

# Daikin HVAC Controls Guide Specification

## VARIABLE REFRIGERANT VOLUME (VRV) HVAC SYSTEM Advanced Multi-zone Controller

### Part 1 - General

#### 1.01. Physical characteristics

##### A. General:

The advanced multi-zone controller shall be made from plastic materials with a neutral color. Each control shall have a LCD (Liquid Crystal Display) that shows On/Off, setpoint, room temperature, mode of operation (Cool/Heat/Dry/Fan/Auto), louver position, and fan speed.

#### 1.02. Electrical characteristics

##### A. General:

The advanced multi-zone controller will require 24 VAC to power the controller. The advanced multi-zone controller shall supply 16 VDC to the communication bus on the F1F2 (out-out) terminal of the outdoor unit. The voltage may rise or fall in relation to the transmission packets that are sent and received.

##### B. Wiring:

The advanced multi-zone controller communication wiring shall be terminated in a daisy chain design at the outdoor unit, which is then daisy chained to branch selector (Heat Recovery system), then daisy chained to each indoor unit in the system and terminating at the farthest indoor unit. The termination of the wiring shall be non-polar. The remote control wiring shall run from the indoor unit control terminal block to the remote controller connected with that indoor unit.

##### C. Wiring size:

Wiring shall be non-shielded, 2-conductor sheathed vinyl cord or cable, and 18 AWG stranded copper wire.

#### 1.03. VRV Controls Network

The VRV Controls Network is made up of local remote controllers, multi-zone controllers, advanced multi-zone controllers, and open protocol network devices that transmit information via the communication bus. The VRV Controls Network shall also have the ability to be accessed via a networked PC. The VRV Controls Network supports operation monitoring, scheduling, error e-mail distribution, general user software, tenant billing, maintenance support, and integration with Building Management Systems (BMS) using open protocol via BACnet<sup>®</sup> or Lonworks<sup>®</sup> interfaces; all of

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which blend to provide the optimal control strategy for the best HVAC comfort solution.

## Part 2 - Products

### 2.01. Advanced Multi-zone Controllers

The Daikin AC VRV advanced multi-zone controllers are compatible with all VRV, SkyAir, and Daikin RA and FTXS indoor units with the use of the KRP928BB2S RA Adapter. The advanced multi-zone controller wiring consist of a non-polar two-wire connection to the outdoor unit. The advanced multi-zone controllers may be wall-mounted and can be adjusted to maintain the optimal operation of up to 64 connected indoor unit groups and 128 indoor units. Set temperatures can be adjusted in increments of 1°F. In the cases where a system or unit error may occur, the VRV controllers will display a two-digit error code and the unit address.

#### **A. DCM601A71: intelligent Touch Manager (iTM) V. 2.0**

The intelligent Touch Manager (version 2.0) shall provide control for all VRV, SkyAir, and Daikin RA and FTXS indoor units with the use of the KRP928BB2S RA Adapter. It shall be capable of controlling a maximum of 64 indoor unit groups and 128 indoor units connected to a maximum of 10 outdoor units. The intelligent Touch Manager shall support operations superseding that of the local remote controller, system configuration, daily/weekly scheduling, monitoring of operation status, and malfunction monitoring.

The controller wiring shall consist of a non-polar two-wire connection to the indoor unit at terminals F1F2 (out-out) of the outdoor unit. The intelligent Touch Manager is wall mounted and can be adjusted to maintain the optimal operation of the connected indoor unit(s).

The intelligent Touch Manager can be used in conjunction with the BRC1E71/72 (Navigation Remote Controller), the BRC2A71 (Simplified Remote Controller), or the BRC4C82/7E83/7C812/7E818 (Wireless Remote Controller), BACnet, and Lonworks interfaces to control the same indoor unit groups. The remote controller shall require daisy chain wiring for grouping multiple indoor units (up to 16) together. Manual addressing is required of each remote controller group associated with the intelligent Touch Manager. DIII-NET address can be set for one (1) indoor unit or each indoor unit in the remote controller group. No more than 2 remote controllers can be placed in the same group.

