## VRF Specifications

Multi Evaporator, Direct Expansion (DX), Air-Cooled, Variable Capacity, Split System

6 to 36 Ton VRF Heat Recovery system – Single module up to 16 Ton, Double module up to 30 Ton

**Hitachi Outdoor Unit VRF Heat Recovery Model Numbers (208/230V, 3-Phase):**

* 6 TON - HVAHR072B32S – Heat Recovery
* 8 TON - HVAHR096B32S – Heat Recovery
* 10 TON - HVAHR120B32S – Heat Recovery
* 12 TON - HVAHR144B32S – Heat Recovery
* 14 TON - HVAHR168B32S – Heat Recovery
* 16 TON - HVAHR192B32S – Heat Recovery
* 18 TON - HVAHR216B32S – Heat Recovery
* 20 TON - HVAHR240B32S – Heat Recovery
* 22 TON - HVAHR264B32S – Heat Recovery
* 24 TON - HVAHR288B32S – Heat Recovery
* 26 TON - HVAHR312B32S – Heat Recovery
* 28 TON - HVAHR336B32S – Heat Recovery
* 30 TON - HVAHR360B32S – Heat Recovery
* 32 TON - HVAHR384B32S – Heat Recovery
* 34 TON - HVAHR408B32S – Heat Recovery
* 36 TON - HVAHR432B32S – Heat Recovery

**Hitachi Outdoor Unit VRF Heat Recovery Model Numbers (460V, 3-Phase):**

* 6 TON - HVAHR072B42S – Heat Recovery
* 8 TON - HVAHR096B42S – Heat Recovery
* 10 TON - HVAHR120B42S – Heat Recovery
* 12 TON - HVAHR144B42S – Heat Recovery
* 14 TON - HVAHR168B42S – Heat Recovery
* 16 TON - HVAHR192B42S – Heat Recovery
* 18 TON - HVAHR216B42S – Heat Recovery
* 20 TON - HVAHR240B42S – Heat Recovery
* 22 TON - HVAHR264B32S – Heat Recovery
* 24 TON - HVAHR288B42S – Heat Recovery
* 26 TON - HVAHR312B42S – Heat Recovery
* 28 TON - HVAHR336B42S – Heat Recovery
* 30 TON - HVAHR360B42S – Heat Recovery
* 32 TON - HVAHR384B42S – Heat Recovery
* 34 TON - HVAHR408B42S – Heat Recovery
* 36 TON - HVAHR432B42S – Heat Recovery

**PART 1 – GENERAL**

1. SYSTEM DESCRIPTION

Variable Refrigerant Flow (VRF) HVAC system shall be a direct expansion (DX) Hitachi heat recovery system. The outdoor unit shall consist of one or more frames (modules) connected through common refrigerant piping and control communication wiring. Each system shall have single or multiple, inverter compressor(s). Each system shall be connected to multiple indoor units (ducted, non-ducted or mixed combinations) through a common refrigerant piping network and integrated system controls and communication network.

Heat recovery systems shall be a three-pipe design with the system ability to heat or cool simultaneously. The outdoor unit shall be an air cooled condensing unit with vertical discharge that uses refrigerant R-410A. The condensing unit may connect an indoor evaporator capacity up to 150% of the condensing unit capacity without any special factory approval. All zones are each capable of operating separately with individual temperature control.

Each indoor unit shall be controlled individually or as a group. Heat recovery systems shall operate in either the heating or cooling mode and shall support simultaneous heating and cooling mode.

Two-pipe, heat recovery systems utilizing a lower temperature mixed liquid/gas refrigerant to perform heat recovery are not acceptable due to reduced heating capabilities.

The Hitachi condensing unit shall be interconnected to Hitachi indoor units in accordance with Hitachi’s engineering manual detailing each available indoor unit. The indoor units shall be connected to the condensing unit utilizing Hitachi’s specified piping joints and headers to ensure correct refrigerant flow and balancing. T-style joints are not acceptable for a variable refrigerant system.

Change-over Boxes shall be located as shown on the drawing(s). The Change-over Boxes shall control the operational mode of the subordinate indoor units.

1. QUALITY ASSURANCE

The units shall be tested by a Nationally Recognized Testing Laboratory (NRTL) in accordance with ANSI/UL 1995 – Heating and Cooling Equipment and shall bear the listed mark.

All wiring shall be in accordance with the National Electric Code (NEC). The System shall be rated in accordance with Air Conditioning Refrigeration Institute (AHRI) Standard 1230 and bear the AHRI label.

The system shall be manufactured in an ISO 9001 and ISO 14001 facility, in accordance with the standards set by the International Standard Organization (ISO).

All units must meet or exceed the 2010 federal minimum efficiency requirements and the proposed ASHRAE 90.1 efficiency requirements for VRF systems.

Efficiency shall be published in accordance with the DOE alternative test procedure, which is based on the Air-Conditioning, Heating, and Refrigeration Institute (AHRI) Standard 1230 and ISO Standard 13256-1.

1. DELIVERY, STORAGE, AND HANDLING

Equipment shall be stored and handled according to the manufacturer’s recommendations.

1. HITACHI VRF

Hitachi VRF shall be the Basis of Design. Acceptable standards shall be supplied based upon the Hitachi VRF model specified. At least 10 days prior to the bid date, alternate manufacturers shall request permission to bid, in writing, from the engineer. This request by the contractor to bid an alternate supplier for the basis of design, listed or not listed, shall not relieve the contractor from supplying all materials, options, controls, sequences, efficiencies, and intent of the original specifications written or implied by Hitachi VRF model number or model family or as otherwise specified. The written request and engineers’ written response to such request shall be included in all submittal documents for approval.

