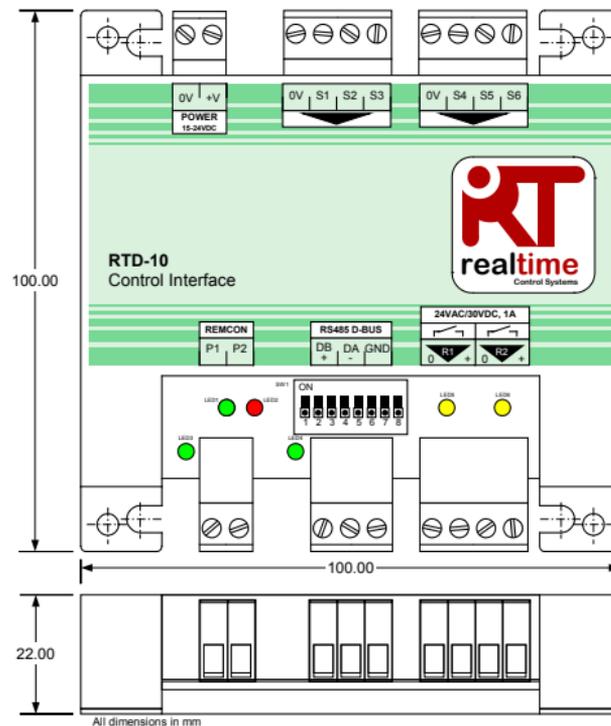
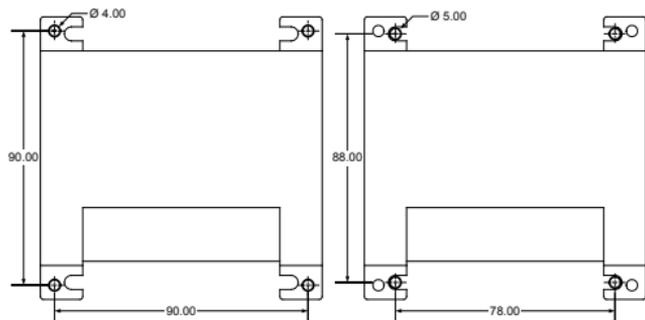


RTD-10

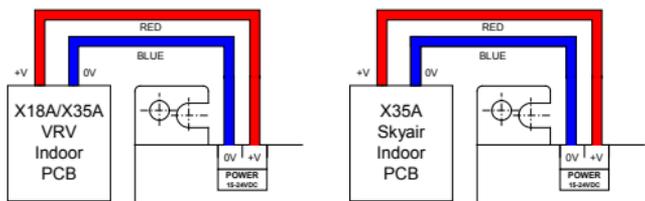
Installation Instructions

English RTD-10 Installation Instructions

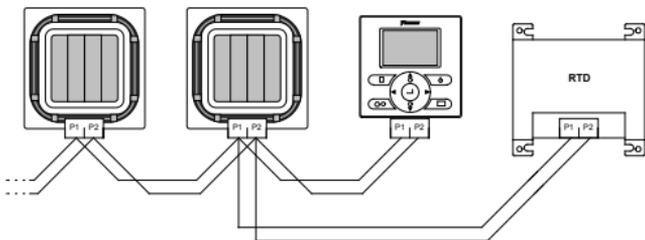




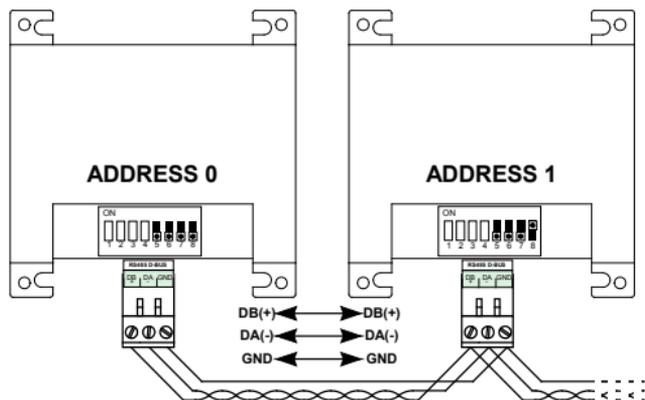
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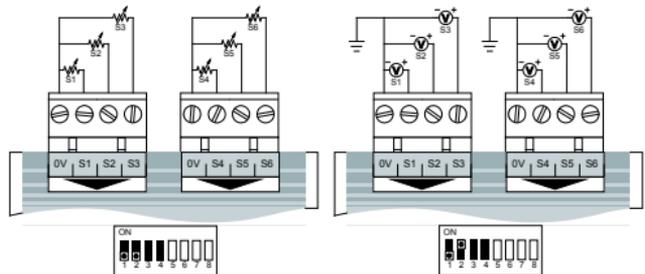
2



