

Daikin HVAC Controls Guide Specification

VARIABLE REFRIGERANT VOLUME (VRV) HVAC SYSTEM Building Management System Integration (Open Protocol Interface)

Part 1 - General

1.01. Physical characteristics

A. General:

The VRV Controls Network shall be capable of supporting remote controllers, schedule timers, system controllers, centralized controllers, an integrated web based interface, graphical user workstation, and system integration to Building Management Systems via BACnet[®] and LonWorks[®].

B. The Open Protocol Interface shall be made from stainless steel. Each interface shall have a battery backup and LED lights to display status/error.

1.02. Electrical characteristics

A. General:

The Open Protocol Interface will require 24 VAC to power the unit. The Open Protocol Interface shall supply 16 volts DC 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 Open Protocol Interface 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[®] or Lonworks[®] 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. Open Protocol Interfaces

The Open Protocol Interfaces are designed as a translator between the DIII-Net communications and the protocols used in BACnet and Lonworks integration. The Daikin VRV Open Protocol Interfaces are compatible with all VRV, SkyAir, and Daikin RA and FTXS indoor units with the use of the KRP928BB2S RA Adapter. The Open Protocol Gateways wiring consist of a stranded non-polar two-wire connection to the outdoor unit. The Open Protocol Interfaces may be wall-mounted and can be used in conjunction with a Building Management System (BMS) to maintain the optimal operation of a minimum of 64 connected indoor unit groups and 128 indoor units (dependent upon interface option configuration). In cases where a system or unit error may occur, the VRV controllers and the BMS central monitoring system will display an error code as specified by Daikin.

A. DMS502B71: Interface for use in BACnet

The Interface for use in BACnet shall provide the ability for a Building Management System (BMS) to control 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 2 DIII-Net systems or 64 indoor unit groups (128 indoor units) connected to a maximum of 10 outdoor units on each DIII-Net system. Each DIII-Net system is independent of each other and each DIII-Net system will terminate on its own DIII-Net port (2 DIII-Net ports standard). The Optional DIII Board (DAM411B51) can be added to the interface. This option provides 2 additional DIII-Net ports to the interface; a total of 4 DIII-Net ports (maximum of 64 indoor unit groups per DIII-Net port) which can handle a maximum of 256 indoor unit groups (512 indoor units) and 40 outdoor units.

The Interface for use in BACnet shall support operations superseding that of the Daikin centralized controller, local remote controller, system configuration, daily/weekly scheduling, monitoring of operation status, and malfunction monitoring.

The Interface for use in BACnet uses a standard open protocol based on ANSI/ASHREA Standard 135. The BACnet Interface has been certified by the BACnet Testing Laboratories (BTL). The BACnet Interface is compatible with BACnet IP (ISO16484-5).

The interface wiring shall consist of a non-polar two-wire connection to the terminals F1F2 (out-out) of the outdoor unit. The Interface for use in BACnet is wall mounted and is used as a translator between the BACnet

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Building Management System (BMS) and the VRV DIII-Net communication bus to maintain the optimal operation of the connected indoor unit(s).

The Interface for use in BACnet can be used in conjunction with the BRC1E71 (Navigation Remote Controller), the BRC2A71 (Simplified Remote Controller), or the BRC4C82/7E83/7C812/7E818 (Wireless Remote Controller), and DCS601C71 (Intelligent Touch Controller (ITC)) with or without the DCS601A72 (ITC DIII Plus Adapter) 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 multiple indoor units (up to 16) together. Manual addressing is required of each indoor unit group associated with the Intelligent Touch Controller and the Interfaces for use in BACnet.

The Interface for use in BACnet shall be equipped with one RJ-45 Ethernet port to support interconnection with a network PC via the Internet or Local Area Network (LAN). The Ethernet connection shall be capable of transmission on 10Base-T and/or 100Base-TX connection at 100 Mbps.

The Interface for use in BACnet shall be capable of being configured as a foreign device. It shall be capable of communicating across BACnet Broadcast Management Devices (BBMD) in different subnet networks.

The Interface for use in BACnet shall be capable of supporting Change of Value (COV) notification for all available objects.

The Daikin BACnet Setup Tool shall be available so that certified commissioning personnel/facility staff can securely log into each Interface for use in BACnet via a PC to support the configuration and testing of the Interface for use in BACnet.

1. Mounting:
The Interface for use in BACnet shall be mounted on the wall or in an enclosure.
2. Display Features:
 - a. The Interface for use in BACnet shall be approximately 10.81" x 10.34" in size.
 - b. LED display provides the interface's operational status and alarm.
 - c. The Interface for use in BACnet shall be capable of displaying indoor unit objects on the BACnet building management system.
 - d. The Interface for use in BACnet shall provide the BACnet building management system the capability to command the setpoint temperature in 1⁰F (0.1⁰C) increments with a range of 60⁰F - 90⁰F (16⁰C - 32⁰C).