1. ALT EQUIPMENT BID INSTRUCTION

The contractor shall provide basis of design bid as specified. If the contractor proposes an alternate manufacturer for the basis of designed products they shall provide a separate and complete Bid detailing the proposed alternate products and the associated adjustment of price to support the change from basis of design products. The contractor bids the alternate product with full knowledge that the proposed product may not be acceptable or approved. In no event shall the contractor be entitled to additional compensation to supply such specified products, options or sequences. Any and all additional cost, to any party, because of any product submitted on or supplied other than that of the original specified products shall be the responsibility of the contractor without recourse. It is agreed that any and all disputes regarding any differences between the specified products, options or sequences and that proposed as an alternate shall be arbitrated by the engineer of record. It shall be further agreed by all parties that all decisions of arbitration shall be final and binding. Any product proposed as an alternate shall have been offered, as a VRF product, in the United States for a minimum of (5) years.

1. SUBMITTALS

A complete submittal package shall be compiled, and 10 copies shall be forwarded to the general contractor who shall supply the architect with the submittals for dissemination to all parties. The submittal shall be a collection of documents that represent the technical aspects of each product or collection of products to be used on the project. All performance submissions shall be calculated at the design temperatures; nominal performance data shall not be allowed. The submission and approval of said submittals does not relieve the contractor from supplying all requirements set forth in the specification and drawings. Any substitutions offered by the contractor shall include, as a separate document, any and all differences between the submitted products and the specified products including but not limited to, all dimensions, electrical, control, weights, warranties, country of origin, and a statement from the manufacture that no child labor has been used in the manufacture or assembly of said products, and a copy shall be supplied with the product outdoor unit submittal.

If submittals contain any proposed alternate equipment specifications, calculations, dimensions, electrical specifications, sound specifications or any other mandated submissions which are not accepted, are noted or rejected for any reason, the contractor shall be allowed to correct any deficiency and re-submit a second time. Should there be any issues found on second submission, the contractor will be directed to and agrees to submit on the original specified products and provide the specified products without any additional compensation.

1. INDOOR UNIT SYSTEM

The system shall consist of multiple Hitachi VRF indoor units, branch joints and headers. T-style joints shall not be permitted due to the large pressure differential through these fittings. The sum of connected capacity of all indoor units shall range from 55% to 150% of outdoor rated capacity. Up to 150% shall be possible without any factory approval for all capacities.

1. OUTDOOR UNIT SYSTEM

The Hitachi VRF outdoor unit shall be interconnected to the indoor units with capacities from 6,000 Btu/h to 96,000 Btu/h. Each Hitachi VRF indoor unit or selected group of indoor units shall be capable of operating in independently and be able to provide set temperatures through a wide variety of control options including simplified wired, wired, wireless, central station, computerized controller, LONWorks adapter, or BACnet adapter; a VRF H-Link Smart Gateway (BACnet) – Metasys compatible device that makes Hitachi VRF viewable from all BACnet IP BMS/BAS systems; aWeb interface and automatic point mapping to the BMS; a VRF Cloud Gateway Device – VRF accessed through mobile device (tablet/phone using Android/iOS operating system); and a VRF compatible with Nest thermostat.

All components (compressor, controls, etc.) in the Outdoor Unit shall be easily accessible from the front for service/replacement.

1. HEATING DEFROST OPERATION

The system shall have the ability to use a continuous heating defrost operation for multi-module system configurations.

**PART 2-WARRANTY**

* 1. LIMITED WARRANTY

The units shall be covered by the manufacturer’s limited warranty. The compressor shall have a manufacturer’s limited warranty for a period of ten (10) years from date of unit installation. The unit’s parts shall have a manufacturer’s limited warranty for period of (10) years from date of unit installation.

* 1. HITACHI VRF INSTALLATION

The Hitachi VRF system shall be installed by a factory trained contractor. The training should be performed by the manufacturer at a factory service and installation training facility. Extended limited parts and compressor warranty to (12) years from date of unit installation shall be available.

**Part 3 – PERFORMANCE**

1. PERFORMANCE

The three-phase VRF system performance shall be rated in accordance with AHRI 1230 test conditions.

The VRF system shall be listed in the AHRI directory.

The system efficiency shall meet or exceed the following certified performance criteria:

| **System** | **EER** | | **IEER** | | **COP47** | | **COP17** | |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **Ducted** | **Non Ducted** | **Ducted** | **Non Ducted** | **Ducted** | **Non Ducted** | **Ducted** | **Non Ducted** |
| 6T:HVAHR072B\_2S | 12.2 | 14.9 | 21.1 | 26.5 | 3.54 | 4.25 | 2.38 | 2.60 |
| 8T:HVAHR096B\_2S | 12.4 | 12.4 | 22.1 | 23.9 | 3.65 | 3.77 | 2.36 | 2.40 |
| 10T:HVAHR0120B\_2S | 12.4 | 12.7 | 21.7 | 24.4 | 3.55 | 3.84 | 2.30 | 2.37 |
| 12T:HVAHR144B\_2S | 11.2 | 10.9 | 21.2 | 23.9 | 3.40 | 3.42 | 2.15 | 2.12 |
| 14T:HVAHR168B\_2S | 11.8 | 11.6 | 21.4 | 23.4 | 3.56 | 3.65 | 2.40 | 2.16 |
| 16T:HVAHR192B\_2S | 11.1 | 10.6 | 20.8 | 21.4 | 3.38 | 3.32 | 2.15 | 2.05 |
| 18T:HVAHR216B\_2S | 11.2 | 10.9 | 20.7 | 20.9 | 3.51 | 3.82 | 2.29 | 2.32 |
| 20T:HVAHR240B\_2S | 10.6 | 11.1 | 21.0 | 20.8 | 3.51 | 3.67 | 2.27 | 2.35 |
| 22T:HVAHR264B\_2S | 10.5 | 10.0 | 20.8 | 21.1 | 3.56 | 3.70 | 2.26 | 2.26 |
| 24T:HVAHR288B\_2S | 9.9 | 9.5 | 20.7 | 19.4 | 3.42 | 3.42 | 2.24 | 2.21 |
| 26T:HVAHR312B\_2S | 10.0 | 9.7 | 19.5 | 20.3 | 3.31 | 3.37 | 2.12 | 2.05 |
| 28T:HVAHR336B\_2S | 9.8 | 9.5 | 19.1 | 20.8 | 3.32 | 3.27 | 2.25 | 2.31 |
| 30T:HVAHR360B\_2S | 10.2 | 9.5 | 19.5 | 19.8 | 3.20 | 3.20 | 2.18 | 2.05 |
| 32T:HVAHR384B\_2S | 9.5 | 9.6 | 18.6 | 19.6 | 3.33 | 3.37 | 2.26 | 2.20 |
| 34T:HVAHR408B\_2S | 9.5 | 9.5 | 19.2 | 19.3 | 3.37 | 3.34 | 2.23 | 2.08 |
| 36T:HVAHR432B\_2S | 9.6 | 9.5 | 19.0 | 19.5 | 3.35 | 3.21 | 2.19 | 2.05 |

