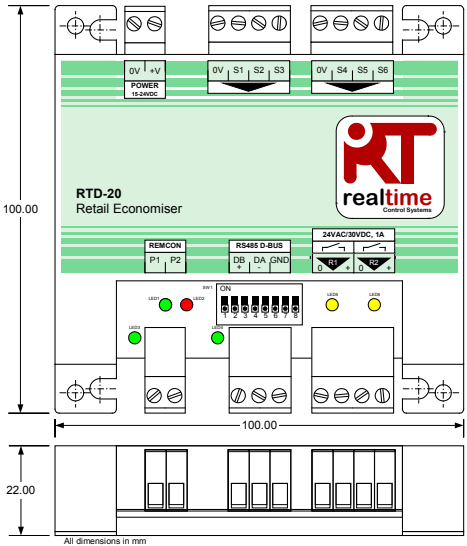
RTD-20

Installation Instructions

English RTD-20 Installation Instructions



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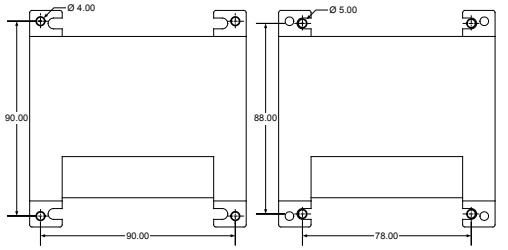
Control Systems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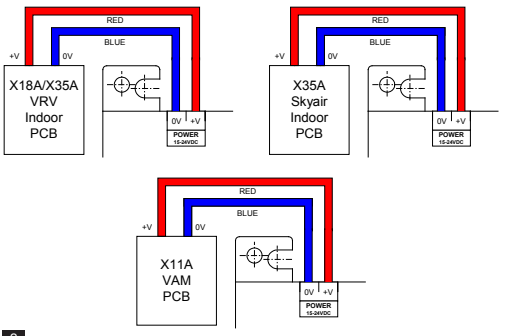
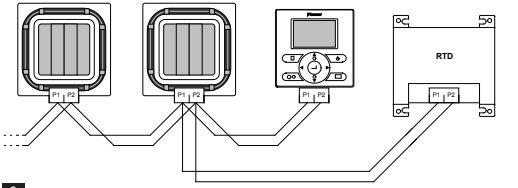
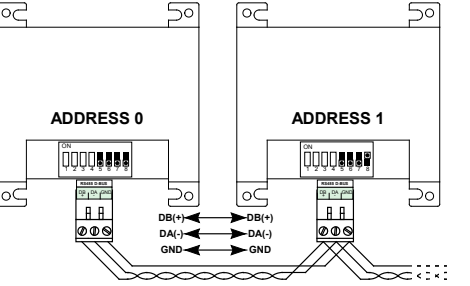

RED
BLUE
+V
0V
X18A/X35A
VRV
Indoor
PCB
0V
+V
POWER
15-24VDC
RED
BLUE
+V
0V
X35A
Skyair
Indoor
PCB
0V
+V
POWER
15-24VDC
RED
BLUE
+V
0V
X11A
VAM
PCB
0V
+V
POWER
15-24VDC

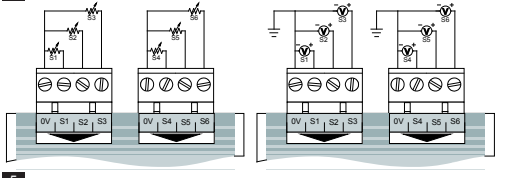
2


P1
P2
RTD

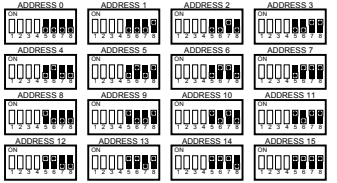
3


ADDRESS 0
ADDRESS 1
ON
DB(+)
DA(-)
GND
DB(+)
DA(-)
GND

4


0V
S1
S2
S3
S4
S5
S6

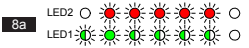
5

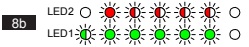


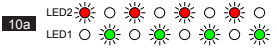
6

S1	S3	S3	Room 0	Room 1	Room 2	Room 3
			Room 0			
			Room 0			Room 3
			Room 0		Room 2	
			Room 0		Room 2	Room 3
			Room 0	Room 1		
			Room 0	Room 1		Room 3
			Room 0	Room 1	Room 2	
			Room 0	Room 1	Room 2	Room 3

7







⚠ 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 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 must 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 must be connected to earth external to the RTD.

S1 to S6 cables must be 0.5 to 0.75 mm^2 multi-stranded screened twisted pair. The screen must 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
Connectors	Rising clamp to 0.75mm^2 cable

Environmental

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

Network

P1P2	<1m
RS485	<500m

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***

Installation Instructions

The RTD-20 is a monitoring and control interface for VRV and Skyair ranges of air-conditioners and VAM ventilation units. The interface is compatible with the 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:

RETAIL MODE: Up to 16 RTD-20s can operate as a coordinated Retail Control System. Multiple Shop Floor and User Control Zones can be controlled with global or zone level settings. Zone setpoints can be limited or locked to restrict staff control of the system. Energy Efficient unit control minimises operating costs.

VAM CONTROL: Advanced control of VAM Units with energy efficient operation of heat-recovery and 3 speed fan control with optional CO2 sensor speed control. Supports integration with Retail Mode.

AIR CURTAIN CONTROL: Advanced control of CYQ* & CYV* Air Curtains Units with energy efficient operation, Outside Air compensated operation Supports integration with Retail Mode including optional cooling interlock.

PARTITIONED ROOM CONTROL: Up to 4 zones can be operated as stand-alone systems that automatically group together when connecting partitions are opened.