3



4



5

6

	R1
	
	
	
	
	
	

7

	R1
	
	
	
	
	
	

8

S2	S4	
		
		

9

S2	S4	
		
		

10

S2	S4	
		
		

11

S2	S4	
		
		

12

S2,S3	S4	ON

13

S2,S3	S4	ON

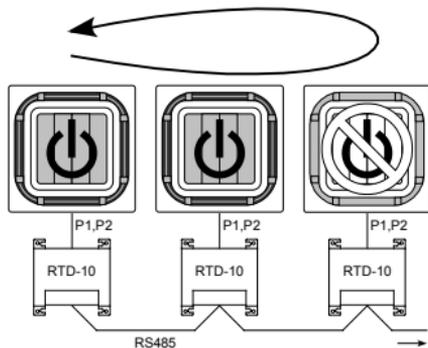
15

S2,S3	S4	ON

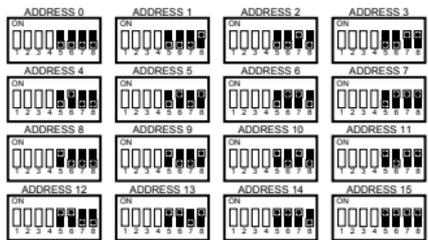
14

S2,S3	S4	ON

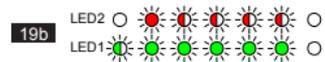
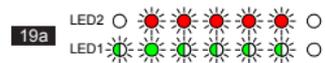
16



17



18



Warnings and Cautions

Do not exceed the specified fault relay ratings (maximum 1A, 24VAC/30VDC). Relays not intended for connection to safety critical equipment.

All cable connections to the device must be adequately secured by suitable strain relief fasteners

The RTD must either be mounted in a suitable metal enclosure or plastic enclosure with a flammability rating of at least IEC60695-11-10 V-1. Do not install it inside the air-conditioning unit. In all cases access by non-qualified persons must be prevented (the enclosure may not be accessible without a tool). The unit can be mounted horizontally or vertically

When the RTD is powered from the indoor unit power supply or other non-SELV supply, all external wiring and electrically attached devices must be suitably insulated to prevent access by non-qualified persons. Where this is not possible, the RTD must be powered from an SELV supply.

RS485 Cables must use stranded 24awg shielded or unshielded twisted pair to Cat3, Cat4 or Cat5 specification. Use a twisted pair for connections DB,DA and an extra core for connection GND. Install RS485 cable as shown in Figure 4.

The P1,P2 Network should be connected as shown in Figure 3. Up to 16 units and one remote controller can be connected to the RTD.

When connecting voltage signals from external sources to inputs S1 to S6, all 0V lines should be connected to earth external to the RTD.

S1 to S6 cables should be 0.5 to 1.0 mm² multi-stranded screened twisted pair. The screen should be earthed at one end only. The maximum distance from the RTD to the input source is 200m.

Specifications

Electrical

Supply	15V-24V DC, 120mA Regulated
Power	<2.5VA
Relay	1A, 24VAC max 1A, 30VDC max Rising clamp to 0.75mm ² cable
Connectors	

Network

P1P2	<500m
RS485	<500m

Environmental

Temperature

Storage	-10oC to 50oC
Operation	0oC to 50oC
Humidity	0-90% RH non-condensing

Inputs

Voltage Mode	S1..S6	0..10VDC
	<1mA	
	Maximum	Rating
	12VDC	

Resistance Mode S1..S6 5V, 1mA



Your product is marked with the symbol shown to the left. This symbol on the product indicates that this product must not be disposed of with your other household waste. Inappropriate disposal may be harmful. Instead, it is your responsibility to dispose of your waste equipment by handing it over to a designated collection point for the recycling of waste electrical and electronic equipment. Units must be treated at a specialized treatment facility for re-use, recycling and recovery. By ensuring this product is disposed of correctly, you will help to prevent potential negative consequences for the environment and human health. Please contact the installer or local authority for more information.