1. OPERATING TEMPERATURE RANGES

The ambient air temperature operating ranges shall be as follows:

| **Category** | **Range (°F)** |
| --- | --- |
| Cooling and simultaneous Cooling/Heating Standard Operating Range  Cooling and simultaneous Cooling/Heating Extended Operating Range | 23 – 122  -10 - 122 |
| Heating Operating Range | -13 - 59 |
| Cooling Mode - Indoor Temperature Range (WB) | 59 - 73 |
| Heating Mode - Indoor Temperature Range (DB) | 59 - 80 |

If an alternate equipment manufacturer is selected, the mechanical contractor shall provide, at their own risk and cost, all additional material and labor to meet ambient operating conditions and performance.

**Part 4 – PRODUCTS**

1. REFRIGERANT PIPING

All refrigerant piping shall be installed in accordance with manufacturer’s recommendations. No additional sight glasses or filter/dryers shall be required. All field installed refrigerant piping shall be nitrogenized ACR copper tubing and shall meet ASTM B280. All branch piping joints shall be approved by the manufacturer.

The three-phase VRF system shall be capable of the following refrigerant piping lengths:

1. Total system piping length: 3,280 ft.
2. Maximum piping length from refrigerant piping branch to indoor unit: 131 ft.
3. Maximum piping length from first branch to furthest indoor unit: up to 295 ft.
4. Maximum vertical separation from outdoor unit to indoor unit, when outdoor unit is above: 360 ft.
5. Maximum vertical separation from outdoor unit to indoor unit, when outdoor unit is below: 131 ft.
6. DEVELOPMENT GENERATIONS

All three-phase VRF outdoor units connected to the same piping system shall be from the same product development generation. Mixing of outdoor units from different development generations in the same piping system is not acceptable.

Change-over Boxes and outdoor units in a system must be of the same product development generation.

1. LOW AMBIENT AIR TEMPERATURES
   1. Outdoor Unit shall be capable of continuous compressor operation between the following operating ambient air conditions. Operations outside of these conditions are possible and may involve non-continuous operations.
      * + 1. Outdoor Unit

Cooling: 23°F DB to 122°F DB (With optional snow hood kit Accessories from 14°F DB to 122°F DB, With optional damper kit Accessories from -10°F DB to 122°F DB)

Heating: -13°F WB to 59°F WB

1. GENERAL FEATURES
   * + - 1. The air-conditioning system shall use R410A refrigerant.
         2. The system shall be capable of an automatic refrigerant charge function to ensure the proper amount of refrigerant is installed into the system.
         3. Each system shall consist of one, two, or three air source outdoor unit modules conjoined together in the field to result in the capacity specified elsewhere in these documents.
         4. Multiple frame configurations shall be field piped together using manufacturer-designed and supplied Y-branch kits and field‑provided interconnecting pipe to form a common refrigerant circuit.
         5. Refrigerant circuit configuration

The refrigerant circuit shall be constructed using field‑provided ACR copper, de-hydrated, and piped together with manufacturer‑supplied Y- branches or headers connected to multiple (ducted, non-ducted or mixed combination indoor units to effectively and efficiently control heating or cooling operation of the VRF system. Other pipe materials shall not be allowed.

* + - * 1. Each refrigerant pipe, y-branches, elbows and valves shall be individually insulated with no air gaps. Insulation R-value (thickness) shall not be less than the minimum called for by the local building code, local energy code or as a minimum per manufacture installation requirements. In no case shall the insulation be allowed to be compressed at any point in the system.
        2. The condensing unit will be factory charged with R-410A.
        3. Depending on the size and length of the piping when installed, it may require additional trim charging in the field.
        4. The condensing unit shall include a refrigerant charge volume analyzer that includes an automatic refrigerant assessment system to check whether or not the correct amount of refrigerant charge exists in a given refrigerant cycle.

1. ELECTRICAL
   1. The condensing unit power supply shall be 208/230V or 460V, 3 phase, 60 Hertz per schedule.
   2. The condensing unit shall have an acceptable voltage range of 187-253V or 416-508V.
   3. The control circuit between the condensing unit, changeover boxes, and indoor units shall use AWG18-2 type control wire.
2. SAFETY
   1. The condensing unit shall include protection devices including a high pressure switch at 4.15 MPa (601psi), over current protection for the inverter and for the PCB, and over heat protection for the inverter and the compressor.
3. ENERGY SAVINGS
   1. The system shall be equipped with power demand limiting control possibility which prevents excessive energy consumption during peak operating conditions and automatically detects electric current flow and prevents the system from using too much energy.
4. CHANGE-OVER BOXES

|  |  |  |
| --- | --- | --- |
| MODEL NUMBER | NUMBER OF PORTS | MAX TOTAL CAPACITY (MBH) |
| COBS048B22S/C | 1 | 48 |
| COBS096B22S/C | 1 | 96 |
| COB04M132B22S | 4 | 132 |
| COB08M264B22S | 8 | 264 |
| COB12M264B22S | 12 | 264 |

1. General
   1. The change-over boxes are designed specifically for use with Hitachi VRF heat recovery system.
   2. The change-over boxes shall be factory assembled, wired, piped and run tested at the factory.
   3. Multiple indoor units may be connected to a port provided they are within the capacity range of the port.
2. Valves
   1. The unit shall be furnished with electronic expansion valves to control the direction of refrigerant flow in each branch. Use of solenoid valves shall not be acceptable due to noise.
3. Condensate Removal
   1. The unit shall not require provisions for condensate removal.
4. 14 INDOOR UNIT TYPES - 73 MODELS