The intelligent Touch Manager shall be equipped with two RJ-45 Ethernet ports for 100 Mbps network communication to support interconnection with a network PC via the Internet, Local Area Network (LAN), or connection with a non-networked PC after completed installation.

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Web access functions shall be available so that facility staff can securely log into each Intelligent Touch Manager via the PC's web browser to support monitoring, scheduling, error recognition, and general user functions. Error emails are also sent to designated email addresses. An additional optional software function Power Proportional Distribution (PPD) tenant billing shall also be available. The optional software shall require advanced purchase and can only be activated upon receipt of a license activation key from Daikin AC.

1. Mounting:
  - The intelligent Touch Manager shall be mounted on the wall or into the mounting fixtures included with the intelligent Touch Manager.
  
2. Display Features:
  - a. The intelligent Touch Manager shall be approximately 11.42" x 9.57" x 1.97' in size with a backlit 10.4" LCD display.
  - b. Display information shall be selectable from English, French, Italian, Korean, Dutch, Portuguese, Chinese, Japanese, German, or Spanish.
  - c. Featured backlit LCD with auto off after 30 minutes (default) is adjustable between 1 to 60 minutes, or the choice of 3 different screen savers.
  - d. Area and Group configuration
    - 1) Area contains one (1) or more Area(s) or Group(s)
    - 2) A Group may be an indoor unit, Di, Dio point that has a DIII-NET address
    - 3) A Group may be an external management point such as a Di, Do, Ai, or Ao that does not have a DIII-NET address
  - e. An Area is a tiered group where management points (indoor unit, digital input/output, and analog input/output groups) can be monitored and controlled by global settings. Up to 650 Areas can be created. Area hierarchy can have up to 10 tiered levels (ex. top level: 1<sup>st</sup> floor West, 2<sup>nd</sup> level: offices, hallways, 3<sup>rd</sup> level: Office 101, 102, and 103, etc.). Area configuration shall classify levels of monitoring and control for each management point
    - 1) Areas and Groups may be assigned names (ex. Office 101, Lobby, North Hallway, etc.)
  - f. The Controller shall display On/Off, Operation Mode, Setpoint, Space Temperature, Louver Position, Fan Speed for each Area or Group.
  - g. The Controller shall display Date (mm/dd/yyyy, yyyy/mm/dd, or dd/mm/yyyy format selectable) and day of the week along with the time of day (12hr or 24hr display selectable).
  - h. The Controller shall adjust for daylight savings time (DST) automatically.
  - i. Display information shall be updated every 3 seconds to show the latest status of the indoor unit groups.

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- j. System status icons shall display On/Off (color coded), Malfunction/Error (color coded), Forced Stop, Setback, Filter, Maintenance, and Screen Lock.
  - k. The controller shall display the temperature setpoint in one degree increments with a range of 60°F – 90°F, 1°F basis (16°C – 32°C, 0.1°C basis).
    - 1) Display of temperature setpoint information shall be configurable for Fahrenheit or Celsius
  - l. Display shall reflect room temperature in one tenth degree increments with a range of -58°F – 248°F, 0.1°F basis (-50°C – 120°C, 0.1°C basis) with 0.1°C accuracy.
    - 1) Display of room temperature information shall be configurable for Fahrenheit or Celsius
  - m. The Menu List shall be used to configure options and display information for each Area or Group.
  - n. Error status shall be displayed in the event of system abnormality/error with one of three color coded icons placed over the indoor unit icon or lower task bar.
    - 1) System errors are generated when the intelligent Touch Manager system with other VRV controls systems are combined incorrectly or power proportional distribution calculation errors occur. The intelligent Touch Manager shall display the error with a red triangle placed on the lower task bar.
    - 2) Unit errors occurring within the VRV system shall be displayed with a yellow triangle placed over the indoor unit icon
    - 3) Limit errors are based upon preconfigured analog input upper and lower limit settings and are generated when the limits have been met. When limit error is generated a yellow triangle will be placed over the unit icon.
    - 4) Communication errors between the intelligent Touch Manager and the indoor units shall be displayed with a blue triangle placed over the indoor unit icon
    - 5) Error history shall be available for viewing for up to 500,000 errors/abnormality events with operation events.
  - o. Layout View
    - 1) Capable of displaying site floor plan as the background for visual navigation. Indoor unit, DIII-NET Di and Dio, and External Di, DO, Ai, and Ao icons with operational status can be placed on the floor layout
      - i) Up to 4 status points can be assigned to the indoor unit icon (room name, room temperature, setpoint, and mode)
      - ii) Digital input and output icons will display On/Off status
      - iii) Analog input icons will display analog value
    - 2) Up to 60 floor layout sections can be created
3. Basic Operation:

