CDL
Cool Designs Ltd

Air Conditioning Design & Distribution

Pocket Quick Reference Guide On the TOSHIBA

Air to Air Heat Exchanger

VN-M#####HE/HE1

Cool Designs Ltd
Raising the Standards in Air Conditioning Distribution

Toshiba air conditioning
Air to Air Heat Exchangers the VN-M series.

This guide shows the general set-up procedures for the unit, associated controls and accessories.

Toshiba VN-M units are equipped with the TCC link controls logic, which allows the equipment to be controlled by a number of Toshiba control options currently available, i.e., standard control, one unit one remote via either the NRC-01HE, (dedicated remote for the air to air range), or via the RBC-AMS41-E (ON / OFF function and Schedule Timer ONLY) remote controller.

Units can be group controlled either specifically air to air, up to 8 units within a group, or air to air units can be incorporated into an air conditioning group.

The units can also be controlled via any of the Central control or BMS options.

In short, all the options available for standard Toshiba air conditioning equipment are also available for air to air products.

The range covers three variants.

1) **Standard air to air units with an Air Volume range from 150 m3/hr to 2000 m3/hr 9 products in total.**

2) **Air to Air with DX-Coil covering Fresh Air Loads of 4.10, 6.56- and 8.25-kW Cooling duty and Air Volumes of 500 m3/hr, 800 m3/hr and 950 m3/hr**

3) **Air to Air with DX-Coil and Humidifier, Fresh Air Loads of 4.10, 6.56 and 8.25kW Cooling duty, air volumes of 500 m3/hr, 800 m3/hr and 950 m3/hr, plus a Permeable Film Humidifier of 3, 5 and 6 kg/hr.**

4) **Dedicated remote controller, RBC-NRC01HE.**

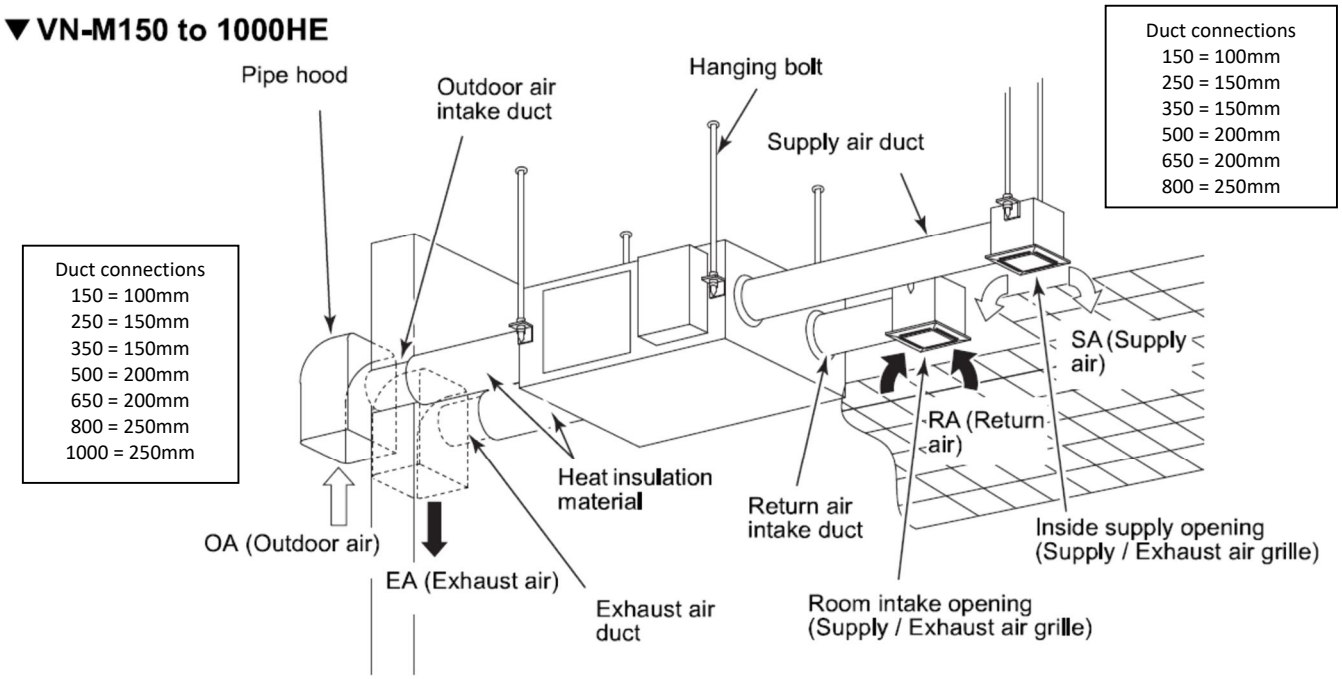
5) **Ancillary Pre-Heaters #kW, ##kW, ###kW (RBC-VNMH1, 2, 3, 4.)**

6) **Pre-Heater Control. (RBC-VNMC).**

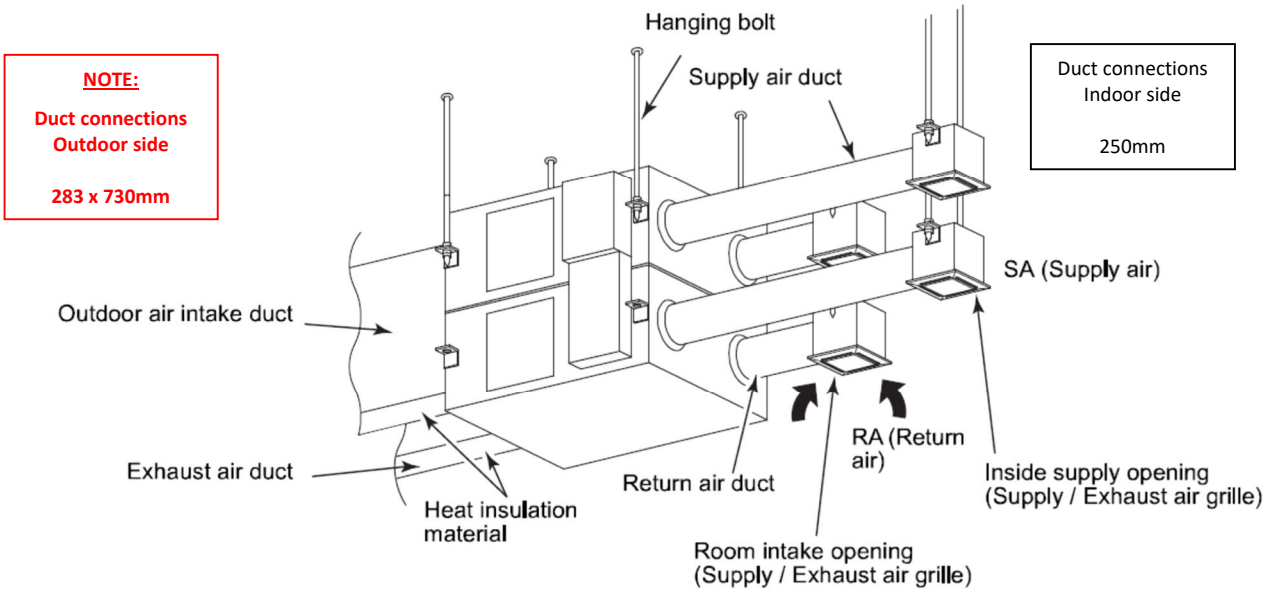
7) **Remote Interface (RBC-VNL1).**

Installation.

