>OFF</b>	<b>OFF</b>	1 (master system, select this for all hydronic units) <b>All other combinations for DIP switches 11 and 12 are reserved and must not be selected.</b>		
<b>13</b>	<b>14</b>	<b>15</b>	<b>16</b>	
<b>ON</b>	<b>ON</b>	<b>OFF</b>	<b>OFF</b>	Hydronic unit (water to air) <b>All other combinations for DIP switches 13, 14, 15 and 16 are reserved and must not be selected.</b>