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- a. Capable of controlling by Area(s) or Group(s)
  - b. Controller shall control the following group operations:
    - 1) On/Off
    - 2) Operation Mode (Cool, Heat, Fan, Dry, and Auto)
    - 3) Independent Cool and Heat dual Setpoints or single Setpoint for current mode in the occupied period
    - 4) Controller shall be able to limit the user adjustable setpoint ranges individually for cooling and heating based upon the Area or Group configurations
    - 5) Independent Setup (Cooling) and Setback (Heating) setpoints in the unoccupied mode adjustable to 50 - 95<sup>0</sup>F
      - i) Setup and Setback setpoints can only be set outside of the occupied setpoint range
      - ii) The Setup and Setback setpoints will automatically maintain a 2<sup>0</sup>F fixed differential from the highest possible occupied setpoints
      - iii) The recovery differential shall be 4<sup>0</sup>F (default) and adjustable between 2 – 10<sup>0</sup>F
      - iv) Settings shall be applied based upon the Area or Group configurations
    - 6) Fan Speed
      - i) Up to 3 speeds (dependent upon indoor unit type)
    - 7) Airflow direction (dependent upon indoor unit type)
      - i) 5 fixed positions or oscillating
    - 8) Remote controller permit/prohibit of On/Off, Mode, and Setpoint
    - 9) Lock out setting for Intelligent Touch Manager display
    - 10) Indoor unit Group/Area assignment
  - c. Capable of providing battery backup power for the clock at least 1 year when no AC power is applied.
    - 1) The battery can last at least 13 years when AC power is applied
    - 2) Settings stored in non-volatile memory
4. Programmability:
- a. Controller shall support weekly schedule settings.
    - 1) 7 day weekly pattern (7)
    - 2) Weekday + Weekend (5 + 2)
    - 3) Weekday + Saturday + Sunday (5 + 1 + 1)
    - 4) Everyday (1)
    - 5) The schedule shall have the capabilities of being enabled or disabled
    - 6) 100 independent schedules configurable with up to 20 events settable for each days schedule
      - i) Each scheduled event shall specify time and target Area or Group
      - ii) Each scheduled event shall include On/Off, Optimum Start, Operation Mode, Occupied Setpoints, Setback Setpoints,

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- Remote Controller On/Off Prohibit, Remote Controller Mode Prohibit, Remote Controller Setpoint Prohibit, Timer Extension Setting, Fan Speed, and Setpoint Range Limit
- Setpoint when unit is On (occupied)
  - Configurable Setup (Cooling) and Setback (Heating) setpoints when unit is Off (unoccupied)
- iii) Time setting in 1-minute increments
- iv) Timer Extension shall be used for a timed override (settable from 30 – 180 minutes) to allow indoor unit operation during the unoccupied period
- 7) A maximum of 40 exception days can be schedule on the yearly schedule (repeats yearly)
- i) Exception days shall be used to override specified days on the weekly schedule based upon irregular occupied/unoccupied conditions
  - ii) Exception days can be configured on a set date (Jan 1) or floating date (1<sup>st</sup> Monday in September)
- b. Controller shall support auto-changeover.
- 1) Auto-change shall provide Fixed (default), Individual, Averaging, and Vote changeover methods for both Heat Pump and Heat Recovery systems based upon the changeover group configuration. This will allow for the optimal room temperature to be maintained by automatically switching the indoor unit's mode between Cool and Heat in accordance with the room temperature and setpoint. The following changeover scheme shall be applicable to the Fixed, Individual, and Averaging methods.
- i) Changeover to cooling mode shall occur at cooling setpoint + 1°F (0.5°C) as the primary changeover deadband and takes the guard timer into consideration
    - Configurable from 1 – 4°F (0.5 – 2°C)
  - ii) Changeover to cooling mode shall occur at the primary changeover deadband to cooling + 1°F (0.5°C) as the secondary changeover deadband.
    - Configurable from 1 – 4°F (0.5 – 2°C)
  - iii) Changeover to heating mode shall occur at heating setpoint - 1°F (0.5°C) as the primary changeover deadband and takes the guard timer into consideration
    - Configurable from 1 – 4°F (0.5 – 2°C)
  - iv) Changeover to heating mode shall occur at the primary changeover deadband to heating - 1°F (0.5°C) as the secondary changeover deadband.
    - Configurable from 1 – 4°F (0.5 – 2°C)
  - v) A weighted demand shall be configurable for the Averaging and Vote methods.
- 2) Fixed Method