Observe precautions for handling Electrostatic Sensitive Devices

Additional information, including Modbus configuration and Fault Codes are available from www.realtime-controls.co.uk/rtd

RTD-10 Installation Instructions

The RTD-10 is a monitoring and control interface for Daikin VRV and Skyair ranges of air-conditioners; and VAM and VKM ventilation units. The interface is compatible with all units that have a P1,P2 remote controller network connection and allows control of up to 16 units in a single group. Control functions include:

HARDWIRED CONTROL. Unit control can be achieved through resistance inputs using resistor, potentiometer and volt-free contact inputs.

BMS INTEGRATION. Unit control can be achieved through 1-10V voltage inputs integrated with BMS control outputs.

HEATING INTERLOCK. Units can be interlocked with external heating systems.

DUTY/STANDBY. Multiple groups can be operated with rotating duty/standby with fault and high temperature alarming.

MODBUS CONTROL. The RTD supports the Modbus Protocol for network control and monitoring.

Installation

MOUNTING (FIGURE 1)

MOUNTING PILLARS

The RTD-10 is supplied with 4 mounting pillars that can be used to mount the interface within units with compatible mounting holes

SCREW MOUNTING

The RTD-10 can be mounted using screws of up to 5mm diameter.

POWER SUPPLY (FIGURE 2)

The RTD requires a 15V to 24VDC power connection. Power can be supplied from VRV indoor unit PCB X18A or X35A connection, a Skyair indoor unit PCB X35A connection or VAM PCB X11A connection. A 1m cable and connector is supplied with the RTD.

P1,P2 NETWORK (FIGURE 3)

Terminals P1, P2 connect to the Daikin P1, P2 network. P1,P2 installation should follow Daikin installation specifications. The RTD-10 can operate in Master or Slave mode with any Daikin remote controller. Operation is also possible without a remote controller being connected. Note that BRC infra-red receivers must be configured to operate in SUB (S) mode (RTD in MAIN (M) mode).

RS485 NETWORK INSTALLATION (FIGURE 4)

The RS485 D-Bus network requires a twisted pair cable connecting terminals DB(+) and DA(-) on each RTD as shown below. Terminal DB must be connected to all other DB terminals. Terminal DA must be connected to all other DA terminals. In addition the common terminal GND on all devices must be connected together. If a shielded cable is used then the shield can be used for this purpose. It is recommended that the GND connection is connected to local Earth at one point only. The network must be installed as a daisy-chained point-to-point Bus configuration, Star and Ring connections must NOT be used.

RS485 NETWORK LENGTH

Standard installation for total network distances of up to 500m can be achieved following the basic daisy-chaining method showed in the above diagram. The network can be extended further using RS485 repeaters.

LED FUNCTIONALITY (Figures 19 to 21)

When the RTD-10 is powered up, or if it loses communication with the Remote Controller the RTD-10 enters P1,P2 search mode. If P1,P2 communications are not re-established after 1 minute the RTD-10 will raise an alarm which will be indicated on the fault relay output. Led behaviour is shown in the following figures

Power-Up sequence: Factory Configuration	Figure 19a
Power-Up sequence: Custom Configuration	Figure 19b
P1,P2 Search. After power-up and during unit configuration	Figure 19c
No Fault State	Figure 20a
Unit Fault	Figure 20b
Device configuration error	Figure 21a
AC Unit Missing (U5 Fault)	Figure 21b
RS485 Communications timeout	Figure 21c

LED Key:

 OFF	 ON	 Flashing
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UNIT SEARCH

When the RTD-10 is powered up, or if it loses communication with the Remote Controller the RTD-10 enters P1,P2 search mode. If P1,P2 communications are not re-established after 1 minute the RTD-10 will raise an alarm which will be indicated on the fault relay output.