ERQ MODE: The RTD-20 ERQ mode gives a linear 0-10VDC capacity control of the range of ERQ condensers for cooling and heating coils within air handling units.

MOUNTING (FIGURE 1)

MOUNTING PILLARS	SCREW MOUNTING
The RTD-20 is supplied with 4 mounting pillars that can be used to mount the interface within units with compatible mounting holes	The RTD-20 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-20.

If the power supply is taken from the X35A/X18A, limitation of options is possible, (example KRP1C shall not be connected).

P1,P2 NETWORK (FIGURE 3)

Terminals P1, P2 connect to the P1, P2 network. P1,P2 installation must follow manufacturer installation specifications. The RTD-20 can operate in MAIN or SUB mode with any manufacturer remote controller. Operation is also possible without a remote controller being connected. Note that infra-red receivers must be configured to operate in slave mode.

A 1m cable is supplied with the RTD-20. See the indoor manual for the instructions on the number of controllers that can be connected to P1P2. The RTD counts for 1 BRC controller.

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

When the RTD-20 is powered up, or if it looses communication with the Remote Controller the RTD-20 enters P1,P2 search mode. If P1,P2 communications are not re-established after 1 minute the RTD-20 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 8a
Power-Up sequence: Custom Configuration	Figure 8b
P1,P2 Search. After power-up and during unit configuration	Figure 8c
No Fault State	Figure 9a
Unit Fault	Figure 9b
Device configuration error	Figure 10a
AC Unit Missing (U5 Fault)	Figure 10b
RS485 Communications timeout	Figure 10c

LED Key:

○ OFF	☼ ON	☼ Flashing

ADDRESSING

The RTD-20 has the facility to create control groups using multiple RTDs connected together on the RS485 D-Bus network. In standard configuration up to 16 RTD-20 devices can be connected together. Each RTD is assigned a D-Bus address using the configuration switches SW1.5 to SW1.8. (FIGURE 6).

RS485 TIMEOUT OPERATION

In Retail Group Mode, the Primary (Address 0) and Secondary (Address > 0) RTD-20 will report communications failure between Secondary and Primary. If the Primary looses communications with a Secondary relay R2 will operate to indicate a network fault, the time period for network timeout on the Primary at least 60 seconds and depends on the number of RTD-20 on the network. A secondary RTD-20 will timeout after no communications witht the Primary for a period of 4 minutes, in this case relay R2 will operate, LED2 will flash (figure 10c), the unit will switch ON and the Remote Controller will unlock.

UNIT SEARCH

When the RTD-20 is powered up, or if it looses communication with the Remote Controller the RTD-20 enters P1,P2 search mode. If P1,P2 communications are not re-established after 1 minute the RTD-20 will raise an alarm which will be indicated on the fault relay output.

MAIN/SUB OPERATION

The RTD can operate as either a MAIN or SUB controller depending on the configuration of the wired remote controller. If a remote controller is configured as a SUB then the RTD will operate as MAIN, and vice

versa. Some operating modes require the RTD to operate in a specific configuration, these are indicated in the configuration Title Bar as follows:

Ⓜ Ⓢ	Remote Controller can operate as MAIN or SUB
Ⓜ	Remote Controller must be configured as MAIN, RTD will operate as SUB
Ⓢ	Remote Controller must be configured as SUB, RTD will operate as MAIN

In cases where only SUB mode Ⓢ is supported, if BRC MAIN mode is selected, RTD will indicate Unit Fault and P1,P2 LED (LED3) will remain lit. BRC on/off button will be locked with unit OFF. In SUB mode Ⓢ operation, Remote Controller display functions are restricted and the setpoint display of the Remote Controller is limited to the setpoint range of the selected operating mode. For units with Self-Cleaning filter function, a MAIN or SUB Remote Controller must be fitted. For maximum energy efficiency it is advised that where possible the BRC is configured as SUB. If Remote Controller is BRC1E52A7 or newer then BRC must be operated in SUB mode.

MAIN MODE FIELD SETTINGS

With RTD operating as MAIN controller, at start-up the following field settings are automatically written

Mode nº	Switch nº	Position nº	Setting
20(10)	2	02	Control from Suction Air Sensor Only *Shop/User Control Zones and Partition Mode**
		03	Control from Remote Controller Sensor *Air-curtain Mode/ERQ Mode only**
20(10)	8	01	Heat-pump mode enabled *ERQ Mode only*
		02	Heating mode destratification offset = DISABLED *Only applicable to units that support this feature*
22(12)	2	01	Thermostat Differential Changeover = 1°C
24(14)	8	01	Self Clean Automatic Operation Lock=ON *Units with self-clean support only*
24(14)	4	02	Green Panel Indicator Lamp during self-clean operation *Units with self-clean support only*

*If unit is operated with BRC in MAIN mode after connection to RTD in MAIN mode, setting should be reverted to 10(20)-2-01

To prevent settings being made, where supported configure BRC to operate in MAIN mode.

RTD SUPPORT FOR VRV HEAT-PUMP

If Heat/Cool Master is required then Heat/Cool Master must be selected before RTD-20 is attached. For correct operation the Retail Primary Zone must be the Heat/Cool Master. For heat-pump systems, if RTD is configured in SUB Mode then system will require Manual Heat / Cool Changeover Switch KRC19-26A to be connected to Outdoor Unit A, B & C Terminals and Changeover to be set to “OUT” on Outdoor PCB.

For heat-pump systems in Shop Floor and User Control Zones, if RTD is configured in MAIN mode on Heat/Cool master then RTD AUTO function will activate to allow automatic changeover between HEAT and COOL mode. In cases where FAN operation would occur, AUTO is displayed on the Remote Controller but unit HEAT/COOL operation is prevented using Force Thermo Off. If a SUB mode BRC is connected

to the RTD then the BRC will display the AUTO function. The Heat/Cool mode indicated in AUTO will indicate the current mode of the system. In this configuration FAN mode is not possible. For RTD in MAIN mode on Heat-Pump VRV System Cassette and Duct models MUST have KRCS01 Remote Sensor Option Installed.