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- 1) Display of temperature setpoint information shall be configurable for Fahrenheit or Celsius
 - e. The Interface for use in BACnet shall provide the BACnet building management system the capability to display the room temperature in 0.1⁰F (0.1⁰C) increments with a range of -120⁰F - 180⁰F (-84⁰C - 82⁰C).
 - 1) Display of room temperature information shall be configurable for Fahrenheit or Celsius
 - f. Error codes generated by the indoor units, outdoor units, branch selector boxes, and remote controllers shall be displayed on the BACnet building management system in the event of system abnormality/error with a two digit error code as specified by Daikin.
 - 1) Communication errors between the Interface for use in BACnet and the BACnet building management system shall be displayed with a red flashing LED on the Interface for use in BACnet
3. Basic Operation:
- a. The Interface for use in BACnet will provide up to 28 objects that can be monitored/controlled via the BACnet building management system (see the Interface for use in BACnet Design Guide –EDUS72-749B)
 - b. Capable of controlling up to 64 indoor unit groups (128 indoor units) per DIII-Net port (2 DIII-Net ports standard).
 - c. Optional DIII Board (DAM411B51) can be added to increase DIII-Net ports to a total of 4 DIII-Net ports.
 - 1) This provides a total of 256 indoor unit groups (512 indoor units) that can be monitored and controlled via the BACnet building management system
 - d. The Building Management System shall control the following group operations:
 - 1) On/Off
 - 2) Operation Mode (Cool, Heat, Fan, Auto, and Dry)
 - 3) Single setpoint setting for Cooling and Heating in the occupied mode.
 - 4) Fan status
 - 5) Fan Speed
 - i) Up to 3 speeds (dependent upon indoor unit type)
 - 6) Vane direction (dependent upon indoor unit type)
 - i) 5 fixed positions or swing position
 - 7) Remote controller permit/prohibit of On/Off, Mode, and Setpoint
 - 8) Filter sign reset for indoor units
 - 9) Disable the Intelligent Touch Controller
 - 10) Forced off of indoor units
 - 11) Forced Thermo-off of indoor units
 - 12) Energy saving offset of indoor unit setpoint
 - 13) Compressor status
 - 14) Thermo-on status

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- 15) Heater status
 - e. Capable of providing battery backup power for up to 3 years in total time for the clock.
 - 1) Settings stored in non-volatile memory
4. Programmability:
- a. The BACnet building management system shall support weekly schedule settings through its programming.
 - 1) The schedule shall support the indoor unit:
 - i. On/Off
 - ii. Each scheduled event shall specify time and target group
 - iii. Each scheduled event shall include On/Off, Operation Mode, Occupied Cooling Setpoint, Occupied Heating Setpoint, Setup (Cooling) setback setpoint, Setback (Heating) setback setpoint, Remote Controller On/Off Permit/Prohibit, Remote Controller Mode Permit/Prohibit, Remote Controller Setpoint Permit/Prohibit, and Timed Override Enable
 - iv. Setup (Cooling) and Setback (Heating) setpoints when unit is Off (unoccupied) by Group
 - v. An override shall be provided for use enabling indoor unit operation during the unoccupied period by the BACnet building management system programming.
 - b. The BACnet building management system shall support auto-changeover through its programming.
 - 1) Auto-change shall provide changeover for both Heat Pump and Heat Recovery systems based upon the group configurations. 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 temperature.
 - 2) 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 on the same DIII-Net communication bus to the same outdoor unit in the Heat Pump system or the same branch selector box in the Heat Recovery system.
 - 3) Changeover to cooling mode shall occur when the room temperature is great than or equal to the cooling setpoint
 - i. Differential to be determined by BACnet building management system programming
 - 4) Changeover to heating mode shall occur when room temperature is less than or equal to the heating setpoint.
 - i. Differential to be determined by BACnet building management system programming
 - 5) Guard timer

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- i. Upon changeover, guard timer will prevent another changeover during this period.
 - ii. Guard timer should be ignored by a change of setpoint manually from the BMS, Intelligent Touch Controller, Remote Controller, or by schedule.
 - iii. Guard timer to be configured by BACnet building management system programming (30 minute minimum recommended)
- c. The Interface for use in BACnet shall support force shutdown of associated indoor unit groups.

B. DMS504C71: Interface for use in Lonworks

The Interface for use in Lonworks 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 (128 indoor units) connected to a maximum of 10 outdoor units.

The Interface for use in Lonworks shall support operations superseding that of the Daikin centralized controller, local remote controller, system configuration, daily/weekly scheduling, monitoring of operation status, and malfunction monitoring.

The Interface for use in Lonworks wiring shall consist of a stranded non-polar two-wire connection to the terminals F1F2 (out-out) of the outdoor unit. The Interface for use in Lonworks is wall mounted and can be used in conjunction with the Intelligent Touch Controller to maintain the optimal operation of the connected indoor unit(s). The Interface for use in Lonworks is connected to the Lonworks building management system by twisted two wire pair specified by Echelon.

The Interface for use in Lonworks can be used in conjunction with the BRC1E71 (Navigation Remote Controller), BRC2A71 (Simplified Remote Controller), or the BRC4C82/7E83/7C812/7E818 (Wireless Remote Controller), and DCS601C71 (Intelligent Touch Controller (ITC)) with or without the DCS601A72 (ITC DIII Plus Adapter) 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 multiple indoor units (up to 16) together. Manual addressing is required of each indoor unit group associated with the Interface for use in Lonworks.