Standard Control: Resistance (Figure 5)



In Resistance Control Mode the RTD-10 Inputs allow individual control of a/c unit operating parameters using resistance values. Each input corresponds to a specific unit setting shown in the table below. If an input is left unconnected then the corresponding setting will remain at the default value.

S	Name	Range (default)
S1	Setpoint	0..10kΩ : 16..32°C (22)
S2	Fanspeed	Low<=1.1kΩ, High =2.2kΩ, HighHigh*=3.3kΩ (*where available)
S3	Mode	Auto <=1.1kΩ, Heat=2.2kΩ, Fan=3.3kΩ, Cool=4.7kΩ, Dry=6.8kΩ,
S4	Louvre	Swing< =1.1kΩ, 0° =2.2kΩ, 20°=3.3kΩ, 45°=4.7kΩ, 70°=6.8kΩ, 90°=9.6kΩ,
S5	On/off	On = Closed Circuit, Off = Open Circuit
S6	Unlock	Lock All<=1.1kΩ, Lock Setpoint, Mode, On/Off= 2.2kΩ, Lock Mode,On/Off=3.3kΩ, Lock On/Off=4.7Ω, Local=6.8kΩ, Lock Mode=9.6kΩ, Unlock >15kΩ

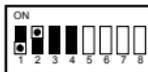
Setpoint	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32
S1 (kΩ)	0.3	0.9	1.5	2.1	2.6	3.2	3.8	4.4	5.0	5.6	6.2	6.8	7.4	7.9	8.5	9.1	9.7

Resistances should be within +/-250 ohms of the quoted value. Open circuit is R>200kΩ. S1 in resistance mode is designed to be operated using a *linear* 10kΩ variable resistance.

It is recommended that volt-free contacts or switch mechanisms have gold plated contacts to ensure a low resistance circuit when the switch is made.

Standard Control: Voltage (Figure 6)

In Voltage Control Mode the RTD-10 Inputs allow individual control of a/c unit operating parameters using voltages. Each input corresponds to a specific unit setting shown in the table below. If an input is left unconnected or is set to 0 Volts then the corresponding setting will remain at the default value.



S	Name	Range (default / 0V value)
S1	Setpoint	1..10V : 16..32°C (22)
S2	Fanspeed	Low=1.75V, High =3.25V, HighHigh*=4.75V (*where available)
S3	Mode	Auto =1.75V, Heat=3.25V, Fan=4.75V, Cool=6.25V, Dry=7.75V,
S4	Louvre	Swing =1.75V, 0° =3.25V, 20°=4.75V, 45°=6.25V, 70°=7.75V, 90°=9.25V,
S5	On/off	On >=5V, Off = 0V
S6	Unlock	Lock All=1.75V, Lock Setpoint, Mode, On/Off=3.25V, Lock Mode, On/Off=4.75V, Lock On/Off=6.25V, Local=7.75V, Lock Mode=9.25V, Unlock =10.0V

Setpoint	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32
S1 (V)	1.3	1.8	2.3	2.9	3.4	3.9	4.4	5.0	5.5	6.0	6.6	7.1	7.6	8.1	8.7	9.2	9.7

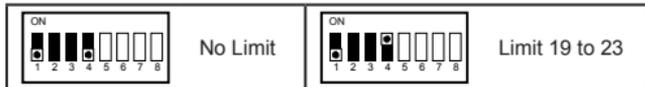
Voltages should be within +/- 0.25V of the quoted value. Open circuit for V<1V.

The 0V connection from external voltage sources should be connected to a local GND connection external to the RTD.

STANDARD CONTROL: SETPOINT LIMIT

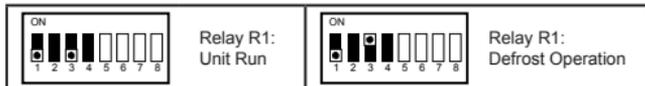
If SW1.4 is ON then a setpoint limit of 19 to 23 degrees is applied to setpoint adjustments made from the Remote Controller or Central Controller. Setpoint Limiting only applies when the setpoint buttons

are unlocked and the keypad Unlock input S6 is NOT set to **Local**. The setpoint limits are not applies to setpoint control from input S1 or adjustment via Modbus commands.