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- i) Changeover evaluated by room temperature and setpoint of the representative indoor unit (first registered indoor unit in changeover group) in the changeover group even when it is not operating (must be in Cool, Heat, or Auto mode)
  - ii) Changeover affects all indoor unit groups in the changeover group.
- 3) Individual method (recommended for Heat Recovery Systems)
- i) Changeover evaluated by room temperature and setpoints of the individual indoor unit group in the changeover group
  - ii) Changeover affects individual indoor unit group in the changeover group
- 4) Average method
- i) Changeover evaluated by the average of all indoor unit group's room temperatures and setpoints operating in Cool, Heat, or Auto mode in the changeover group list
  - ii) If none of the indoor units in the group meet the above requirements the Fixed method of changeover will be applied
  - iii) A weighted demand (0 – 3) can be configured for each indoor unit in the changeover group.
  - iv) Changeover affects all indoor unit groups in the changeover group.
- 5) Vote Method
- i) In each indoor unit, the cooling demand is calculated based upon the difference between the room temperature and cooling setpoint. If the room temperature falls below the primary cool changeover point (cool setpoint plus the primary changeover deadband) the cooling demand is considered as 0 (zero). Then the total cooling demand is calculated as the sum of each indoor unit's cooling demand
  - ii) The opposite is true for the total heating demand
  - iii) A weight (0-3) can be added to each indoor unit's demand in the changeover group. The default setting is 1
  - iv) The weight 0 (zero) means the indoor unit's demand is not added in the total demand, so the indoor unit's demand is considered to be 0 (zero)
  - v) The weight 2 or 3 means the indoor unit's demand is added 2 or 3 times in the total demand, respectively
  - vi) Changeover to cooling mode shall occur when the total cooling demand is greater than the total heating demand.
  - vii) The opposite is true for changeover to heating
  - viii) Vote supports a Heating Override option, which prioritizes switching to the heating mode if at least one room temperature falls below the secondary heat changeover point (heat setpoint minus the secondary changeover deadband) even if the total cooling demand is greater than the total heating demand.

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- ix) Changeover affects all indoor unit groups in the changeover group.
  - 6) Changeover shall change the operation mode of the indoor unit that is set as the Changeover Master. The Changeover Master indoor unit shall then change the operation mode of all indoor unit groups daisy chained to the same outdoor unit in the Heat Pump system or branch selector box in the Heat Recovery system.
  - 7) Guard timer
    - i) Upon changeover, guard timer will prevent another changeover during the guard timer activation period (15, 30, 60 (default) min).
    - ii) Guard timer is ignored by a change of setpoint manually from either intelligent Touch Manger or Remote Controller, by schedule, or the room temperature meets or exceeds the secondary changeover deadband of the mode opposite of the current mode setting
  - c. Controller shall support Interlock
    - 1) Interlock feature for use with 3<sup>rd</sup> party equipment (DOAS, dampers, occupancy sensing, etc...) to automatically control Groups or Areas corresponding to the change of the operation states or the On/Off states of any Group.
    - 2) WAGO I/O unit – Di, Do, Ai, Ao
      - i) On/Off based monitoring and control of equipment
      - ii) Manual or scheduled operation of equipment
      - iii) Operation based upon interlock with management points (group(s))
      - iv) Monitor equipment error/alarm status
    - 3) Digital Input/Output (DEC102A51-US2) unit or Digital Input (DEC101A51-US2) unit
      - i) On/Off based monitoring and control of equipment
      - ii) Manual or scheduled operation of equipment
      - iii) Operation based upon interlock with management points (group(s))
      - iv) Monitor equipment error/alarm status
  - d. Controller shall support force shutdown of associated indoor unit groups.
5. Web/Email Function
- a. Each intelligent Touch Manager shall be capable of monitoring, operating, and scheduling a maximum of 64 indoor unit groups (up to 512 indoor unit groups with the addition of the iTM Plus Adapter) from a networked PC's web browser. It shall also be capable of creating general user access and sending detailed error emails to a customized distribution list (up to 10 email addresses).
  - b. All PCs shall be field supplied