▼ VN-M150 to 1000HE



▼ VN-M 1500 and 2000HE1



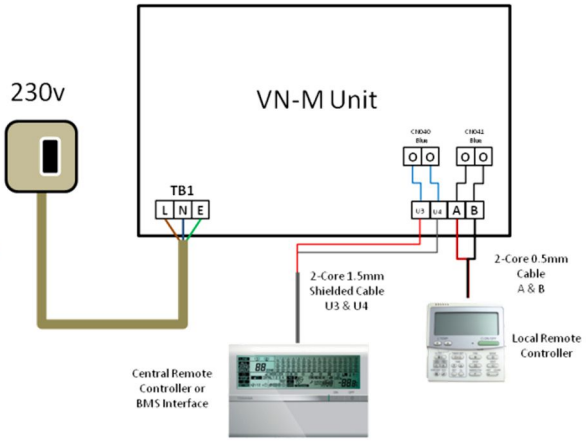
Wiring.

Standard.

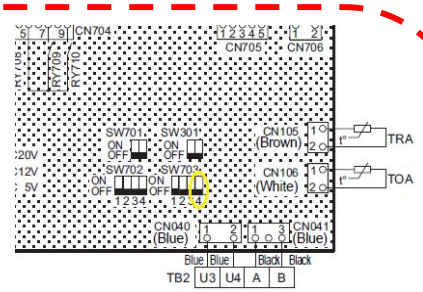
A 10-amp, 230-volt power supply is applied to terminals L, N & E (Without heater kit.)

Local controllers are connected to terminals A & B

Central controllers / BMS gateways are connected to terminals U3 & U4



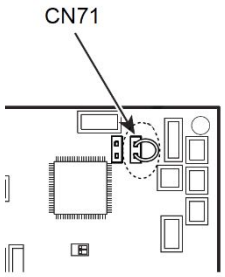
When being used as an Individual unit, either via a Local Remote or a Central Remote/BMS "bit" switch SW703 bit 4 must be turned to the ON position, factory default is OFF. * HE models ONLY*



Slightly different set-up for the HE1 models.

When being used as an individual unit, either via a Local Remote or a Central Remote/BMS "Link CN71" (White Plug) must be "Unplugged" from the PCB.

Factory default is link plugged in.

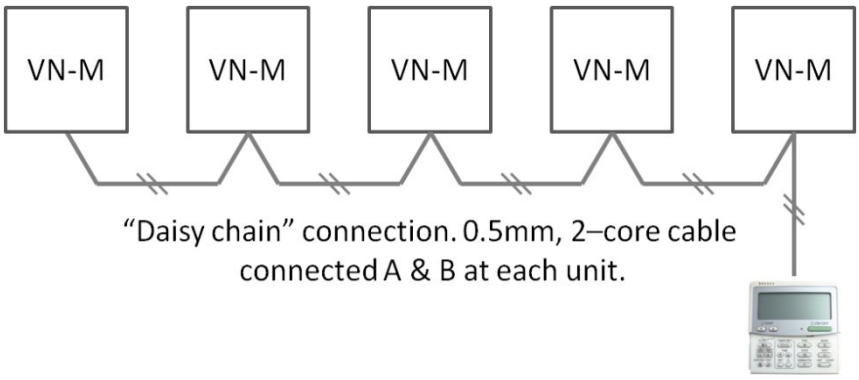


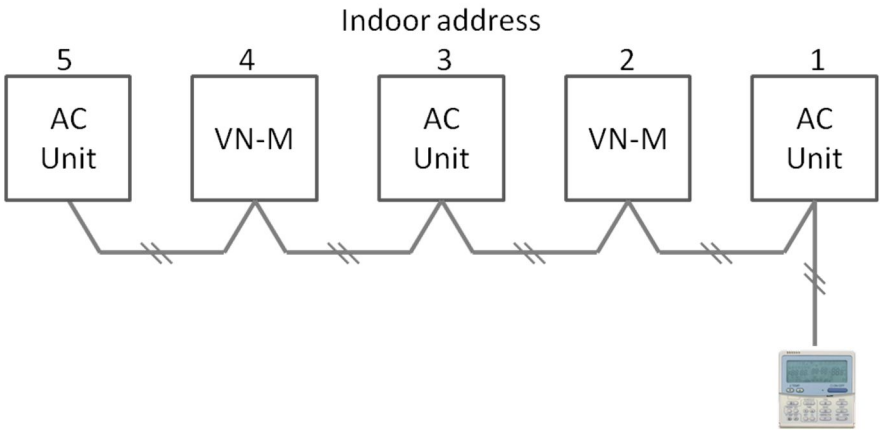
Group Configuration.

Up to 8 units can be group controlled.

Using a 2-core 0.5mm cable

Connected to terminals A & B at each unit within the group.



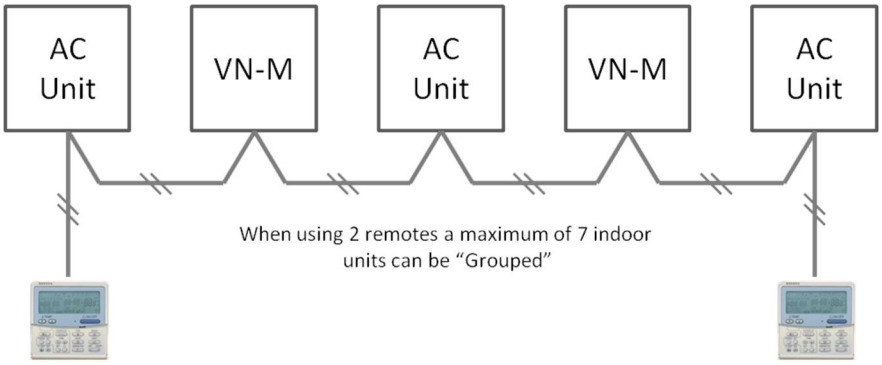


A “group” can comprise of up to 8 units of any combination, RAV, VRF, VN-M indoor units.

Wiring is the same as above.

When a “group” is controlled via two remote controllers, the quantity of units drops to a maximum of 7.

Wiring is the same as above.



Electrical “Dip Switches” and their purpose HE Models

There are 4 “Banks of “Dip Switches. Two banks of two and two banks of four.

SW301 - “Terminal – End of Line” resister. ON = 100Ω. **OFF = None**

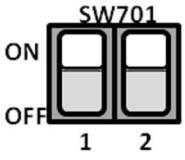
SW701 – Pulse/Static ON = Pulse. **OFF = Static**.