STANDARD CONTROL: RELAY OUTPUTS

SW1.3 configures Relay R1 as either a Run signal that closes when the unit is enabled to run, or a Defrost signal that indicates when the unit is in Defrost.



Output	Name	Operation (Caution: maximum rating 1A, 24VAC/30VDC)
R1	Run/ Defrost	Run: SW1.3 OFF : Closed when unit switched ON Defrost: SW1.3 ON : Closed when unit in defrost
R2	Fault	Closed on any unit fault

STANDARD CONTROL: REMOTE CONTROLLER UNLOCK

Input S6 in Voltage or Resistance mode can configure the unlock state of the Remote Controller buttons. The default state is **Unlock**, in this state the Remote Controller buttons are all active and no lock symbol appears on the display. Updates from inputs S1 to S5 are only sent when the input changes so that users can still operate the A/C. Setting S6 to **Locked** locks all input buttons and updates from the inputs S1 to S5 will control the operation of the A/C. Several partial Lock states allow combinations of the Setpoint, Mode and On/Off buttons to be locked so that the user has partial control of the unit.

Setting S6 to **Local** unlocks all remote controller buttons and prevents any control updates from inputs S1 to S5.

VAM and VKM Unit Operation

VAM and VKM units can be switched on and off using the RTD-10 On/off input. Control of VAM and VKM unit fanspeed and damper position from RTD-10 inputs or from Modbus registers is also possible using extended RTD-10 operating modes.

More details are available from www.realtime-controls.co.uk/rtd

Modbus Operation

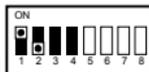
The RTD-10 supports the same Modbus command set as the RTD-NET interface. The RTD-10 supports Modbus addresses 0 to 15 as shown in Figure 18.

More details are available from www.realtime-controls.co.uk/rtd

Heating/Cooling System Interlock

The RTD-10 can be configured to operate in Heating System Interlock mode to prevent A/C cooling or heating operation from conflicting with the operation of an additional system. The RTD-10 can be wired to operate either in Master mode in which the RTD-10 determines when the secondary system operates, or Slave mode in which the secondary system will inhibit the RTD-10 operation.

Inputs are the same as Resistance Control Mode, with input S4 changed to act as an operation inhibit input signal. Closed circuit inputs on S1 to S3 select additional functions and override the default behaviour of the input.



S	Name	Range (default)
S1	Setpoint	0.3..10kΩ : 16..32°C (22) Restart Inhibit = Closed Circuit (Setpoint Control not available)
S2	Fanspeed	Low=1.1kΩ, High =2.2kΩ, HighHigh*=3.3kΩ (*where available) Invert S4 Input = Closed Circuit (Fanspeed Control not available)
S3	Mode	Auto =1.1kΩ, Heat=2.2kΩ, Fan=3.3kΩ, Cool=4.7kΩ, Dry=6.8kΩ, Heat/Cool Mode Inhibit = Closed Circuit (Mode Control not available)
S4	Inhibit	Inhibit=Closed Circuit, Enable = Open Circuit
S5	On/off	On = Closed Circuit, Off = Open Circuit
S6	Unlock	Lock All<=1.1kΩ, Lock Setpoint, Mode, On/Off= 2.2kΩ, Lock Mode, On/Off=3.3kΩ, Lock On/Off=4.7Ω, Local=6.8kΩ, Lock Mode=9.6kΩ, Unlock >15kΩ

Output	Name	Operation (Caution: maximum rating 1A, 24VAC/30VDC)
R1	Mode Interlock	SW1.3 OFF: Closed if Mode Auto:Cool, Cool or Dry + Unit On SW1.3 ON: Closed if Mode Auto:Heat or Heat + Unit On
R2	Fault	Closed on any unit fault

INTERLOCK MASTER MODE (Figures 7 & 8)

To operate the RTD-10 in Interlock Master Mode the relay output R1 is wired as an input to the secondary system. With SW1.3=OFF R1 will close when the unit is On and in a cooling mode. With SW1.3=ON R1 will close when the unit is On and in a heating mode. If the unit is in fault then R1 will not operate.