PASSIVE INFRA-RED SENSOR (PIR) SUPPORT

In cases where PIR support is indicated, the RTD supports connection of a Volt-Free contact where the input is Closed-Circuit on PIR activity detection. The RTD uses multiple pulses from the PIR sensor to indicate activity level, therefore if the PIR is fitted with a timer, this should be set to generate shortest possible pulse when activity is detected. In Demo/Commissioning Mode with PIR fitted, output R2 will operate to indicate PIR activity instead of standard R2 function.

DIII-NET DEVICE SUPPORT

RTD-20 in MAIN Mode on Retail Control Zones MUST NOT have Connection to DIII NET Control Devices (I Touch Controller, I Manager, I Touch Manager, BACNET Gateway & LON Gateway). With RTD-20 in SUB mode a DIII NET Control Device can be used for read-only operations, but not setting of unit operation.

RTD-20 Standard Inputs

Inputs S1 to S6 are wired between the labelled sensor terminal and the 0V terminal on the same connector block (FIGURE 5). Inputs configured as Voltage inputs must have the 0V externally grounded.

S1 to S6 cables must be 0.5 to 0.75mm^2 multi-stranded screened twisted pair. The screen must be earthed at one end only. The maximum distance from the RTD-20 to the input source is 200m.

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

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 must 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.

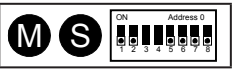
STANDARD OUTPUTS

Unless specified otherwise Relay Outputs are configured as follows

Output	Name	Operation
R1	Run	TRADE Operation
R2	Fault	Closed on any unit fault

Relays rated for maximum 1A, 24VAC/30VDC

RETAIL PRIMARY SHOP FLOOR ZONE



A Primary Shop Floor Zone is the primary control zone in Retail Mode. The Primary zone is always Modbus Address 0. Additional Retail Zones can be networked to the Primary Zone and will receive control signals from the Primary Zone. For optimal energy efficiency it is recommended that the Remote Controller is configured as SUB.

Setpoint Limit 19 to 23

Setpoint Limit 20 to 24

No Trade Off-Delay

Trade Off-Delay

Input	Name	Range (default)
S1	PIR	**Open Circuit: No Activity** Closed Circuit: Activity
S2	Enable (Fire)	**Open Circuit: Fire Condition** Closed Circuit: Operation Enabled
S3	Trade Extension	Momentary Action Volt Free Contact
S4	Trade	**Open Circuit = Not Trade,** Closed Circuit = Trade,
S5	Occupied	**Open Circuit = Unoccupied,** Closed Circuit = Occupied
S6	Engineers Mode	Momentary Action Volt Free Contact

Output	Name	Operation
R1	Trade	Closed on Trade or Extend Trade
R2	Fault	Closed on any unit fault

PIR Input (S1) Input S1 supports a Volt Free Contact input from a Passive Infra-Red (PIR) Sensor (Closed Circuit on activity). If a PIR is connected then the RTD-20 will activate adaptive setback mode based on customer footfall activity, resulting in lower energy consumption during quiet periods. The PIR should be located in a busy region of the shop floor. PIR operation is activated by activity pulses on S1, a constant open or closed circuit will not activate PIR operation.

Enable (Fire) Input (S2) Input S2 must be closed-circuit to allow normal operation. An open-circuit condition on S2 indicates a Fire condition, all zones will be locked OFF until this condition is cleared.

Trade Extension (S3) During the **POST-TRADE** mode, a momentary closed circuit on input S3 will cause all Shop Floor Zones to revert to **TRADE** operation for a 2 hour period before reverting to **POST-TRADE** mode. If the store is **UNOCCUPIED** but S4 is linked then an extension is allowed for 6 hours after the end of occupancy. An additional pulse will cancel the extension.

Trade Mode (S4) and Occupied Mode (S5) define the Store Mode of the site, this is transmitted to all Secondary zones to determine their modes of operation.

When **UNOCCUPIED** all systems are switched off and locked. At the start of the **OCCUPIED** period the system initially operates in the **PRE-TRAD**E mode until **TRADE** operation, after which the system enters the **POST-TRADE** mode.

If only one signal is available, then S4 must be linked **CLOSED**. In this configuration the mode will switch between **UNOCCUPIED** and **TRADE**.

S5 Occupancy	S4 Trade	Store Mode
OPEN	OPEN	**UNOCCUPIED**
OPEN	CLOSED	**UNOCCUPIED,** (6 hour Post-Trade Extend window)
CLOSED	OPEN	**PRE-TRADE** (Before Trade Occurred)
CLOSED	CLOSED	**TRADE**
CLOSED	OPEN	**POST-TRADE** (After Trade Occurred)

If SW3 is ON then a **Trade Off-Delay** of 5 minutes will operate when S4 goes from closed to open circuit. If S4 returns to closed circuit within 5 minutes then the system will remain in **TRADE**.

Engineers Mode (S6) Input S6 is used to unlock the system control to allow maintenance and commissioning operations. The following modes are available using S6.

Engineers Mode.	Momentary Input on S6 enters **Engineers Mode.** Remote Controllers Totally Unlocked (lock symbol disappears) Setpoint Limits Removed
Demo Mode	Firstly Enter **Engineers Mode** Hold S6 closed for 5 seconds to enter **Demo Mode** LED1 and LED2 are both illuminated on all RTDs. System operates as **Normal Mode**, but mode change timers are not used, Trade Extension Timer is reduced to 60 seconds
Commissioning Mode	Firstly Enter **Demo Mode** Hold S6 closed for a further 5 seconds to enter **Commissioning Mode**. System operates as **Demo Mode**, but all setpoint limits are removed.