1. Mounting:

The Interface for use in Lonworks can be mounted on the wall or in an enclosure (field supplied).

2. Display Features:

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- a. The Interface for use in Lonworks shall be approximately 10.23" x 6.61" in size.
 - b. LED display provides the interface's operational status and alarm.
 - c. The Interface for use in Lonworks shall be capable of displaying the indoor unit network variable points on the Lonworks building management system.
 - d. The Interface for use in Lonworks shall provide the Lonworks building management system the capability to command the setpoint temperature in 0.1⁰C increments with a range of 16⁰C - 32⁰C.
 - 1) Display of temperature setpoint information shall be displayed in Celsius
 - 2) Fahrenheit display will require the Lonworks building management system to convert the temperature setpoint from Celsius to Fahrenheit
 - e. The Interface for use in Lonworks shall provide the Lonworks building management system the capability to display the room temperature in 0.1⁰C increments with a range of -10⁰C - 50⁰C.
 - 1) Display of room temperature information shall be shown in Celsius
 - 2) Fahrenheit display will require the Lonworks building management system to convert the room temperature from Celsius to Fahrenheit
 - f. Error codes generated by the indoor units, outdoor units, branch selector boxes, and remote controllers shall be displayed on the Lonworks building management system in the event of system abnormality/error with a decimal value error code that can be cross referenced as specified by Daikin.
 - 1) Communication errors between the Interface for use in Lonworks and the Lonworks building management system shall be displayed with a red flashing LED on the Interface for use in Lonworks
3. Basic Operation:
- a. The Interface for use in Lonworks will provide 2 Node Network Variables, 4 Common Network Variables for the DIII-Net communication bus, and 23 indoor unit Network Variables for each indoor unit that can be monitored/controlled via the Lonworks building management system (see the Interface for use in Lonworks Design Guide –ED72-333)
 - b. Capable of controlling up to 64 indoor unit groups (128 indoor units)
 - c. The Building management System shall control the following group operations:
 - 1) On/Off
 - 2) Operation Mode (Auto, Heat, Cool, Fan)
 - 3) Single setpoint setting for Cooling and Heating in the occupied mode

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- 4) Fan Speed
 - i. 2 fan speeds selectable (High/Low)
 - ii. Indoor units with 3 or more fan speeds will display as either high or low based upon fan speed value.
 - iii. Fan speeds with a value less than 4 will display as “Low”. Values 5 or greater will display as “High”.
 - 5) Remote controller permit/prohibit of On/Off, Mode, and Setpoint
 - 6) Filter sign reset for indoor units
 - 7) Disable the Intelligent Touch Controller
 - 8) Forced off of indoor units
 - 9) Forced Thermo-off of indoor units
 - d. Capable of providing battery backup power for up to 3 years in total time
 - 1) Capable of providing battery backup power for up to 1 month in total time with a minimum charging time of 24 hours.
 - 2) Settings stored in non-volatile memory
 - 3) Binding between the Interface for use in Lonworks and the Lonworks building management system will be saved if power is lost.
4. Programmability:
- a. The Lonworks building management system shall support weekly schedule settings through its programming.
 - 1) The schedule shall support the indoor unit:
 - i. On/Off
 - ii. Each scheduled event shall specify time and target group
 - iii. Each scheduled event shall include On/Off, Operation Mode, Occupied Cooling Setpoint, Occupied Heating Setpoint, Setup (Cooling) setback setpoint, Setback (Heating) setback setpoint, Remote Controller On/Off Permit/Prohibit, Remote Controller Operation Mode Permit/Prohibit, Remote Controller Setpoint Permit/Prohibit, and Timed Override Enable
 - iv. Setup (Cooling) and Setback (Heating) setback setpoints when unit is Off (unoccupied) by Group
 - v. An override shall be provided for use enabling indoor unit operation during the unoccupied period by the BACnet building management system programming.
 - b. The Lonworks building management system shall support auto-changeover through its programming.
 - 1) Auto-changeover shall provide changeover for both Heat Pump and Heat Recovery systems based upon the group configurations. 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 temperature.

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- 2) 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 on the same DIII-Net communication bus to the same outdoor unit in the Heat Pump system or to the same branch selector box in the Heat Recovery system.
 - 3) Changeover to cooling mode shall occur when the room temperature is great than or equal to the cooling setpoint
 - i. Differential to be determined by BACnet building management system programming
 - 4) Changeover to heating mode shall occur when room temperature is less than or equal to the heating setpoint.
 - i. Differential to be determined by BACnet building management system programming
 - 5) Guard timer
 - i. Upon changeover, guard timer will prevent frequent changeover during a short period
 - ii. Guard timer should be ignored by a change of setpoint manually from the BMS, Intelligent Touch Controller, Remote Controller, or by schedule
 - iii. Guard timer to be configured by the Lonworks building management system programming (30 minute minimum recommended)
- c. The Interface for use in Lonworks shall support force shutdown of associated indoor unit groups.