Indoor Unit – 1-Way Cassette

|  |  |  |  |
| --- | --- | --- | --- |
| MODEL NUMBER | NOMINAL CAPACITY  (TONS) | COOLING (BTU/H) | HEATING (BTU/H) |
| HIC1006B21S | .50 | 6,000 | 6,700 |
| HIC1008B21S | .70 | 8,000 | 9,000 |
| HIC1012B21S | 1.0 | 12,000 | 13,500 |
| HIC1015B21S | 1.3 | 15,000 | 17,000 |

1. General
   1. The unit shall have the ability to be recessed into the ceiling with a ceiling grill and shall be a 1-way air distribution type.
   2. The unit shall be factory assembled, piped, and wired, as well as run tested at the factory.
   3. The unit and refrigerant pipes will be charged with dehydrated air (nitrogen gas) prior to shipment from the factory.
   4. The 1-way cassette shall be equipped with an electronic expansion valve.
   5. All sizes of 1-Way Cassettes shall be equipped with a built-in condensate pump with 33.5” lift.
   6. The unit shall have an automatic swing louver.
   7. The 1-way cassette shall be available with optional energy saving motion and radiant heat sensor for optimized airflow and temperature control.
2. Performance:
   1. Each 1-way cassette’s performance is based on nominal operating conditions shown in mechanical schedules.
3. Unit Cabinet:
   1. The unit cabinet shall be space saving and have the ability to be recessed into a ceiling.
   2. The 1-way panel shall be affixed to the bottom of the unit allowing for 1-way airflow.
   3. The 1-way cassette (without panel) shall be no larger than 9-1/4” x 35-7/16” x 27-5/16” and weigh no more than 57 lbs.
   4. An outside air knockout shall exist to for branch ducting supply air.
4. Fan:
   1. Unit shall be equipped with a brushless DC fan motor drive.
   2. The 1-way cassette shall consist of four fan speeds including: low (Lo), medium (Me), high (Hi), and high 2 (Hi2).
5. Filter
   1. The standard 1” air filter shall be made of an anti-mold polypropylene that is also a washable type.
6. Sound:
   1. The 1-way cassette sound pressure shall range 27 dB(A) to 31 dB(A) at low speed.
7. Electrical:
   1. The unit shall be 208-230V, 1 phase, 60 Hertz.
   2. The 1-way cassette shall have an acceptable voltage range of 187-255V.
   3. The control circuit between the units in the system shall use AWG18-2 type control wire.

Indoor Unit – 2-Way Cassette

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| --- | --- | --- | --- |
| MODEL NUMBER | NOMINAL CAPACITY (TONS) | COOLING (BTU/H) | HEATING (BTU/H) |
| HIC2018B21S | 1.5 | 18,000 | 24,000 |
| HIC2024B21S | 2.0 | 24,000 | 27,000 |

1. General:
   1. The unit shall have the ability to be recessed into the ceiling with a ceiling grill and shall be a 2-way air distribution type.
   2. The unit shall be factory assembled, piped, and wired, as well as run tested at the factory.
   3. The unit and refrigerant pipes will be charged with dehydrated air (nitrogen gas) prior to shipment from the factory.
   4. The 2-way cassette shall be equipped with an electronic expansion valve.
   5. All sizes of 2-Way Cassettes shall be equipped with a built-in condensate pump with 33.5” lift.
   6. The unit shall have an automatic swing or fixed air louver.
   7. The 2-way cassette shall be available with optional energy‑saving motion and a radiant heat sensor for optimized airflow and temperature control.
2. Performance:
   1. Each 2-way cassette’s performance is based on nominal operating conditions shown in mechanical schedules.
3. Unit Cabinet:
   1. The unit cabinet shall be space saving and have the ability to be recessed into a ceiling.
   2. The 2-way panel shall be affixed to the bottom of the unit allowing for 2-way airflow.
   3. The 2-way cassette (without panel) shall be no larger than 11-3/4” x 33-7/8” x 24-13/16” and weigh no more than 55 lbs.
   4. An outside air knockout shall exist to for branch ducting supply air.
4. Fan:
   1. Unit shall be equipped with a brushless DC fan motor drive.
   2. The 2-way cassette shall consist of four fan speeds including: low (Lo), medium (Me), high (Hi), and high 2 (Hi2).
5. Filter
   1. The standard 1” air filter shall be made of an anti-mold polypropylene that is also a washable type.
6. Sound:
   1. The 2-way cassette sound pressure shall range 33 dB(A) to 34 dB(A) at low speed.
7. Electrical:
   1. The unit shall be 208-230V, 1 phase, 60 Hertz.
   2. The 2-way cassette shall have an acceptable voltage range of 187-255V.
   3. The control circuit between the units in the system shall use AWG18-2 type control wire.

Indoor Unit – 4-Way Cassette

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| --- | --- | --- | --- |
| MODEL NUMBER | NOMINAL CAPACITY(TONS) | COOLING (BTU/H) | HEATING (BTU/H) |
| HICM008B21S  (MINI CASSETTE) | .70 | 8,000 | 9,000 |
| HICM012B21S  (MINI CASSETTE) | 1.0 | 12,000 | 13,500 |
| HICM015B21S  (MINI CASSETTE) | 1.3 | 15,000 | 17,000 |
| HICM018B21S  (MINI CASSETTE) | 1.5 | 18,000 | 20,000 |
| HIC4008B21S | .70 | 8,000 | 9,000 |
| HIC4012B21S | 1.0 | 12,000 | 13,500 |
| HIC4015B2S | 1.3 | 15,000 | 17,000 |
| HIC4018B21S | 1.5 | 18,000 | 20,000 |
| HIC4024B21S | 2.0 | 24,000 | 27,000 |
| HIC4030B21S | 2.5 | 30,000 | 34,000 |
| HIC4036B21S | 3.0 | 36,000 | 40,000 |
| HIC4036B21S | 4.0 | 48,000 | 54,000 |