A momentary pulse is applied to invert output R2 when a change of engineers mode occurs. if BRC is operating in SUB mode then it will temporarily indicate **Connection Under Check** when S6 input pulse occurs. To revert to Normal Operation apply an additional momentary input to S6. Normal Operation will also revert after 2 hours. S6 function is not available for a period of up to 60 seconds after device power-up or DIP Switch setting change.

START-UP OPERATION

At the start of the **OCCUPIED** period the Shop Floor indoor unit fans will be locked at high speed with louvers locked at 90° for a period of 15 minutes, even if the store enters **TRADE** during this period. The startup period is used to destratify the shop floors and purge any heat build-up. For the first 3 minutes the system will run in FAN mode, followed by a Restricted AUTO mode for 12 minutes during which HEAT is enabled if required but cooling is prohibited. If the Shop Floor enters **TRADE** mode during this period then the AUTO mode will be displayed on the remote controller but the same mode restrictions will apply. During this period all buttons on the Remote Controller are locked. If the Shop changes to **UNOCCUPIED,** a period of 1 hour (1 minute in Demo/ Commission mode) in the UNOCCUPIED state is required before the 15 minute start-up timer will reset.

During **PRE-TRADE** and **POST-TRADE** the shop floor is controlled to minimum comfort conditions (18°C to 26°C, 22°C to 30°C for High Temperature mode), if the temperature is within the minimum comfort limit then the units will run in FAN at high speed. During **TRADE** the system will be controlled to the specified setpoint with a deadband of +/-2°C. During **PRE-TRADE** and **POST-TRADE** operation the Remote Controller will be completely locked.

During **TRADE** operation, and once the startup period of 15 minutes is completed, the FAN and LOUVRE buttons will be completely unlocked, and the SETPOINT will be unlocked but limited to the specified setpoint range. The mode display will indicate AUTO.

LOW TEMPERATURE PROTECTION

When the site is **UNOCCUPIED** The Retail Primary Space temperature is monitored and if it falls below the Low Temperature Limit (default 12°C) for 60 seconds then all RTD Retail and User Control Zones will switch on until the condition is cleared. Air-curtain and VAM zones will NOT run. Each zone will run in HEAT if a local Low Temperature condition is detected, otherwise the zone will run in FAN. Each zone will also monitor local temperatures and will trigger site Low Temperature Protection if a local Low Temperature condition is detected. Note that unit Return Air sensors must be positioned to measure room temperature even when the unit is off. Extended Sensor kits should be used for ducted units. To prevent Low Temperature Protection, configure S2 Enable (Fire) Input as open circuit during **UNOCCUPIED** period.

BRC CONFIGURATION

For maximum energy efficiency a BRC attached to an RTD-20 configured as a Retail Control Zone should be configured as a SUB remote controller. If BRC is configured as MAIN, for BRC1E51/ BRC1E52 controllers will display the [S] symbol in periods where the RTD enforces the Force Thermo Off condition.

RTD MAIN MODE AUTO OPERATION

If RTD is operating as MAIN mode and AUTO is displayed on BRC, then RTD will control system mode between Heat/Cool in order to minimise energy use. Minimum run timers are used to prevent rapid changing between modes.

ZONE PRIMARY

The **Retail Primary** generates Occupancy and Trade conditions for the entire network. Further zoning can be created by configuring other zones on the network as a **Zone Primary** using Input S6 on Secondary Zones where available. A Zone Primary can override the Retail Primary signals for all addresses above the Zone Primary until another Zone Primary is encountered. Additional Trade and Occupied signals can be generated by Zone Primaries. Further information is available at **http://www.realtime-controls.co.uk/rtd-20**.

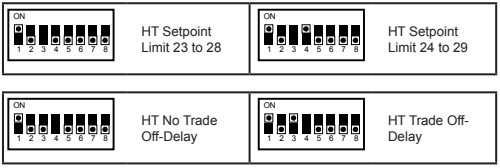
INTELLIGENT DEMAND PREDICTION (IDP)

The Primary Zone monitors the operating demand from the Indoor Units and predicts future system demand to minimise unnecessary heating and cooling operation. Under conditions where the site is predicted to have a dominant cooling load the IDP will prevent unnecessary heating occurring, if a dominant heating load is predicted then unnecessary cooling will be prevented. The IDP calculation uses recent historical logs of heating and cooling to determine if mixed operation is required or whether heating or cooling is dominant.

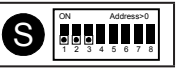
Secondary Retails Zones use the primary IDP mode by default to determine their operation. Secondary zones can be configured to use their own local IDP. Secondary User Control Zones are not affected by the Demand Prediction and will allow heating and cooling on demand.

HIGH TEMPERATURE (HT) MODE

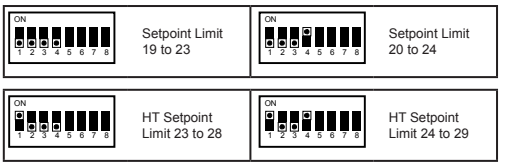
High Temperature Mode operation raises the setpoint range to the ranges 23 to 28, or 24 to 29, selectable using SW4.



SECONDARY SHOP FLOOR ZONE



A Secondary Shop Floor Zone provides control of additional Shop Floor zones. The Primary Zone determines the overall operating conditions of the shop, the secondary zone can be configured to operate with local control of the secondary zone during trading conditions, or to slave its control from the Primary Zone. For maximum energy efficiency the Remote Controller should be configured as a SUB in this mode.