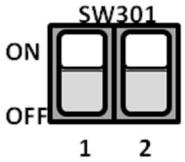
SW702 – (1 to 4) Indoor unit address. (See chart)

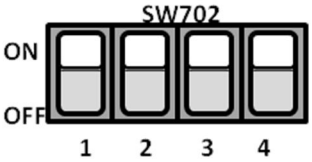
SW703 – (1 to 2) Indoor unit address.
(Factory default ALL OFF indoor address No 1.)
(3) Central controller address. ON = Fix, **OFF = Auto**

When multiple units are “grouped” to a single central address, set this switch to **ON**

(4) ON = Header (Individual) **OFF = Follower**
(Factory default follower)







Indoor unit address switch (●: ON —: OFF)

Address	Address switch number SW702				SW703		Address	Address switch number SW702				SW703		Address	Address switch number SW702				SW703		Address	Address switch number SW702				SW703	
	1	2	3	4	1	2		1	2	3	4	1	2		1	2	3	4	1	2		1	2	3	4	1	2
1	—	—	—	—	—	—	17	—	—	—	—	●	—	33	—	—	—	—	—	●	49	—	—	—	—	●	●
2	●	—	—	—	—	—	18	●	—	—	—	●	—	34	●	—	—	—	—	●	50	●	—	—	—	●	●
3	—	●	—	—	—	—	19	—	●	—	—	●	—	35	—	●	—	—	—	●	51	—	●	—	—	●	●
4	●	●	—	—	—	—	20	●	●	—	—	●	—	36	●	●	—	—	—	●	52	●	●	—	—	●	●
5	—	—	●	—	—	—	21	—	—	●	—	●	—	37	—	—	●	—	—	●	53	—	—	●	—	●	●
6	●	—	●	—	—	—	22	●	—	●	—	●	—	38	●	—	●	—	—	●	54	●	—	●	—	●	●
7	—	●	●	—	—	—	23	—	●	●	—	●	—	39	—	●	●	—	—	●	55	—	●	●	—	●	●
8	●	●	●	—	—	—	24	●	●	●	—	●	—	40	●	●	●	—	—	●	56	●	●	●	—	●	●
9	—	—	—	●	—	—	25	—	—	—	●	●	—	41	—	—	—	●	—	●	57	—	—	—	●	●	●
10	●	—	—	●	—	—	26	●	—	—	●	●	—	42	●	—	—	●	—	●	58	●	—	—	●	●	●
11	—	●	—	●	—	—	27	—	●	—	●	●	—	43	—	●	—	●	—	●	59	—	●	—	●	●	●
12	●	●	—	●	—	—	28	●	●	—	●	●	—	44	●	●	—	●	—	●	60	●	●	—	●	●	●
13	—	—	●	●	—	—	29	—	—	●	●	●	—	45	—	—	●	●	—	●	61	—	—	●	●	●	●
14	●	—	●	●	—	—	30	●	—	●	●	●	—	46	●	—	●	●	—	●	62	●	—	●	●	●	●
15	—	●	●	●	—	—	31	—	●	●	●	●	—	47	—	●	●	●	—	●	63	—	●	●	●	●	●
16	●	●	●	●	—	—	32	●	●	●	●	●	—	48	●	●	●	●	—	●	64	●	●	●	●	●	●

VN-M units' default to system number 31, this cannot be adjusted

When a VN-M (HE models) is connected to a central remote device the unit requires a unique address, on the HE models this is achieved via the bit switches listed above, each unit or group of units requires a number between 1 to 64, duplicate numbers are **NOT** acceptable.

On the VN-M (HE1 models) central control addressing is achieved via the "**DN Code – 03**", using the RBC-NRC01, press and hold, for 4 seconds or more, "**TEST, SET and CL**", the controller will display the number "10" on the right-hand display, using the "**TEMP UP/DOWN** buttons" scroll the "10 to 03".

Change the left-hand display using the "**TIME UP/DOWN** buttons" to a unique number between "1 to 64", once this is displayed on the left-hand display, press "**SET**" then press "**TEST**".

For more details how to set the "**DN Codes**" please refer to either the "Pocket Guide for RBC-AMS32-41" or Pocket Guide AMS 51-54-55E-ES", copies available form our web site www.cdlweb.info.

Examples HE Models

Single VN-M unit with local remote.

SW301 – (1 & 2) = OFF

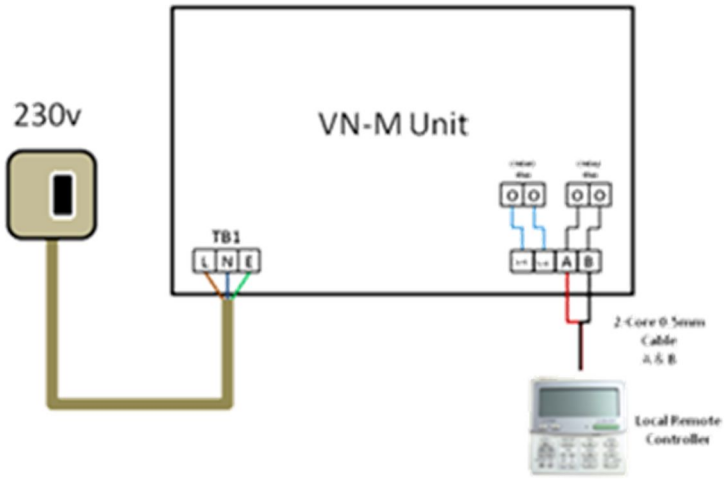
SW701 – (1 & 2) = OFF

SW702 – (1 to 4) = OFF

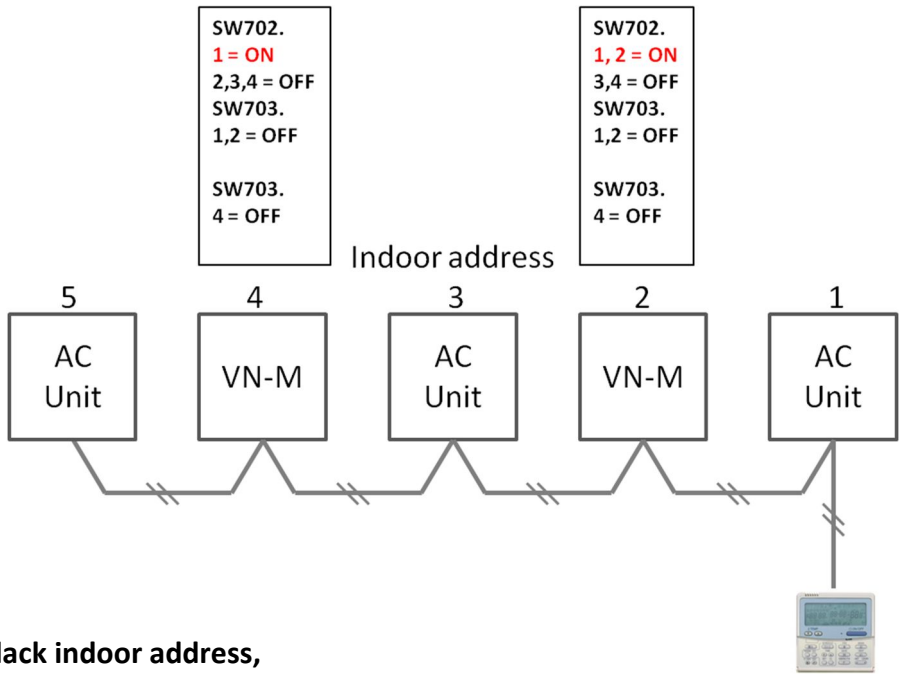
SW703 – (1 to 2) = OFF

SW703 – (3) = OFF

SW703 – (4) = ON



Multiple units within a group.