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### 6. Optional Software

Licensed per option, per intelligent Touch Manager shall be required.

#### a. DCM002A71: Power Proportional Distribution (PPD)

The tenant billing option shall be capable of calculating VRV Controls Network equipment energy usage in kWh based on the energy consumption of the outdoor unit(s) divided among the associated indoor units. This software is used in conjunction with the intelligent Touch Manager and a Watt Hour Meter (WHM). A maximum of 3 Watt Hour Meters can be connected to the intelligent Touch Manager. Up to 4 additional Watt Hour Meters can be connected to each iTM Plus Adapter, and up to 7 iTM Plus Adapters can be connected to the intelligent Touch Manager.

The Power Proportional Distribution results data can be saved to a USB flash drive, or on a PC with the use of the web access. Data is saved in the CSV format. Results can be stored up to 13 months in the intelligent Touch Manager.

### **B. DCM601A72: iTM Plus Adapter**

The iTM Plus Adapter shall provide control for all VRV, SkyAir indoor units, and Daikin RA and FTXS indoor units with the use of the KRP928BB2S RA Adapter. It shall be capable of handling a maximum of 64 indoor unit groups and 128 indoor units connected to a maximum of 10 outdoor units. The iTM Plus Adapter is to be used in conjunction with intelligent Touch Manager. Up to 7 iTM Plus Adapters can be connected to a single intelligent Touch Manager. This combination will provide intelligent Touch Manager monitoring and control of up to 512 indoor unit groups, 1024 indoor units, and 80 outdoor units. The iTM Plus Adapter shall support operations superseding that of the local remote controller, system configuration, daily/weekly scheduling, monitoring of operation status, and malfunction monitoring.

The controller wiring shall consist of a non-polar two-wire connection to the outdoor unit at terminals F1F2 (out-out). The iTM Plus Adapter is wall mounted and is used in conjunction with the intelligent Touch Manager to maintain the optimal operation of the connected indoor unit(s). The iTM Plus Adapter is connected to the intelligent Touch Manager via a polarity sensitive 18-2 AWG stranded non-shielded wire (field supplied).

The iTM Plus Adapter can be used in conjunction with the BRC1E71/72 (Navigation Remote Controller), the BRC2A71 (Simplified Remote Controller), or the BRC4C82/7E83/7C812/7E818 (Wireless Remote Controller), BACnet, and Lonworks interfaces to control the same indoor unit groups. No more than 2 remote controllers can be placed in the same group. The remote controller shall require daisy chain wiring for grouping

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multiple indoor units (up to 16) together. Manual addressing is required of each indoor unit group associated with the iTM Plus Adapter.

1. Mounting:  
The iTM Plus Adapter can be mounted on the wall or in a standard enclosure (field supplied).
2. Features:
  - a. The iTM Plus Adapter shall be approximately 6.30" x 5.87" x 2.41" in size.
3. Basic Operation:
  - a. Control of all associated indoor unit groups shall be done via the connected intelligent Touch Manager.
4. Programmability:
  - a. Programming of all associated indoor unit groups shall be done via the connected intelligent Touch Manager.