1. General:
   1. The unit shall have the ability to be recessed into the ceiling with a ceiling grill and shall be a 4-way air distribution type.
   2. The unit shall be factory assembled, piped, and wired, as well as run tested at the factory.
   3. The unit and refrigerant pipes will be charged with dehydrated air (nitrogen gas) prior to shipment from the factory.
   4. The 4-way cassette shall be equipped with an electronic expansion valve.
   5. All sizes of 4-Way Cassettes shall be equipped with a built-in condensate pump with 33.5” lift.
   6. The unit shall have an automatic louver control.
   7. The 4-way cassette shall be able to be configured for 2-way or 3-way airflow as well.
   8. The 4-way cassette shall be available with optional energy‑saving motion and radiant heat sensor for optimized airflow and temperature control.
2. Performance:
   1. Each 4-way cassette’s performance is based on nominal operating conditions shown in mechanical schedules.
3. Unit Cabinet:
   1. The unit cabinet shall be space saving and have the ability to be recessed into a ceiling.
   2. The 4-way panel shall be affixed to the bottom of the unit allowing for 4-way airflow.
   3. The 4-way cassette (without panel) shall be no larger than 11-23/32” x 33-5/64” x 33-5/64” and weigh no more than 57 lbs.
   4. An outside air knockout shall exist to for branch ducting supply air.
4. Fan:
   1. Unit shall be equipped with a brushless DC fan motor drive.
   2. The 4-way cassette shall consist of four fan speeds including: low (Lo), medium (Me), high (Hi), and high 2 (Hi2).
5. Filter
   1. The standard 1” air filter shall be made of an anti-mold polypropylene that is also a washable type.
6. Sound:
   1. The 4-way cassette sound pressure shall range 27 dB(A) to 35 dB(A) at low speed.
7. Electrical:
   1. The unit shall be 208-230V, 1 phase, 60 Hertz.
   2. The 4-way cassette shall have an acceptable voltage range of 187-255V.
   3. The control circuit between the units in the system shall use AWG18-2 type control wire.

Indoor Unit – Wall Mount

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| --- | --- | --- | --- |
| MODEL NUMBER | NOMINAL CAPACITY(TONS) | COOLING (BTU/H) | HEATING (BTU/H) |
| TIWM006B21S | .5 | 6,000 | 8,000 |
| TIWM008B21S | .70 | 8,000 | 9,000 |
| TIWM1012B21S | 1.0 | 12,000 | 13,500 |
| TIWM1015B21S | 1.3 | 15,000 | 17,000 |
| TIWM018B21S | 1.5 | 18,000 | 20,000 |
| TIWM024B21S | 2.0 | 24,000 | 27,000 |
| TIWM030B21S | 2.5 | 30,000 | 34,000 |

1. General:
   1. The unit shall be factory assembled, piped, and wired, as well as run tested at the factory.
   2. The unit and refrigerant pipes will be charged with dehydrated air (nitrogen gas) prior to shipment from the factory.
   3. The unit shall have an automatic wide angle louver control.
   4. The unit shall have a removable front panel for easy cleaning.
   5. The unit shall have an auto-swing function to ensure efficient air distribution and uniform temperature.
   6. The unit shall have a built-in wireless sensor.
2. Performance:
   1. Each wall mount indoor unit’s performance is based on nominal operating conditions shown in the mechanical schedules.
3. Unit Cabinet:
   1. The wall mount indoor unit shall be no larger than 13-1/8” x 45-9/32” x 9-21/32” and weigh no more than 40 lbs.
   2. The unit shall be affixed to a separate galvanized steel back plate to secure the unit firmly to the wall.
4. Fan:
   1. Unit shall be equipped with a brushless DC fan motor drive.
   2. The wall mount shall consist of four fan speeds including: low (Lo), medium (Me), high (Hi), and high 2 (Hi2).
5. Filter
   1. The standard 1” air filter shall be made of an anti-mold polypropylene that is also a washable type.
6. Sound:
   1. The wall mount indoor unit sound pressure shall range 30 dB(A) to 41 dB(A) at low speed.
7. Electrical:
   1. The unit shall be 208-230V, 1 phase, 60 Hertz.
   2. The wall mount indoor unit shall have an acceptable voltage range of 187-255V.
   3. The control circuit between the indoor units shall use AWG18-2 type control wire.
8. Piping:
   1. Refrigerant and drain piping shall have the ability to be connected at the right, left or rear of the unit for ease of installation.

Indoor Unit – Floor Mount

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| --- | --- | --- | --- |
| MODEL NUMBER | NOMINAL CAPACITY(TONS) | COOLING (BTU/H) | HEATING (BTU/H) |
| HIFC006B21S  (CONCEALED) | .5 | 6,000 | 6,700 |
| HIFC008B21S  (CONCEALED) | .70 | 8,000 | 9,000 |
| HIFC012B21S  (CONCEALED) | 1.0 | 12,000 | 13,500 |
| HIFC015B21S  (CONCEALED) | 1.3 | 15,000 | 17,000 |
| HIFE006B21S  (EXPOSED) | .5 | 6,000 | 6,700 |
| HIFE008B21S  (EXPOSED) | .70 | 8,000 | 9,000 |
| HIFE012B21S  (EXPOSED) | 1.0 | 12,000 | 13,500 |
| HIFE015B21S  (EXPOSED) | 1.3 | 15,000 | 17,000 |

1. General:
   1. The floor mounted indoor unit shall be a concealed or exposed vertical mounted type.
   2. The unit shall be factory assembled, piped, and wired, as well as run tested at the factory.
   3. The unit and refrigerant pipes will be charged with dehydrated air (nitrogen gas) prior to shipment from the factory.
   4. The unit shall have front access for easy service and troubleshooting.
2. Performance:
   1. Each floor mount indoor unit’s performance is based on nominal operating conditions shown in the mechanical schedules.
3. Unit Cabinet:
   1. The cabinet shall be concealed or exposed and distribute air directly to the space.
   2. The floor mount indoor unit shall be no larger than 24-13/16” x 55-7/8” x 8-11/16” and weigh no more than 79 lbs.
4. Fan:
   1. The floor mount shall consist of three fan speeds including: low (Lo), medium (Me), and high (Hi).
5. Sound:
   1. The ducted high static indoor unit sound pressure shall range 29 dB(A) to 36 dB(A) at low speed.
6. Electrical:
   1. The unit shall be 208-230V, 1 phase, 60 Hertz.
   2. The floor mount indoor unit shall have an acceptable voltage range of 187-255V.
   3. The control circuit between the units in the system shall use AWG18-2 type control wire.