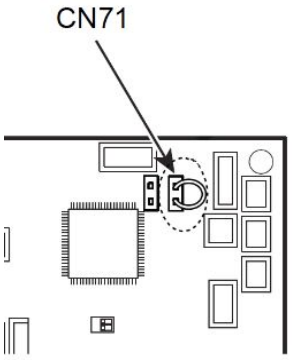
Controller would display.

1 – 1, 31 – 2, 1 – 3, 31 – 4, 1 – 5

Red = System (i.e. Outdoor unit), Black indoor address,

HE1 Models VN-M1000/1500/2000HE1.

HE1 models do not have the same “Dip Switches”, however configuration is very similar to a standard Toshiba split system.



On the “Header Unit” the “CN71” link needs removing.

The “CN71” link remains in position on follower units.

Configuration is generally automatic, with “CN71” link removed on the header, apply power to the units within the “Group”, addressing will be carried out automatically.

If manual addressing is required.

Using the RBC-NRC01HE remote controller, with power on.

Press and HOLD, for 4 seconds; **"TEST, SET and CL".**

The controller will display "10" on the right-hand display.

Using the **Temp up/down** buttons, scroll **10** to **13**.

Change the left-hand display using the "**Time**" Up/down buttons

Selecting a unique number between 1 (Header) – 64 (Follower), Groups can comprise of up to 8 units.

Press "**SET**" then Press "**TEST**"

When you press the "**Unit**" button the middle window will Display, the system number, always fixed at 31, and the indoor unit number between 1 to 64, pressing the "**Unit**" button again will display the next unit in the group, 31 – 2 etc.

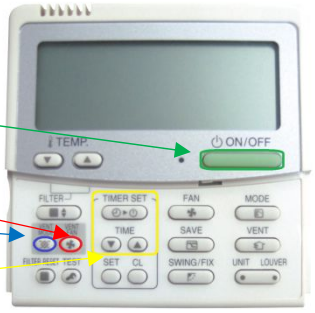
Control options and the functions associated with them.

RBC-NRC01HE – Standard VNM remote controller, available functions;

ON / OFF

Fan Speed (High – Low)

Ventilation mode,
(Automatic, Heat Exchanger, Bypass.)



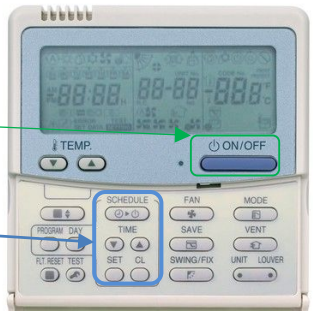
Timer (OFF, Repeat OFF, ON timer, 168 hours in ½ hr increments NOT clock based, NO day omit available. "Sleep Timer ONLY")

This controller can also be used to control standard air conditioning units along with VNM units either singular or within a group of units, remaining functions are available for standard air conditioning units, were

RBC-AMS41E – Enhanced remote, when used with VNM units the following functions are available;

ON / OFF

Scheduled Timer (7 Day Time Switch)
Clock based, with day omit.



The following remote controllers are not suitable for connecting on a "One to One" basis.

RBC-AMS51/54/55

RBC-AMT32

RBC-AS21/41

Infra-Red

Accessories

Accessories.

RBC-VNL1 VN-M Unit Interface Lead, HE models ONLY

The lead will allow the VN-M unit to be controlled from volt free contact closures. Separate contacts are required for on/off, remote controller lock, increased fan speed and damper position.

Installation

The interface lead must be plugged into the, CN705 on the main PCB

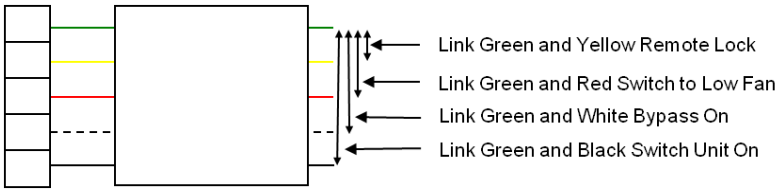
If the lead is used with a remote controller it will operate in last one touched mode. If the VN-M units are grouped the lead can be connected to any VN-M unit in the group. Please see Installation manual supplied with the VN-M unit for details.

When connected to the HE models, VN-M150, 250, 350, 500, 650 & 800HE

Remove the screws to expose the PCB pass the Interface cable from the Electrical box out through the provided bushes. Connect the ring crimp terminal to the provided earth screw inside the electrical box.

Ensure the VN-M unit is set to static input SW701 bit Sw1 OFF (This is set at unit shipment from the factory).

The links between the common (Green Cable) and the selected input are to be connected to a volt free contact.



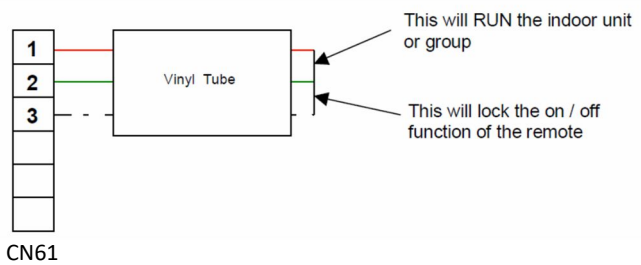
RBC-CN61 VN-M Unit Interface Lead, HE1 models ONLY

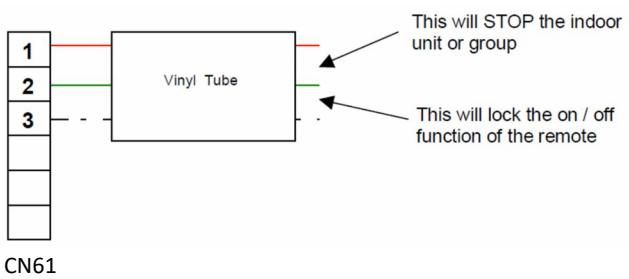
The lead will allow the VN-M unit to be controlled from volt free contact closures, for remote on/off, also to “Lock” the on/off function of the local remote controller.