PIR Input (S1) can be used to activate activity setback with the same functionality as the Primary Shop Floor zone. If the input is open-circuit then no setback is applied. If the input is permanently closed-circuited then the Primary Shop Floor setback is applied to this zone. If a PIR is connected then setback will be performed based on local activity.

Setpoint(S2) Input S2 can be configured to allow local control of the zone setpoint from the remote controller, or the value can be slaved to the Primary Shop Floor Zone

Local IDP (S3) If open-circuit then the Primary Shop Floor IDP is applied to this zone. If closed-circuit then the zone will use local IDP.

Input	Name	Range (default)
S1	PIR	**Open Circuit: No Activity** Closed Circuit (Pulsed): Activity Closed Circuit (Permanent): Use Zone Primary PIR
S2	Setpoint	**Open Circuit: RC Unlocked** Closed Circuit: Setpoint from Primary
S3	Local IDP	**Open Circuit: Use Primary Zone IDP** Closed Circuit: Use Local Zone IDP
S4	Trade	**Open Circuit = Zone Primary Trade Signal** Closed Circuit = Local Trade Signal
S5	Occupied	**Open Circuit = Zone Primary Occupancy Signal.** Closed Circuit = Local Occupancy Signal
S6	Zone Primary	**Open Circuit = Not Active.** Closed Circuit = Zone Primary Active

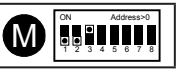
Outputs are the same as for the Primary Shop Floor Zone

Local Trade Signal (S4) overrides the Zone Primary signal allowing Trade operation outside of the Zone Primary Trade time. Default operation generates a local TRADE signal if Zone Primary **TRADE** *OR* Local S4 **TRADE** signal.

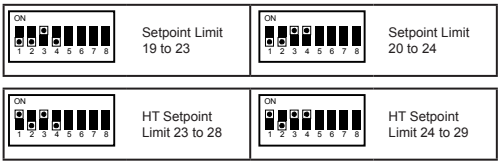
Local Occupancy Signal (S5) overrides the Zone Primary signal allowing Occupied operation outside of the Zone Primary Occupancy time. Default operation generates a local **OCCUPANCY** signal if Zone Primary **OCCUPANCY** *OR* Local S5 **OCCUPANCY** signal.

Activate Zone Primary (S6) If closed-circuit then the zone operates as a Zone Primary as described in the Retail Primary section.

SECONDARY USER CONTROL ZONE



A Secondary User Control Zone allows users to alter unit operation during the occupied period. The Zone Primary co-ordinates the User Control Zone and ensures the zone is shut down when **UNOCCUPIED**. User Control zones can be configured to support areas with permanent or temporary occupancy.



When the primary zone is **UNOCCUPIED** the remote controller is locked and the A/C unit is switched off. The User Control Zone is unlocked when the primary zone is either **OCCUPIED**, or in **TRADE**, depending on User Zone Type set by input S3. When first unlocked the unit will switch ON if the zone is NOT a timed zone. The unit can be switched on and off by the user when unlocked. When the zone is unlocked the Remote Controller is restricted to allow only AUTO and FAN modes. If other modes are selected the mode will be overridden. At the start of occupancy the mode is always reset to AUTO.

PIR Input (S1) Input S1 supports a Volt Free Contact input from a Passive Infra-Red (PIR) Sensor (Closed Circuit on activity). If a PIR is connected then the User Control Zone will operate as a timed zone, after a period of 1 hour of no activity the unit will switch off. If input S1 is permanently Closed Circuit then the User Control Zone will operate as a timed zone based on unit operation, after 1 hour of operation the unit will switch off. When operating as PIR or Timed User Control Zone the unit will be initially OFF at the start of occupancy, user activity or manually switching the unit on will start the timed operation.

Input	Name	Range (default)
S1	PIR / Timed Mode	**Open Circuit: Not Active** Closed Circuit(Pulsed): PIR Activity Closed Circuit(Permanent): Timed User Control Zone
S2	Setpoint Reset	**Open Circuit: Not Active** Closed Circuit: Reset Setpoint at start of user operation
S3	User Zone Type	**Open Circuit : Occupancy Zone** Closed Circuit: Trade Zone
S4	Minimum Comfort	**Open Circuit = Not Active** Closed Circuit = Minimum Comfort Control
S5	Zone PIR Occupancy	**Open Circuit = Not Active.** Closed Circuit = Send PIR Occupancy to Zone Primary
S6	Zone Primary	**Open Circuit = Not Active.** Closed Circuit = Zone Primary Active

Output	Name	Operation
R1	Run	AC Unit Run
R2	Fault	Closed on any unit fault

Setpoint Reset (S2) If S2 is closed-circuit then the setpoint will reset to the default setpoint at the start of the occupied period (the default setpoint is the middle of the Setpoint Range).

User Zone Type (S3) If S3 is closed-circuit then the unit will operate using the Trade time signal from the Zone Primary. If Minimum Comfort operation is activated then when **OCCUPIED** but not **TRADE** operation

the unit will maintain minimum comfort conditions in the room.

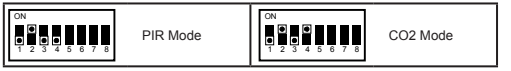
Minimum Comfort Control (S4) When active Minimum Comfort control will maintain the room to Setpoint Range +/-1°C when the Zone Primary generates an Occupied signal, even if the User Control Zone is currently OFF. In conditions where the unit would be normally OFF, the unit will be switch OFF once Minimum Confort Conditions are achieved. In conditions where the unit would normally be ON and the user has switched the unit OFF, if the room temperature falls outside of the Minimum Comfort Range then the unit will switch ON and remain ON.

Zone Occupancy (S5) If S5 is linked then PIR activity during **UNOCCUPIED** will cause the User Control Zone to enter **OCCUPIED**, for a minimum of 2 hours.