INTERLOCK SLAVE MODE (Figures 9 to 16)

To operate in slave mode the input S4 operates as a Volt-free inhibit input. When the inhibit signal is closed circuit the RTD-10 will prevent the A/C unit from operating (Figure 9). Input S4 operation can be inverted by inserting a Short Circuit on input S2 (Figure 10).

The RTD-10 can be configured using switch SW1.4 to switch the A/C units OFF during the inhibit or to switch the units to FAN-ONLY (Figures 11 & 12) or Mode Prohibit (Figures 13 to 16).

The inhibit signal overrides on/off commands both from the Remote Controller as well as input S5. If A/C Fan-Only mode is selected then the unit will remain on and the unit mode will be switched to Fan-only and locked. If Mode Prohibit is selected then the Mode will be prevented from operating in Auto and Heat if Heating Inhibit is selected (SW1.3 OFF), and will be prevented from operating in Auto, Cool and Dry if Cooling Prohibit is selected (SW1.3 ON). When the inhibit signal occurs, if the unit mode is in a prohibited mode then if Heating is prohibited then the mode will switch to Cool, and if Cooling is prohibited then the mode will switch the Heat.

When the inhibit signal is removed the RTD-10 will restore the previous operating state of units. If input S1 is Short Circuited then the previous settings will not be restored when the interlock is removed.

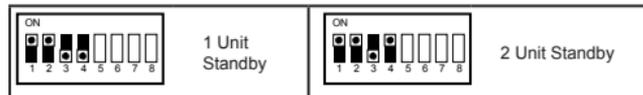
Duty/Standby Operation (Figure 17)

The RTD-10 can be configured to operate in a duty/standby configuration suitable for IT and Telecoms applications. An RTD-10 master together with up to 7 RTD-10 slaves can be configured to operate in a rotating duty/standby configuration with the following features:

- Up to 8 duty/standby groups
- All units run on fault

- 1 or 2 standby units
- Daily, Weekly or Multi-week duty rotation
- Two level alarm on high temperature and unit fault
- Optional Thermistor space temperature alarm
- A7 (Louvre) fault code filtering

The Run/Standby configuration is selected using the RTD-10 DIP switch settings. Both master and slave devices must have the DIP switches set. The position of SW1.4 on the master determines whether the system operates with 1 unit or 2 unit standby. The possible switch configurations are as follows:



S	Name	Range (default)
S1	Setpoint	0..10kΩ : 16..32°C (from RC)
S2	Fanspeed	Low=1.1kΩ, High=2.2kΩ, HighHigh*=3.3kΩ (from RC)
S3	Rotation	60s<=1.1kΩ, 1 Day=2.2kΩ, <u>1 Week</u> =3.3kΩ, 2 Weeks=4.7kΩ, 4 Weeks=6.8kΩ
S4	Auxiliary Space Temp	10kΩ NTC Thermistor (screened twisted-pair cable no longer than 100 metres)
S5	All On	All On = Closed Circuit, Normal Operation = Open Circuit
S6	All Off	All Off = Closed Circuit, Normal Operation = Open Circuit

Output	Name	Operation (Caution: maximum rating 1A, 24VAC/30VDC)
R1	Alarm Level 1	Closed when Alarm Level 1 or 2 occurs
R2	Alarm Level 2	Closed when Alarm Level 2 occurs

DUTY/STANDBY INSTALLATION

All RTD interfaces must be networked together using the 3 wire RS485 network, each RTD must then have a network address set in the range 0 to 7 (Figure 18). The RTD-10 Duty/Standby Master must have an address of 0. The remaining RTD slaves should have addresses in the range 1 to 7. If there are less than 7 slaves then start the addressing at 1 and allocate each slave consecutively upwards.

The Master and Slave RTD-10s will both initially indicate a Level 2 alarm. The master alarm will clear when it discovers at least one slave RTD-10. The slave alarm will clear when the master discovers the slave. If communications fails with a slave RTD-10 the master will generate a Level 2 alarm after 120s.

DUTY/STANDBY OPERATION

Under 'no fault' conditions the system will operate with 1 or 2 units in standby and the remaining units operational (2 unit standby is only available if there are at least three RTD groups). Default rotation time is 7 days, input S3 can be configured to select rotation times of 1 day, 2 weeks or 4 weeks if required using specific resistor values. In addition a test-mode is available by placing a 0 ohm link on S3 which will cause the system to operate in test mode with a 60 second rotation time. The system should only be operated in test mode for short time periods.