Installation

The interface lead must be plugged into the, CN61 on the main (A) PCB

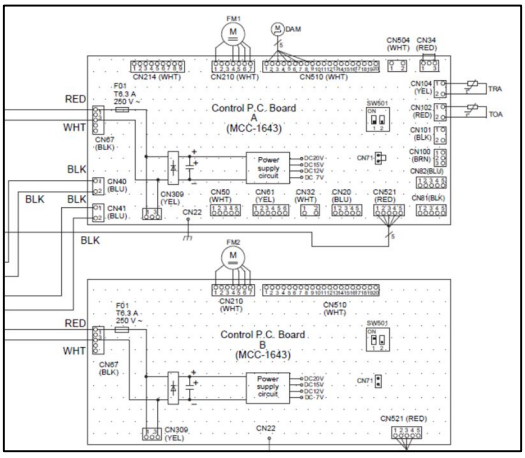
If the lead is used with a remote controller it will operate in last one touched mode. If the VN-M units are grouped the lead can be connected to any VN-M unit in the group. Please see Installation manual supplied with the VN-M unit for details.

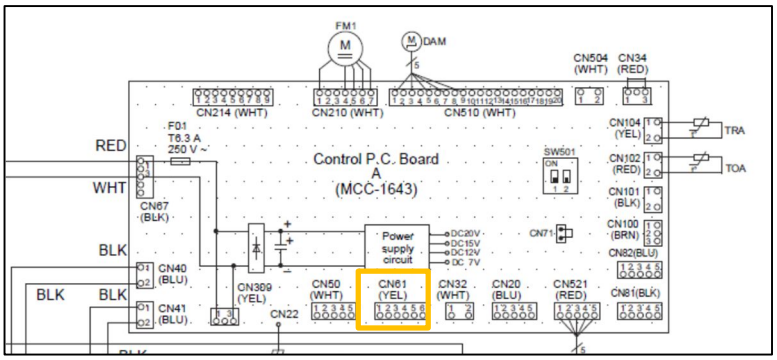




When connected to the HE1 models, VN-M1000, 1500 & 2000HE1

This must be connected to the CN61 socket on “Control PCB – A, (MCC-1643), there are two “Control PCB’s the “A” board has the temperature sensors connected to it.



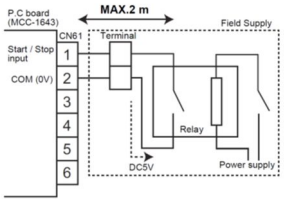


Additional functions are available when using an **RBC-SMIM4** interface, this will allow remote ON/OFF via volt free contacts, plus the ability to “Lock” the on/off function of the local remote controller.
In addition, it provides the facility for an “Operation Signal” – via a volt free contact, and a “Abnormal Signal – Fault Signal” – Via a second volt free contact.

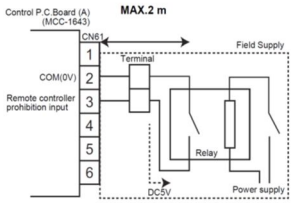
The functions available are;

Connector No.	Pin No.	Function	Note
CN61	1	Start / Stop input	Start/Stop input (pulse/static input changed by J01 Connect / Cut = Pulse input / Static input)
	2	COM (0V)	-
	3	Remote controller prohibition input	Remote controller prohibition input
	4	Operation signal output	Connecting an auxiliary fan or monitoring operation output
	5	12V	-
	6	Abnormal signal output	Monitoring an abnormal signal

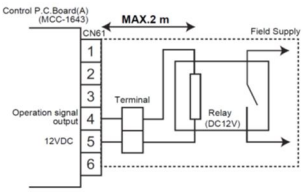
1 Start / Stop input



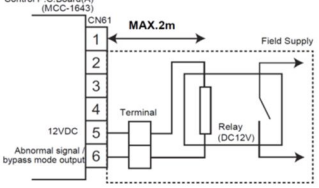
2 Remote controller prohibition input



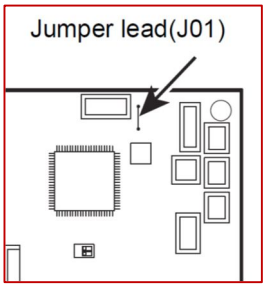
3 Operation signal output
Connecting an auxiliary fan or monitoring operation output



4 Abnormal signal / bypass mode output
Monitoring an abnormal signal or the operation signal of bypass mode.



Note: The jumper lead on the “Control PCB – A” requires cutting.

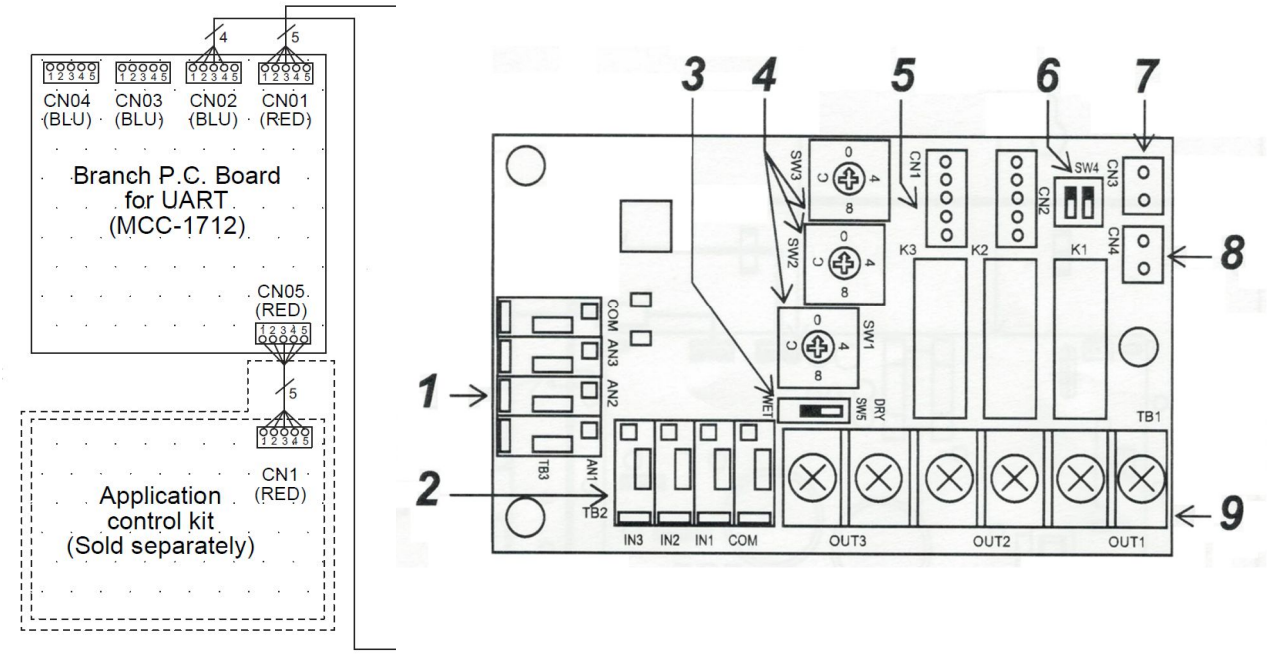


Application Kit TCB-PCUC2E

Additional external control functions are available for the VNM-####HE1 models via Toshiba's Application Control Kit, TCB-PCUC2E.