Activate Zone Primary (S6) If closed-circuit then the zone operates as a Zone Primary as described in the Retail Primary section.

VAM CONTROL

VAM Control mode allows VAM units to be operated either stand-alone or as part of a retail control group. A wired remote controller is optional, and if used should be configured as a SUB.



VAM Fanspeed (S1) can be used to program the VAM fanspeed, or if left open circuit allows the fanspeed to be adjusted from the VAM fanspeed button on a Remote Controller. In PIR Mode, if wired a PIR sensor will generate an activity profile that is used to control the fanspeed, at activity <10% the VAM will switch OFF. If no PIR Sensor or Remote Controller is detected then the default fanspeed is HIGH. If S1 is permanently Closed Circuit in PIR mode then the Occupancy level generated by the Zone Primary will be used to control the fanspeed. In CO2 mode a CO2 sensor with suitable output scaling can be used to control the fanspeed, if the CO2 sensor voltage is below the minimum 1V threshold the unit will be switched off.

Input	Name	PIR Mode	CO2 Mode
S1	VAM Fanspeed	PIR Activity Closed Circuit: Zone Primary Occupancy Level used	CO2 Sensor 1..10V <1V OFF 3.0V Fan=LOW 6.0V Fan=MEDIUM 9.0V Fan=HIGH
S2	Unit Enable (Fire)	**Open Circuit = Unit Disabled** Closed Circuit = Unit Enabled	
S3	User Zone Type	**Open: Occupancy Zone** Closed: Trade Zone	
S4	VAM Damper	**Open:Auto Damper** Heat Recovery=2.2kΩ, Bypass=3.3kΩ	
S5	Fresh Air High Volume	**Open Circuit = Normal** Closed Circuit = HH Fan / Damper Bypass Mode	
S6	Zone Primary	**Open Circuit = Not Active.** Closed Circuit = Zone Primary Active	

Output	Name	Operation
R1	Run	VAM Running (VAM Fan Operational)
R2	Fault	Closed on any unit fault

Unit Enable (Fire) (S2) must be Closed Circuit to allow the VAM to

run. If a Fire Signal is available then this can be wired with a Normally Closed contact enabling unit operation. In stand-alone operation the S5 input can also be used for on/off functionality. In Retail Control the unit will be switched on/off by the **OCCUPIED** state of the Retail Primary Zone.

User Zone (S3) in a retail group determines if the VAM will run when an Occupied signal or a Trade signal is generated by the Zone Primary.

VAM Damper (S4) should be left Open circuit unless external control of the bypass damper is required. In the default AUTO mode the damper will be controlled to ensure the most energy efficient operation under all conditions.

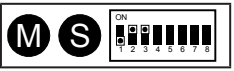
Fresh-Air/High Volume (S5) Operates the system at HH fan with damper in bypass mode. Input S2 must be closed-circuit for the unit to run.

Activate Zone Primary (S6) in a retail group, if closed-circuit then the zone operates as a Zone Primary as described in the Retail Primary section.

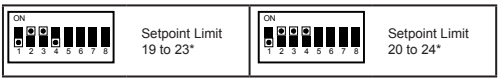
VAM SETPOINT

In Stand-Alone operation the VAM setpoint is a default of 22°C. In a Retail Group, if S6 is open-circuit then the VAM will use the setpoint of its Zone Primary. If S6 is closed-circuit and the VAM is a Zone Primary then the VAM will use the average of the setpoints of all RTD-20 that are within the VAM Control Zone.

AIR-CURTAIN CONTROL



Air-Curtain control allows CYQ* & CYV* Air-Curtains to be manually or automatically controlled. Control can be stand-alone or coordinated by a Primary Retail Zone.



*High Temperature Setpoint ranges used if Primary configured for High Temperature Mode

M Standard Control is selected by configuring the Remote Controller in MAIN mode, in this mode the unit can be switched on and off from the remote controller, input S5 or a Primary Retail Zone. In standard mode the Fanspeed can be manually selected from the Remote Controller. If Outside Air Sensor S3 is not wired then the user can manually select the unit mode using the remote controller, otherwise unit mode is automatically selected based on Outside Air Sensor.

S Advanced Control is selected by configuring the Remote Controller as a SUB, or omitting it altogether. In this mode the unit can be switched on and off from the remote controller or a Primary Retail Zone. All other remote controller keys are locked except for Setpoint if input S1 is open circuit, in which case a limited setpoint range is allowed.

In Retail Group operation the Air-curtain will run when the **OCCUPIED** and **TRADE** conditions are active.

Input	Name	Range (default)	
S1	Setpoint	0.3..10kΩ : 16..32°C (Remote Controller Setpoint Locked) Open Circuit: BRC, Zone Primary or Fixed see table in section on S1 Closed Circuit: Third Party Unit (TPU) Mode	
S2	Auxilliary Space Temp	10kΩ NTC Thermistor Recommended part: RS Stock No. 813-806	
S3	Outside Temp	10kΩ NTC Thermistor *Recommended part:* RS Stock No. 813-828	
S4	Door Closed	Door Closed = Closed Circuit, **Door Open** = Open Circuit	
		Retail Group	**Stand-Alone**
S5	Zone Mode Interlock / On/Off	**Open Circuit: Normal** Closed Circuit: Zone Mode Interlock	On = Closed Circuit, **Off** = Open Circuit (last touched)
S6	Zone Primary/ Commission	**Open Circuit: Normal** Closed Circuit: Zone Primary	**Open Circuit: Normal** Closed Circuit: Commission Mode

Output	Name	Operation
R1	Run	Air-Curtain Operation
R2	Fault	Closed on any unit fault Closed if SUB Remote Controller and S3 Open-Circuit

Relays rated for maximum 1A, 24VAC/30VDC

In Advanced Control, when the unit is in HEAT mode the Return Air temperature is used to determine a heat demand based on the setpoint. If there is no demand the unit will run at minimum heat capacity with LOW fan, otherwise the fan will run in HIGH and the unit will increase heat output. In FAN mode the speed will be LOW if the inside air is below the control setpoint, and HIGH otherwise. Once fanspeed is increased, it will not be decreased until the start of the next Occupied period.