The RTD-10 with Address 0 (SW1.5 to SW1.8 OFF) is the Duty/Standby master. All inputs and outputs are wired to the Master. Slave inputs should not be wired. Slave output relays indicate the Alarm Level for that slave only.

An optional auxiliary space sensor can be fitted to provide alarm monitoring in the controlled space. If the sensor is fitted then the unit return air temperatures are *not* used for alarm generation. The Auxiliary sensor will raise alarms even if the units are overridden off.

A/C UNIT OPERATION

The unit mode is set to COOL and the mode button on the Master remote controller is locked to prevent change. The on/off button is also locked. The setpoint and fanspeed can be set from the RTD-10 master or the remote controller on the master group. If S1 and S2 are wired then setpoint and fanspeed are set by the RTD-10 inputs and the corresponding buttons on the remote controller are locked. If S1 and S2 are not wired then the buttons on the master remote controller are unlocked and can be used to set operating values. In this mode the setpoint is **limited** to the range 20 to 32°C.

ALARM OPERATION

Relay outputs R1 and R2 on the Master RTD-10 operate respectively as Level 1 and Level 2 alarm outputs. If a Level 2 alarm occurs then both R1 *and* R2 will be closed. All units will run if a Level 1 or Level 2 alarm occurs.

All unit return air temperatures are monitored and alarm levels 1 and 2 are set respectively at 2°C and 4°C above operating setpoint. The Auxiliary Space Temperature sensor has the same alarm limits applied.

Any unit fault other than code A7 will result in a Level 2 alarm being generated. An A7 (louvre fault) will generate a Level 1 alarm, but will not force units on.

The RTD-10 master will monitor all of the RTD slave devices discovered after power-up. If any of the RTD slave devices fail to respond the RTD-10 will raise a Level 2 alarm after 1 to 2 minutes.

Alarm	Reasons
Alarm Level 1 Output R1	Unit Return Air > Setpoint + 2°C Aux. Space Temperature > Setpoint + 2°C A/C Unit Louvre Fault (A7) Alarm Level 2 Exists
Alarm Level 2 Output R2	Unit Return Air > Setpoint + 4°C Aux. Space Temperature > Setpoint + 4°C A/C Unit Fault (except A7) A/C Unit Missing (U5 Fault) RTD-10 Slave Missing (master RTD-10) RTD-10 No slaves found (master RTD-10) RTD-10 Master not found (slave RTD-10)

If a Level 1 or Level 2 alarm occurs due to a unit or communications fault then all units will run until all faults are cleared.

If a Level 1 or Level 2 alarm occurs due to a high temperature on an indoor unit or the Auxiliary Space sensor then all units will run until temperature has reset and will continue to run on for 20 minutes before reverting to normal Run/Standby operation. In Test Mode (rotation = 60s) the run on time will be 40 seconds..

If a Level 2 alarm occurs due to an Indoor Unit Fault then all units will run until the Indoor Unit Fault has cleared and will continue to run on for 10 minutes before reverting to normal Run/Standby operation. In Test Mode (rotation = 60s) the run on time will be 20 seconds.

OVERRIDE ALL ON/OFF

Input S5 is a volt-free contact input that overrides all units ON if closed circuit. Input S6 is a volt-free contact input which overrides all units OFF if closed circuit.

AUXILLIARY SPACE SENSOR

18770-1.06.15 RTD-10 Installation Instructions

An optional auxiliary space sensor can be fitted to provide alarm monitoring in the controlled space. If the sensor is fitted then the unit return air temperatures are *not* used for alarm generation.

The sensor should be a 10kΩ NTC Thermistor mounted on a suitable vertical surface in the monitored space. The sensor should be wired to the RTD-10 using a twisted pair cable no longer than 100 metres. The Auxiliary sensor will raise alarms even if the units are overridden off.

MODBUS OPERATION

When operating in Duty/Standby mode the RTD devices CANNOT be connected to an external Modbus Master as this will disrupt operation.