TCB-PCUC2-E is a multipurpose Application Board which can be utilised for a wide range of external inputs or Outputs.

The application board is mounted adjacent to the original factory fitted PCB's and connects via CN05 (Red) on the "Branch PCB – MCC-1712)



Component layout of TCB-PCUC2E is;

1) External analogue input terminals (**TB3**) Change air flow, operation mode, temperature settings depending on resistance value from 0 to 140 ohms.
2) External digital input terminals (**TB2**) External error input.
3) External digital input, Voltage ON, No Voltage OFF
4) Signal Output switch, (Default 0)
5) Connector to connect to indoor PCB, **CN01** Application board, **CN05** Branch PCB.
6) Function select (**SW4**) – (Default OFF.
7) Filter connection (**CN3**)
8) EXCT connector (**CN4**), Can thermo off by shorting connection. (Plug supplied with kit.
9) Signal output terminals (**TB1**)

Examples of use;

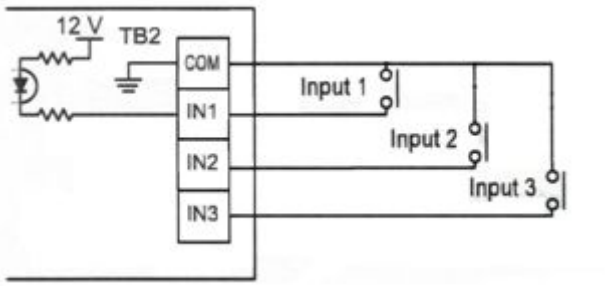


Fig 1

Fig 1 - Voltage OFF Input

Set input switch (**SW5**) to the voltage OFF – Dry setting. (Default Voltage OFF.)
Use micro-contacts of minimum application loads of 12 VDC 1 mA or LESS.

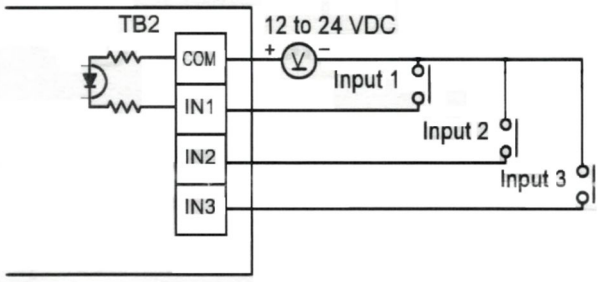


Fig 2

Fig 2 – Voltage ON Input

Set input switch (**SW5**) to the voltage ON – Wet setting. (Default Voltage OFF.)
Use 12 to 24 VDC for external power source. Approx. 10 mA input current is required for each contact.
Com terminal is +

Wire specification, 1.25 to 2mm maximum cable length 70m.

External analogue inputs are available via **TB3**.
Functions available.
Operation mode (**AN1**), 30 to 120 ohms.
Set Temperature) **AN2**), 10 to 140 ohms.
Fan Speed (**AN3**), 30 to 120 ohms.

- Some functions are model specific.

Pre-Heater ONLY.

There are two control panels VNMC for VN-M####HE models and VNMC9HE1) for VN-M####HE1 models, there are also four heater kit options available.

Model	Heater Size	Duct Diameter (mm)	VN Model
VNMC	Control Panel	N/A	VNM####HE
VNMC(HE1)	Control Panel	N/A	VNM####HE1
RBC-VNMH1	1 X 1 kW Heater	100	VN-M150HE
RBC-VNMH2	1 x 1kW Heater	150	VN-M2550HE & VN-M350HE
RBC-VNMH3	2 x 1 kW Heater	200	VN-M500HE & VN-M650HE
RBC-VNMH4	2 x 1kW Heater	250	VN-M800HE & VN-M1000HE(HE1)

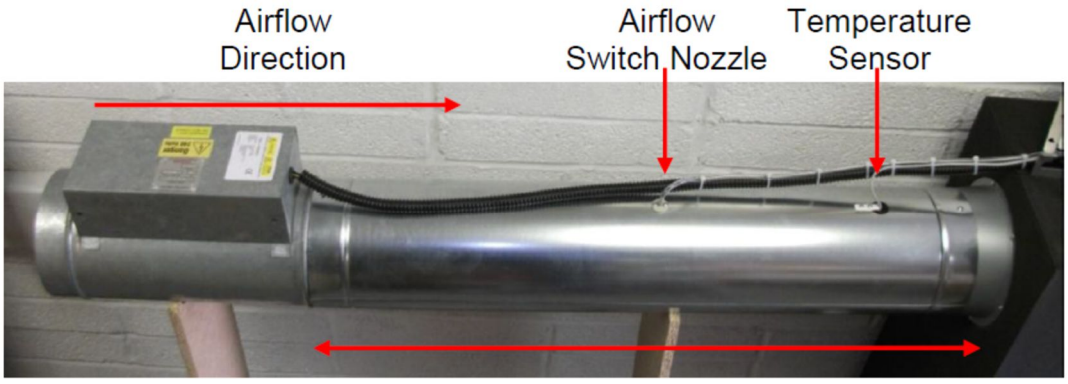
Currently there are NO Pre-Heater kits available for the VN-M1500HE1 or the VN-M2000HE1 units.

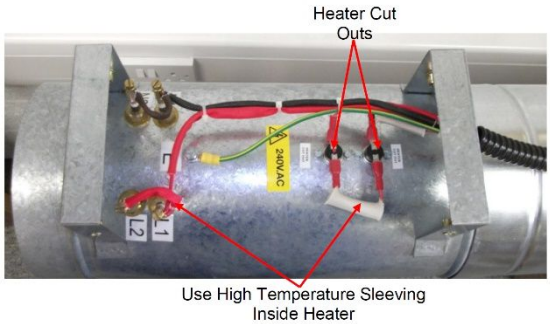
Each heater option requires a controller (RBC-VNMC(HE1)). The heater will only operate when the temperature of the air in the duct is below the pre-set value.

The controller will also provide a run on when the unit stops

The controller is class 1 and MUST be earthed.

General Layout.