Indoor Unit – Ceiling Mount

|  |  |  |  |
| --- | --- | --- | --- |
| MODEL NUMBER | NOMINAL CAPACITY(TONS) | COOLING (BTU/H) | HEATING (BTU/H) |
| HICS015B21S | 1.3 | 15,000 | 17,000 |
| HICS024B21S | 2.0 | 24,000 | 27,000 |
| HICS030B21S | 2.5 | 30,000 | 34,000 |
| HICS036B21S | 3.0 | 36,000 | 40,000 |

1. General:
   1. The unit shall be factory assembled, piped, and wired, as well as run tested at the factory.
   2. The unit and refrigerant pipes will be charged with dehydrated air (nitrogen gas) prior to shipment from the factory.
   3. The unit shall have an automatic wide angle louver control.
   4. The unit shall have a removable front panel for easy cleaning.
   5. The unit shall have an auto-swing function to ensure efficient air distribution and uniform temperature.
   6. The unit shall have a built-in wireless sensor.
2. Performance:
   1. Each ceiling mount indoor unit’s performance is based on nominal operating conditions shown in the mechanical schedules.
3. Unit Cabinet:
   1. The ceiling mount indoor unit shall be no larger than 9-1/4” x 62-3/16” x 27-3/16” and weigh no more than 90 lbs.
   2. The unit shall be affixed to a separate galvanized steel back plate to secure the unit firmly to the wall.
4. Fan:
   1. Unit shall be equipped with a brushless DC fan motor drive.
   2. The wall mount shall consist of four fan speeds including: low (Lo), medium (Me), high (Hi), and high 2 (Hi2).
5. Filter
   1. The standard 1” air filter shall be made of an anti-mold polypropylene that is also a washable type.
6. Sound:
   1. The wall mount indoor unit sound pressure shall range 28 dB(A) to 35 dB(A) at low speed.
7. Electrical:
   1. The unit shall be 208-230V, 1 phase, 60 Hertz.
   2. The wall mount indoor unit shall have an acceptable voltage range of 187-255V.
   3. The control circuit between the units in the system shall use AWG18-2 type control wire.
8. Piping:
   1. Refrigerant and drain piping shall have the ability to be connected at the right, left or rear of the unit for ease of installation.

Indoor Unit – Ducted High Static

|  |  |  |  |
| --- | --- | --- | --- |
| MODEL NUMBER | NOMINAL CAPACITY(TONS) | COOLING (BTU/H) | HEATING (BTU/H) |
| HIDH015B22S | 1.3 | 15,000 | 17,000 |
| HIDH018B22S | 1.5 | 18,000 | 20,000 |
| HIDH024B22S | 2.0 | 24,000 | 27,000 |
| HIDH024B22S | 2.3 | 28,000 | 30,000 |
| HIDH030B22S | 2.5 | 30,000 | 34,000 |
| HIDH036B22S | 3.0 | 36,000 | 40,000 |
| HIDH048B22S | 4.0 | 48,000 | 54,000 |
| HIDH054B22S | 4.5 | 54,000 | 61,400 |
| HIDH072B22S | 6.0 | 72,000 | 81,000 |
| HIDH096B22S | 8.0 | 96,000 | 108,000 |

1. General:
   1. The ducted high static indoor unit shall be a built-in ceiling type.
   2. The unit shall be factory assembled, piped, and wired, as well as run tested at the factory.
   3. The unit and refrigerant pipes will be charged with dehydrated air (nitrogen gas) prior to shipment from the factory.
   4. All sizes of Ducted High Static units shall be equipped with a built-in condensate pump with 25” minimum drain lift.
   5. The unit shall have bottom access for easy service and troubleshooting.
2. Performance:
   1. Each ducted high static indoor unit’s performance is based on nominal operating conditions shown in the mechanical schedules.
3. Unit Cabinet:
   1. The cabinet shall be ceiling-concealed and ducted to the supply and return openings.
   2. The ducted high static indoor unit shall be no larger than 18-3/8” x 51-49-3/16” x 44-1/8” and weigh no more than 258 lbs.
4. Fan:
   1. Unit shall be equipped with a brushless DC fan motor drive. (PSC for 72,000 & 96,000 models)
   2. The ducted high static indoor unit shall consist of four fan speeds (two fan speeds for 72,000 & 96,000 models).
5. Filter
   1. Filter box with high efficiency filters (MERV 13) shall be made available as an option.
6. Sound:
   1. The ducted high static indoor unit sound pressure shall range 30 dB(A) to 50 dB(A) at low speed.
7. Electrical:
   1. The unit shall be 208-230V, 1 phase, 60 Hertz.
   2. The ducted high static indoor unit shall have an acceptable voltage range of 187-255V.
   3. The control circuit between the units in the system shall use AWG18-2 type control wire.
8. Static Pressure
   1. The ducted high static indoor unit shall have adjustable static pressure up to 1.16 in WG.