Setpoint (S1) If a resistance value is connected to input S1 then the setpoint is programmed by the resistance using the standard setpoint range map, if a BRC is fitted then it will be locked. If S1 is open-circuit then the remote controller setpoint source is determined by the following table

BRC Fitted	Zone Primary Exists	Setpoint Source
NO	NO	Setpoint Limit 19 to 23 : Setpoint = 21 Setpoint Limit 20 to 24 : Setpoint = 22
NO	**YES**	Zone Primary Setpoint
YES		BRC Setpoint

If input S1 is short circuit then the Air Curtain mode operates in Third Party Unit (TPU) mode.

Space Temp / Interlock (S2) If a 10kΩ NTC Thermistor is wired then the RTD will use this sensor in Advanced Control mode instead of the unit return air sensor for control.

Outside Temp (S3) monitors the outside air conditions and determines when the air curtain will operate in FAN or HEAT. The sensor samples over a 24 hour period and is not affected by direct sunlight. This input is required when the Remote controller is a SUB, in this mode a fault will be reported on R2 if S3 is open-circuit. When the Remote Controller is configured as a MAIN the input is optional and the Mode button will be unlocked if S3 is open circuit.

Door Closed (S4) in Advanced Control mode switches the air curtain to setback mode after the door has been closed for 3 minutes, after which the door must open and remain open for 1 minute before the setback is cancelled.

RETAIL GROUP

Zone Mode Interlock (S5) If closed-circuit then if the unit is in HEAT the zone will generate a cool inhibit signal that is sent to the Zone Primary (as described in the Retail Primary section). Cooling is then prohibited in all zones covered by the Zone Primary. If the Zone Primary is the Store Primary then cooling will be inhibited for the entire system. For Heat-Pump operation, ensure Zone Primary is Heat/Cool master with BRC in SUB if Heat changeover is required.

Activate Zone Primary (S6) If closed-circuit then the zone operates as a Zone Primary as described in the Retail Primary section.

STAND ALONE

On/Off (S5) Allows external signal pulse to switch unit on and off.

Commission (S6) If linked will cause the door close timers to be reduced to 10 seconds and the Outside Air sample window to be reduced to 10 seconds.

BIDDLE AIR CURTAIN CYV* & CYQ* Ⓢ

The RTD-20 supports Biddle Air Curtain Models CYV* & CYQ*. **If connected a wired Remote Controller must be configured as SUB mode Ⓢ to allow Biddle Air Curtain operation**. When connected to a model CYV* Air Curtain the RTD relay outputs R1 and R2 are re-configured to generate volt-free fan signals for fan steering. The relays must be connected to the Air Curtain fan control contacts according to the Air Curtain wiring diagram. Note that Biddle Jumpers must be set to enable external fan steering.

Output	Name	Connection
R1	Fan Medium	Terminals G,D
R2	Fan High	Terminals G,T (+R1 Closed circuit)

When entering commissioning mode, if the unit is on then the RTD will exercise the fan connection and unit mode by switching fanspeeds at 15 second intervals, firstly the unit will be set to FAN mode and the fanspeed will change HIGH-MEDIUM-LOW, then the unit will be set to HEAT mode and the fanspeed will again step through HIGH-MEDIUM-LOW.

THIRD PARTY UNIT (TPU) MODE

With input S1 short circuit the RTD Air-curtain will operate in Third Party Unit (TPU) mode.

In TPU mode the P1,P2 connection is disabled, in this state the P1,P2 LED (LED3) will pulse every second. In TPU mode the unit Fan will be switched by the TRADE condition of the Zone Primary. The RTD will then use S2 and S3 to determine Heat output requirement.

Temperature sensors on input S2 and S3 MUST be connected for TPU operation.

In TPU mode the Relay R1 and R2 are reconfigured to the following functions.

Output	Name	Operation
R1	TPU Fan	Closed to operate Air-Curtain Fan
R2	TPU Heat	Closed to operate Air-Curtain Heating

Relays rated for maximum 1A, 24VAC/30VDC

PARTITION MODE

Partition Mode allows up to four RTD-20s to be operated in configurations where there are movable partitions that can separate adjacent rooms. When a partition is closed, the remote controller associated with the partition will be unlocked. When a partition is open, the remote controller becomes locked and the room control is slaved to the next room.

Input	Name	Range (default)
S1	Partition 1	Partition Closed = Closed Circuit, Partition Open = Open Circuit
S2	Partition 2	Partition Closed = Closed Circuit, Partition Open = Open Circuit
S3	Partition 3	Partition Closed = Closed Circuit, Partition Open = Open Circuit
S4		NOT IN USE
S5	On/Off	On = Closed Circuit, Off = Open Circuit (last touched)
S6	Enable	Occupied = Closed Circuit, Unoccupied = Open Circuit

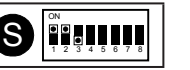
One RTD-20 must be configured as Address 0, this will operate as the partition group Master. The inputs on the group Master are wired to switches on each partition. Inputs S1 to S3 are wired to partitions 1, 2 and 3 respectively. Input S6 is a global disable input, if S6 is open circuit then all units are switched off and remote controllers locked. Inputs S5 is an optional on/off input that allows a last -touched on/off switching of the units from a time clock. The room partitioning operation is shown in FIGURE 7.