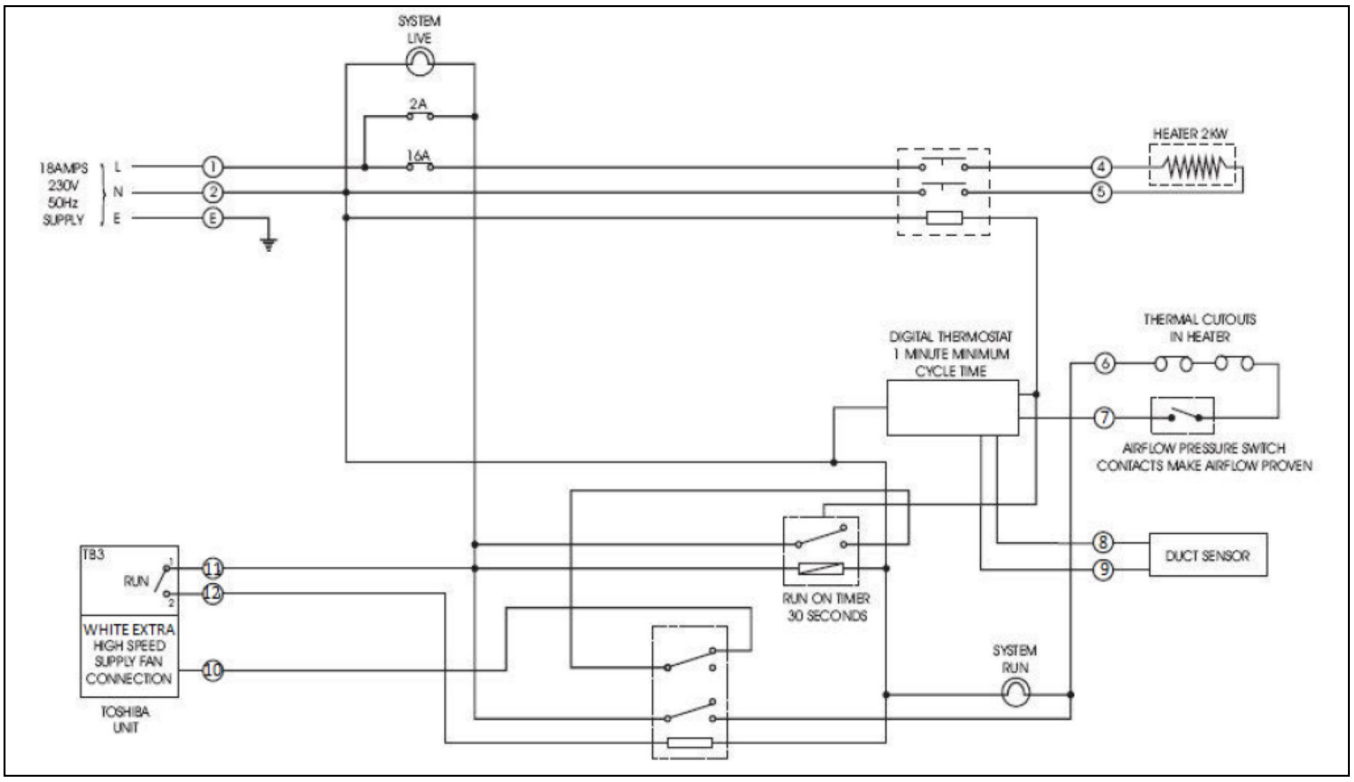




For 2kW heaters link L1-L2 (Live) and N1-N2 (Neutral)
For 1kW heaters connect to L1 (Live) and N1 (Neutral)

Wiring.

THE HEATER CONTROLLER AND THE HEAT EXCHANGE UNIT MUST BE SUPPLIED FROM THE SAME PHASE AND SUPPLY

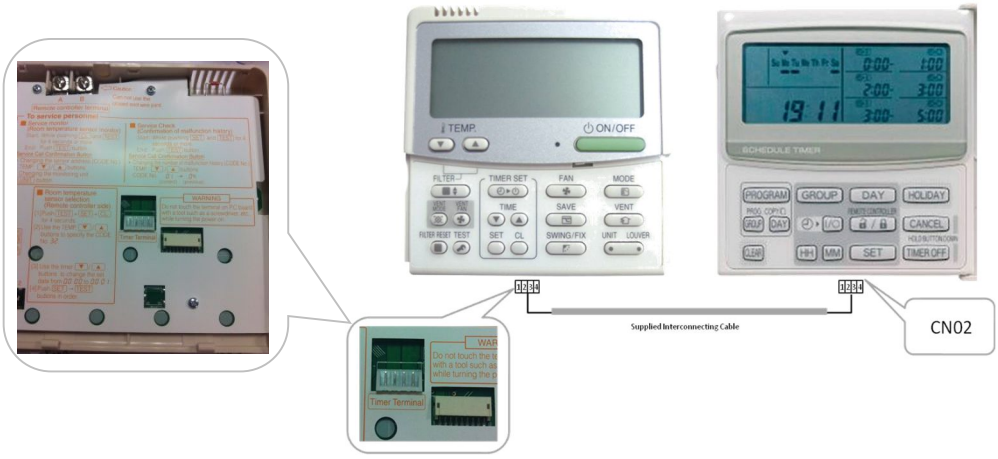


For full technical details please refer to the relevant manuals available for this product.

Time Switch Control

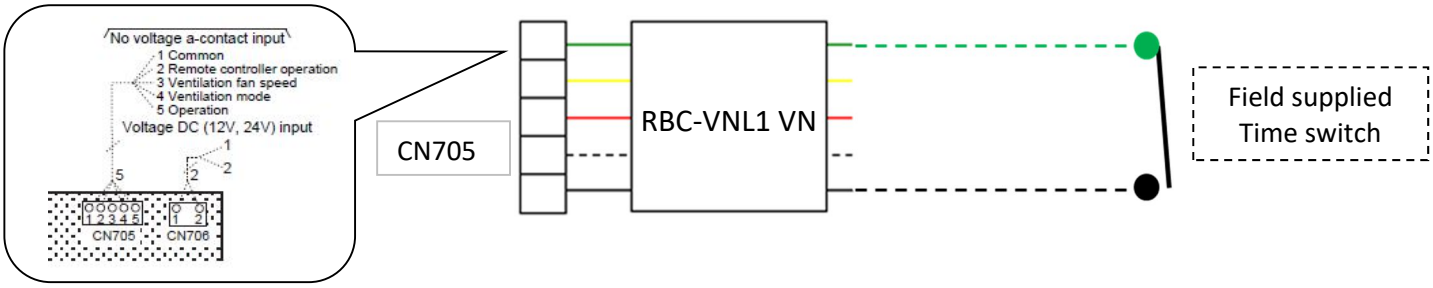
There are a number of options available for time switch control.

Option 1) TCB-EXS21TLE 7-day weekly / schedule timer complete with day omit, used in conjunction with the RBC-NRC01HE remote controller, HE and HE1 models

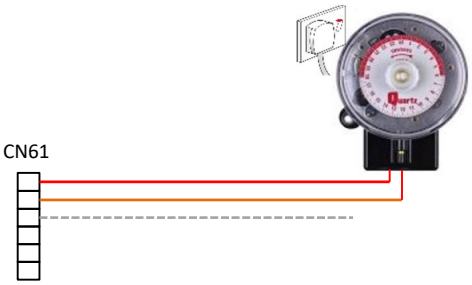


Option 2) RBC-SMT1 timer interface lead, connects in the rear of the RBC-NRC01HE via the CN02 connector and provides an external volt free switching circuit, for connection to a third-party timer, **HE and HE1 models**