Indoor Unit – Ducted Medium Static

|  |  |  |  |
| --- | --- | --- | --- |
| MODEL NUMBER | NOMINAL CAPACITY(TONS) | COOLING (BTU/H) | HEATING (BTU/H) |
| HIDM006B22S | 0.5 | 6,000 | 8,000 |
| HIDM008B22S | 0.7 | 8,000 | 9,000 |
| HIDM012B22S | 1.0 | 12,000 | 13,500 |
| HIDM015B22S | 1.3 | 15,000 | 17,000 |
| HIDM018B22S | 1.5 | 18,000 | 20,000 |
| HIDM024B22S | 2.0 | 24,000 | 27,000 |
| HIDM024B22S | 2.3 | 28,000 | 30,000 |
| HIDM030B22S | 2.5 | 30,000 | 34,000 |
| HIDM036B22S | 3.0 | 36,000 | 40,000 |
| HIDM048B22S | 4.0 | 48,000 | 54,000 |
| HIDM054B22S | 4.5 | 54,000 | 61,400 |

1. General:
   1. The ducted medium static indoor unit shall be a built-in ceiling type.
   2. The unit shall be factory assembled, piped, and wired, as well as run tested at the factory.
   3. The unit and refrigerant pipes will be charged with dehydrated air (nitrogen gas) prior to shipment from the factory.
   4. All sizes of Ducted Medium Static units shall be equipped with a built-in condensate pump with 25” minimum drain lift.
   5. The unit shall have bottom access for easy service and troubleshooting.
2. Performance:
   1. Each ducted medium static indoor unit’s performance is based on nominal operating conditions shown in the mechanical schedules.
3. Unit Cabinet:
   1. The cabinet shall be ceiling-concealed and ducted to the supply and return openings.
   2. The ducted medium static indoor unit shall be no larger than 9-13/16” x 55-1/8” x 31-1/2” and weigh no more than 97 lbs.
4. Fan:
   1. Unit shall be equipped with a brushless DC fan motor drive.
   2. The ducted medium static indoor unit shall consist of four fan speeds including: low (Lo), medium (Me), high (Hi), and high 2 (Hi2).
5. Filter
   1. Filter box with high efficiency filters (MERV 13) shall be made available as an option.
6. EconoFresh (Economizer Option – 30, 36, & 48 MBH Models Only)
   1. Bolt on economizer section with return and outside air dampers shall be made available as an option.
   2. Inputs for enthalpy and CO2 sensors available to provide outside air depending on humidity or indoor air quality.
   3. Remote control switch allows control of the outside air damper to ensure minimum outside airflow is met.
7. Sound:
   1. The ducted medium static indoor unit sound pressure shall range 27 dB(A) to 34 dB(A) at low speed.
8. Electrical:
   1. The unit shall be 208-230V, 1 phase, 60 Hertz.
   2. The ducted medium static indoor unit shall have an acceptable voltage range of 187-255V.
   3. The control circuit between the units in the system shall use AWG18-2 type control wire.
9. Static Pressure
   1. The ducted medium static indoor unit shall have adjustable static pressure up to .6 in WG.

Indoor Unit – Ducted Slim

|  |  |  |  |
| --- | --- | --- | --- |
| MODEL NUMBER | NOMINAL CAPACITY(TONS) | TOTAL COOLING (BTU/H) | HEATING (BTU/H) |
| HIDS006B21S | 0.5 | 6,000 | 8,000 |
| HIDS008B21S | 0.7 | 8,000 | 9,000 |
| HIDS012B21S | 1.0 | 12,000 | 13,500 |
| HIDS015B21S | 1.3 | 15,000 | 17,000 |
| HIDS018B21S | 1.5 | 18,000 | 20,000 |

1. General:
   1. The ducted slim indoor unit shall be a built-in ceiling type.
   2. The unit shall be factory assembled, piped, and wired, as well as run tested at the factory.
   3. The unit and refrigerant pipes will be charged with dehydrated air (nitrogen gas) prior to shipment from the factory.
   4. The unit shall have a bottom or horizontal return.
   5. All sizes of Ducted Slim Units shall be equipped with a built-in condensate pump with 25” minimum drain lift.
   6. The unit shall have bottom access for easy service and troubleshooting.
2. Performance:
   1. Each ducted slim indoor unit’s performance is based on nominal operating conditions shown in the mechanical schedules.
3. Unit Cabinet:
   1. The cabinet shall be ceiling-concealed and ducted to the supply and return openings.
   2. The ducted slim indoor unit shall be no larger than 7-9/16” x 46-3/8” x 17-19/32” and weigh no more than 57 lbs.
4. Fan:
   1. Unit shall be equipped with a brushless DC fan motor drive.
   2. The ducted medium static indoor unit shall consist of four fan speeds including: low (Lo), medium (Me), high (Hi), and high 2 (Hi2).
5. Filter
   1. Filter box with high efficiency filters (MERV 13) shall be made available as an option.
6. Sound:
   1. The ducted slim indoor unit sound pressure shall range 27 dB(A) to 34 dB(A) at low speed.
7. Electrical:
   1. The unit shall be 208-230V, 1 phase, 60 Hertz.
   2. The ducted slim indoor unit shall have an acceptable voltage range of 187-255V.
   3. The control circuit between the units in the system shall use AWG18-2 type control wire.
8. Static Pressure
   1. The ducted medium static indoor unit shall have adjustable static pressure up to .20 in WG.

Indoor Unit – Dedicated Outside Air System (DOAS)

|  |  |  |  |
| --- | --- | --- | --- |
| MODEL NUMBER | NOMINAL CAPACITY(TONS) | TOTAL COOLING (BTU/H) | HEATING (BTU/H) |
| HDOA096B21S | 8 | 96,000 | 83,600 |

1. General:
2. The DOAS indoor unit shall be a built-in ceiling type.
3. The unit shall be factory assembled, piped, and wired, as well as run tested at the factory.
4. The unit and refrigerant pipes will be charged with dehydrated air (nitrogen gas) prior to shipment from the factory.
5. The DOAS unit shall be equipped with a built-in condensate pump with 25” minimum drain lift.
6. The unit shall have bottom access for easy service and troubleshooting.
7. Performance:
   1. Each DOAS indoor unit’s performance is based on nominal operating conditions shown in the mechanical schedules.
8. Unit Cabinet:
   1. The cabinet shall be ceiling-concealed and ducted to the supply and return openings.
   2. The DOAS unit shall be no larger than 19-1/8” x 50” x 44-1/8” and weigh no more than 247 lbs.
9. Fan:
   1. The DOAS unit shall have a nominal air flow of 1,236 CFM.
10. Electrical:
    1. The unit shall be 208-230V, 1 phase, 60 Hertz.
    2. The ducted high static indoor unit shall have an acceptable voltage range of 187-255V.
    3. The control circuit between the units in the system shall use AWG18-2 type control wire.
11. Static Pressure
12. The DOAS unit shall have adjustable static pressure up to 1.24 in WG.