An additional Slave RTD-20 is added for each partitioned room and networked together as described in the RTD Networking section. These are addressed in the range 1 to 3 as shown in FIGURE 6. The inputs on the slave RTD-20s should not be wired.

If a Room Master is operating in AUTO, slaved zones will not operate in AUTO, but will operate in HEAT or COOL depending on the demand of the Master.

If a slave cannot communicate with the RTD Group Master then it will indicate a network timeout using LEDs 1 and 2, and the remote controller will be unlocked.

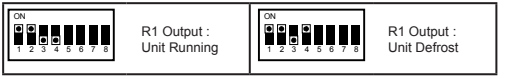
ERQ MODE



The RTD-20 ERQ mode gives a linear 0-10VDC heating and cooling capacity control of the ERQ condensers for air handling units. **If connected a wired Remote Controller must be configured as SUB mode Ⓢ to allow ERQ mode operation**.

Control over the system can either be by hard-wired physical contacts or via Modbus commands which enables full control via BMS without any additional wired contacts.

Relay Output R1 can be configured to indicate Unit Running state or Unit Defrost state. Relay Output R2 indicates unit fault condition.



Input	Name	Range (default)
S1	On/Off	**Open Circuit: Unit Off** Closed Circuit: Unit On
S2	Heat/Cool	**Open Circuit: Cooling Mode** Closed Circuit: Heating Mode
S3	Coil Demand	0-10VDC : 30% to 100% of Outdoor Unit capacity
S4	Pull-down mode enable (Cooling mode)	**Open Circuit: Disabled** Closed Circuit: Enabled
S5	External Mode Source	**Open Circuit: RTD Control on S2** Closed Circuit: Enable RC / ABC Control
S6	SPARE	

Output	Name	Operation
R1	Run/ Defrost	Unit Run (Selected by DIP SW4 Position) Defrost (Closed Circuit : Defrost)
R2	Fault	Closed on any unit fault

Unit On/Off (S1) Closed circuit for unit operation. Open circuit disables operation.

Heat/Cool Mode (S2) Open Circuit operates system in Cooling Mode. Closed Circuit operates system in Heating Mode.

Capacity Demand (S3) 0-10VDC signal varies the capacity from approximately 30% to 100% of Outdoor Unit capacity. At 0V the unit operates at minimum capacity, set S1 to Open Circuit to select 0% capacity.

Pull down mode (S4) If Closed Circuit this mode enables the unit to decrease it's minimum evaporating temperature in Cooling.

External Mode Source (S5) A Closed Circuit on S5 allows commissioning and service access via a temporarily connected BRC controller, and also by the use of the ABC Terminals of ERQ and VRV® Outdoor Units and BSVQ Unit.

MODBUS CONFIGURATION

Network	3 wire RS485
Mode	Modbus RTU Slave
Baud	9600*
Parity	None*
Stop bits	1
Register Base	0

**RTD interfaces can be configured with different baud rate and parity settings if required*

Modbus address range 0 to 15 set using SW1 (Figure 6). Further details of RTD Modbus engineering are available in the RTD-NET Installation Manual available from ***http://www.realtime-controls.co.uk/rtd .***

STAND-ALONE MODBUS SUPPORT

It is not possible to directly attach an external Modbus Master to the control network when an RTD-20 Retail Primary Shop Floor Zone is active because the RTD-20 Retail Primary is acting as a Network Master. In cases where no Retail Primary is installed, stand-alone Modbus operation is possible for VAM, Air-Curtain and ERQ modes.

If all functions are to be controlled via a Modbus enabled BMS then

the setting are changed by altering Holding Registers, as listed below. Holding Registers H8001 to H8006 correspond to inputs S1 to S6 and use a default scaling of x100 for all values. See previous sections on each mode for function details.

Standard unit readback data registers are also available, refer to the RTD-NET Installation Manual for details.

VAM MODBUS CONTROL

Note Input S2 must be wired for FIRE input.

Input	Name	Range (default)	
H0001	Setpoint	16..32	
H0005	OnOff	0..1 (0:Off, 1:On)	
		PIR Mode	CO2 Mode
H8001	VAM Fanspeed	**0 : No Activity** 100 : Activity Pulse	**<100 : OFF** 300 : Fan=LOW 600 : Fan=MEDIUM 900 : Fan=HIGH
H8004	VAM Damper	**0 : Auto Damper** 100 : Heat Recovery 200 : Bypass	
H8005	Fresh Air High Volume	**0 : Normal** 100 : HH Fan / Damper Bypass Mode	

AIR-CURTAIN MODBUS CONTROL

Holding Register	Name	Range (default)
H0002	Fanspeed	1..2 (1:Low, 2:High1) Standard Mode Only

H8001	Setpoint	**0: Remote Controller Setpoint Unlocked** value °C x 100 so 2500 = 25.00 °C Range 16.00..32.00°C (Remote Controlller Setpoint Locked, limits removed)
H8002	Auxilliary Space Temp	Signed value °C x 100, 0 = Sensor not present so 2500 = 25.00 °C
H8003	Outside Temp	Signed value °C x 100, 0 = Sensor not present so 2500 = 25.00 °C
H8004	Door Closed	**0 : Door Open** 100: Door Closed
H8005	On/Off	**0 : Unit Off** 100: Unit On
H8006	Commission	**0 : Normal** 100 : Commission Mode

ERQ MODBUS CONTROL

Holding Register	Name	Holding Register Value
H8001	On/Off	**0 : Unit Off** 100: Unit On
H8002	Heat/Cool	**0 : Cooling Mode** 100 : Heating Mode
H8003	Coil Demand	0 - 1000 : 30% to 100% capacity
H8004	Pull-down mode enable (Cooling mode	**0 : Disabled** 100 : Enabled