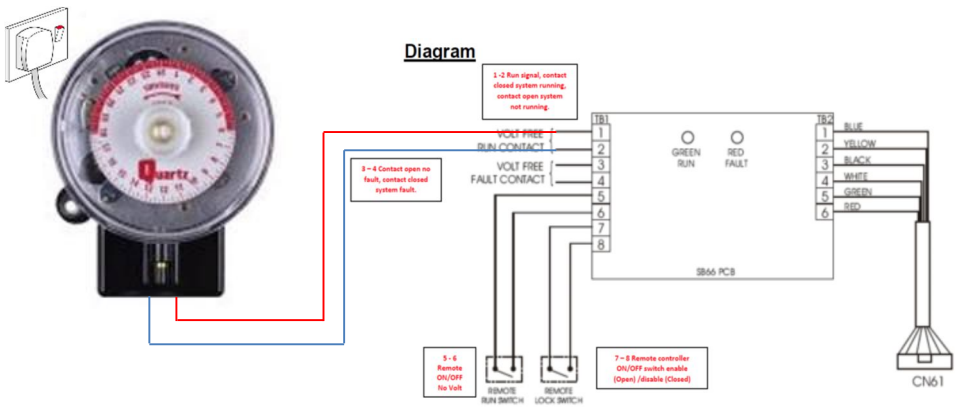
Option 3) RBC-VNL1 VN Unit Interface Lead, electrical details available within this publication, **HE models ONLY.**



Option 4) RBC-CN61 VN Unit Interface Lead, electrical details available within this publication, **HE1 models ONLY.**



Option **5**) RBC-**SMIM4**, electrical details available within this publication, **HE1 models ONLY**



Advanced Functions

There are a number of advanced facility / functions which are available, configuration of these facilities/functions is carried out via the RBC-NRC01 local remote controller.

The facilities/functions available are;

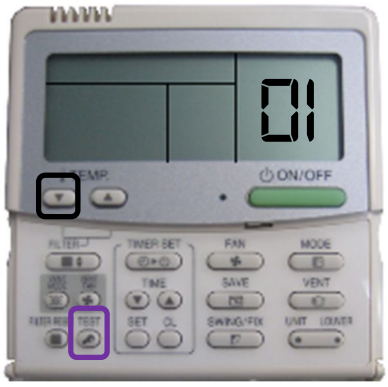
Code	Description	SET DATA and description	Factory default	Note
01	Lighting-up hours of the Filter Sign	0000: None 0001: 150 H 0002: 2500 H 0003: 5000 H 0004: 10000 H	0002: 2500 H	Adjusting this setting is necessary for the header unit.
28	Auto recovery from a power failure	0000: Invalid 0001: Valid * Resumes the status just before the power failure	0000: Invalid	*1
31	Single operation of the fan	0000: Invalid 0001: Valid ON/OFF operation for the Air to Air Heat Exchanger only	0000: Invalid	Adjusting this setting is necessary for the header unit. (System equipped with the Air to Air Heat Exchanger and air conditioners)
48	Imbalanced Fan speed ventilation	0000: Normal 0001: SA (High) > EA (Low) active 0002: SA (Low) < EA (High) active * "High" may be "Extra High".	0000: Normal	Adjusting this setting is necessary for all the Air to Air Heat Exchangers in the group.
49	24-hour ventilation	0001: Invalid 0002: Valid	0001: Invalid	Adjusting this setting is necessary for all the Air to Air Heat Exchangers in the group.
4B	Delayed operation	0000: Invalid 0001-0006: [Setting value] x 10 minutes delay * Delaying the Air to Air Heat Exchanger operation to reduce the air-conditioning load when starting running the air conditioner	0000: Invalid	Adjusting this setting is necessary for all the Air to Air Heat Exchangers in the group. (System equipped with the Air to Air Heat Exchanger and air conditioners)
4C	Nighttime heat purge	0000: Invalid 0001-0048: Start after [Setting value] x 1 hour(s) * Setting for the time before the nighttime heat purge operation starts	0000: Nighttime heat purge OFF	Adjusting this setting is necessary for all the Air to Air Heat Exchangers in the group. (System equipped with the Air to Air Heat Exchanger and air conditioners)
4D	Setting of the exhausting fan operation below −15 °C (OA)	0000: Exhausting fan run 0001: Exhausting fan stop * The supplying fan stops when the temperature is below −15 °C. (OA)	0000: Exhausting fan run	Adjusting this setting is necessary for all the Air to Air Heat Exchangers in the group.
4E	Setting of the linked operation with external devices	0000: ON/OFF linked 0001: ON linked 0002: OFF linked * Specifies whether the ON/OFF operation of the Air to Air Heat Exchanger is linked with the external device operation	0000: ON/OFF linked	Adjusting this setting is necessary for a Air to Air Heat Exchanger to which an adapter for remote ON/OFF control (sold separately) is connected.
EA	Changing the ventilation mode	0001: Bypass mode 0002: Heat Exchange mode 0003: Automatic mode * Compatible with systems without a remote controller and RBC-AMT32E	0003: Automatic mode	*1
EB	Changing the ventilation Fan speed	0002: High 0003: Low 0004: Imbalanced * "High" may be "Extra High". * Compatible with systems without a remote controller and RBC-AMT32E	0002: High	*1

Code	Description	SET DATA and description	Factory default	Note
ED	Changing the operation output	0000: ON during normal operation 0001: ON during normal operation, 24-hour ventilation, or nighttime heat purge operation 0002: ON during 24-hour ventilation or nighttime heat purge operation 0003: ON when SA fan is running 0004: ON when EA fan is running	0000: ON during normal operation	Adjusting this setting is necessary for a Air to Air Heat Exchanger which transfers the operation output.
EE	Changing the abnormal signal / Bypass mode signal output	0000: ON when an abnormal signal is detected 0001: ON when the Bypass mode signal is detected	0000: ON when an abnormal signal is detected	Adjusting this setting is necessary for a Air to Air Heat Exchanger which transfers the operation output.

How to access the advanced facilities/functions, via an RBC-NRC01 remote controller.

1) Press "**TEST**" and the "**TEMP - DOWN** "button together and hold for 4 seconds.

   After a short delay the display will show "01" on the right-hand side.



2) Using the "**TEMP UP/DOWN**" buttons scroll through to the code you require, this will be displayed on the right-hand side of the display.

3) If you wish to change the "Data – Displayed on the left-hand side of the display" use the "**TIME – UP/DOWN**" buttons.
4) Once you have the required data on the left-hand display, Press "**SET**".
5) If there are a number of units controlled via the same controller and you wish to change their "Data" then press the "**UNIT**" button, the middle window will change and the new indoor unit's reference will be displayed, (31-1 to 31-2 etc.) repeat step 3 above.
6) If you wish to change additional "Codes" Repeat steps 2 to 4 above.
7) Once all the required "Codes" have been set then press "**TEST**", this will lock in the new data.
8) The controllers display will show "Setting" flashing, then the display will clear and the system enters normal operation mode.

NOTES:

Contact details:

Cool Designs Ltd Technical Support

07590 775510 / 07706 293028

Monday – Friday 07.30 to 19.30

Email: support@cooldesignsltd.co.uk

Web site: www.cdlweb.info

Toshiba Air Conditioning

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