Multi Position Air Handler

|  |  |  |  |
| --- | --- | --- | --- |
| MODEL NUMBER | NOMINAL CAPACITY(TONS) | TOTAL COOLING (BTU/H) | HEATING (BTU/H) |
| 18B | 1.5 | 18,000 | 20,000 |
| 24B | 2.0 | 24,000 | 27,000 |
| 30B | 2.5 | 30,000 | 34,000 |
| 36B/36C | 3.0 | 36,000 | 40,000 |
| 48C/48D | 4.0 | 48,000 | 60,000 |
| 60C/60D | 5.0 | 54,000 | 64,000 |

1. General:
2. Indoor mounted air-handling unit designed to provide air to a conditioned space as required to meet specified performance requirements for ventilation, heating, cooling, filtration, and air distribution. Unit shall be assembled for draw-through application and shall be arranged to discharge conditioned air up flow, down flow, or side flow as shown on the contract drawings.
3. Unit with a direct-expansion cooling coil shall have the capability to be used in a refrigerant circuit in conjunction with a field-supplied and matched air-cooled condensing unit. The unit shall be factory assembled, piped, and wired, as well as run tested at the factory. The unit and refrigerant pipes will be charged with dehydrated air (nitrogen gas) prior to shipment from the factory.
4. Performance:
   1. Each multi position air handler’s performance is based on nominal operating conditions shown in the mechanical schedules.
5. Unit Cabinet:
   1. The cabinet shall be ducted to the supply and return openings.
   2. The unit shall be no larger than 55-1/2” x 24-1/2” x 26-5/8” and weigh no more than 170 lbs.
6. Fan:
   1. The unit shall have two fan speeds including: low (Lo) and high (Hi).
7. Filter
   1. The unit shall have an integrated internal filter rack for 1” thick standard filter.
8. Electrical:
   1. The unit shall be 208-230V, 1 phase, 60 Hertz.
   2. The unit shall have an acceptable voltage range of

187-255V.

* 1. The control circuit between the units in the system shall use AWG18-2 type control wire.

1. Static Pressure
   1. The unit shall have adjustable static pressure up to .7 in WG.

EconoFresh Economizer

|  |  |  |  |
| --- | --- | --- | --- |
| MODEL NUMBER | NOMINAL CAPACITY(TONS) | TOTAL COOLING (BTU/H) | HEATING (BTU/H) |
| HIDM030B21E | 2.5 | 30,000 | 34,000 |
| HIDM036B21E | 3.0 | 36,000 | 40,000 |
| HIDM048B21E | 4.0 | 48,000 | 54,000 |

1. General:
   1. The EconoFresh unit shall seamlessly integrate with the VRF system and be paired with the ducted medium static unit to provide outside air/free cooling, up to 100%, when the outside conditions are favorable.
   2. The EconoFresh unit shall have provisions for input from optional CO2 or enthalpy sensors for control based on indoor air quality or temperature/humidity.
   3. The unit shall be equipped with a remote control setting for the outside air damper opening to ensure that minimum outside airflow requirements are met.

**Part 5 – CONTROLLERS**

1. CIS01-SIMPLIFIED WIRED CONTROLLER

* On/Off Mode
* Temperature
* Fan Speed
* Louver Angle
* Automatic Reset of Temp.
* Setpoint Temperature
* Setpoint Limit
* Backlit display
* Built-in thermistor
* Controls 1 to 16 indoor units
* (same settings)
* Error code diagnosis
* Adjustable fan speed
* Louver control
* Small size for discreet applications

1. CCM01- MINI CENTRAL CONTROLLER

* Controls up to 32 groups of indoor units (maximum 160 units)
* Easy-to-use touchscreen interface
* Color-coded graphics for quick reference
* Set up to 10 on/off times per day
* Up to 8 Mini Controllers can be connected to the H-LINK II segment
* External input/output terminals are provided as standard.
* External signals enable the following options: o Central operation/stop o Demand control
* Emergency stop
* Central operation output
* Central alarm output

1. CCL01- LARGE CENTRAL CONTROLLER

* Controls up to 64 groups of indoor units
* (maximum 160 units)
* Easy-to-use touchscreen interface
* Color-coded graphics for quick reference
* Set up to 10 on/off times per day
* Up to 8 Large Controllers can be connected to the H-LINK II segment
* External input/output terminals are provided as standard. External signals enable the following options:
* Central operation/stop
* Demand control
* Emergency stop
  + - Central operation output
    - Central alarm output
* Control Functions
* Run/Stop

1. CIW01-WIRED ZONE CONTROLLER

* Backlit display
* Built-in thermistor
* Standard wall controller
* Controls temperature, mode, fan speed
* Seven-day timer with multiple setpoints
* Controls up to 16 indoor units
* Built-in 23-hour timer
* Room name and service company name programmable
* Help menus and error code diagnosis
* Large LCD display permits users to see the operating conditions and settings
* The timer can be set at half-hour intervals
* Monitors the operating conditions in the system, and an alarm is issued if a problem occurs.
* A “self-diagnosis function” checks for problems on:
* printed boards in indoor and
* outdoor units
* Temperature range limit
* Individual function lockout. (mode, temperature, fan speed)

1. CIR01 WIRELESS CONTROLLER

* Controls up to 16 indoor units
* Built-in 23-hour timer
  + On/Off
  + Mode
* Temperature
* Fan Speed
* Louver Angle
* On Timer
* Off Timer
* Filter Sign Reset

1. CBN02 VRF SMART GATEWAY

* Supports up to 64 VRF systems, up to 160 Indoor Units, and up to 200 total Indoor and Outdoor Units
* Integrates with the Metasys and FX building automation systems
* Integrates with third party building automation systems supporting the BACnet IP protocol
* BACnet Gateway (B-GW) device profile
* BACnet IP, (Annex J), BACnet Broadcast Management Device (BBMD)"
* Connects up to 4 Large Central Controllers (CCCL01) simultaneously to the same H-LINK II segment
* Includes a Wi-Fi antenna for access via Laptop, Smartphone, etc.