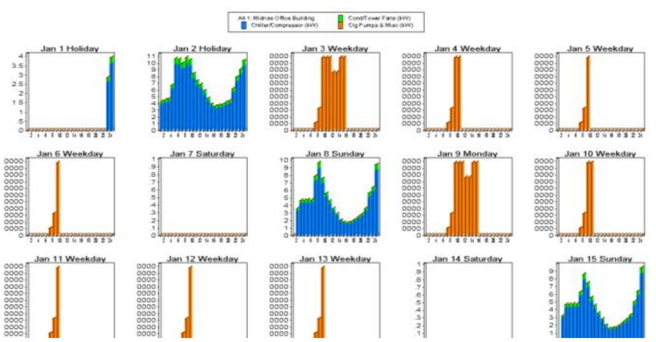
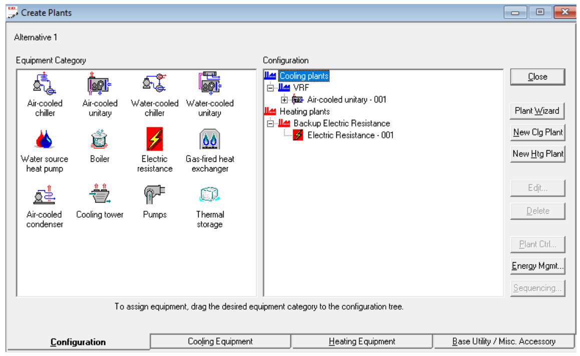
TRANE TRACE™ 700 Building Energy Modeling Guide for LG Multi V™





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Introduction

Overview

The TRANE TRACE™ 700 Building Energy Modeling Guide for LG Multi V ™ provides step-by-step instructions in modeling LG Multi V systems. The definitions of the code-words are based from Modeling Guide TRANE TRACE™700 Building Energy and Economic Analysis version 6.3.

Disclaimer

This building energy modeling guide and TRACE™ 700 library files should be used as a guideline only. Building load/energy has been approximated for modeling purposes or input value of equipment (capacity, power input, etc.), and actual results may vary accordingly. The conclusions of this modeling guide and TRACE™ 700 library file do not guarantee actual energy costs or savings.

This modeling guide and TRACE™700 library file are intended as a design-and analysis guide to help designers optimize the design of the LG Multi V ™ VRF systems based on energy utilization. Modeling accuracy is highly dependent on user-supplied data. It is a user's responsibility to understand how the data entered affects program output, and any predefined TRACE™ 700 library files are used only as guidelines for entering the data. The calculation results and reports by this guide and TRACE™ 700 library file are meant to aid the system designer and are not a substitute for design services, judgment, or experience.

Designing VRF Systems with TRANE TRACE™ 700

This section shows how to design VRF systems in TRANE TRACE™ 700. All of the VRF designs requires the following five identical procedures:

1. **Define the Problem.**

   Define a scope of a building project

2. **Gather Data.**

   A data of building, its environment and its HVAC equipment is necessary and a details of the data are shown below:

   - Weather of a building location
   - Building material of interior and exterior includes walls, roofs, windows, doors, and floors.
   - Size and orientation of a building including wall, roof, windows, door and floor areas, solar exposure and shading.
   - Internal load characteristics determined by levels and schedules for occupancy, lighting systems, equipment, and ventilation of a building.
   - HVAC equipment, controls and its components.
   - Utility rates applied for a building.

3. **Enter Data in TRANE TRACE™ 700**

   Project Navigator toolbar shows the sequence of building data to be entered. Enter weather, building and equipment data in the Project Navigator windows.

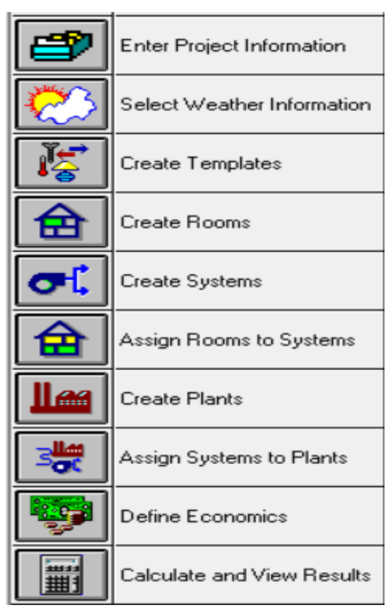

Figure 1: Project Navigator Toolbar

a. **How to Enter Weather Information**

- To open the Weather window
  - Click Weather icon located next to "Select Weather Information" in the Project Navigator toolbar.
  - Click **Actions** in the menu bar > **Select Weather Information**.
- Click a region of building in the weather map and select a name of the building region from the dropdown menus. Make sure it appear correctly in the weather location box.
- Click **OK** to return to the Project Navigator toolbar.

b. **How to Create Spaces/Rooms**

TRACE™ 700 defines a room to be the smallest space where you can calculate heating and cooling loads. You can also combine these individual rooms into zones and/or systems to perform complex design calculations (i.e. design airflows, coil capacities, design temperatures, etc.). A room can be made of opened and/or closed spaces. Here are load factors that determine heating and cooling loads:

- Size and mass of room
- Room design thermostat settings
- Size, construction, and direction of external walls and roofs
- Size, properties, and direction of external windows and skylights
- Internal loads, such as people, lights, and miscellaneous equipment
- Infiltration
- Ventilation requirements
- Partition walls and exposed or slab-on-grade floors

c. **How to Enter System Data**

Next, you need to define an air distributor, airside system. In the "Create System- Selection" tab, select **System Category** and **System Type** of a building. Room airflows, coil loads, fan sizes, and other system design data are determined by calculation of heating and cooling loads.

4. **Create Design Reports with TRANE TRACE™ 700**

   When a project file is finished, you need to define design, system, energy and economics of a building.

   How to perform calculation:

   a. Click the **Calculate and View Results** icon on Project Navigator toolbar or click **Actions** in the menu bar > select **Calculate**.
   b. Click the **Calculate** button in the Calculate and View Results window and select reports to print at your selection.

5. **Select Equipment.**

   The TRACE™ 700 reports recommend in selecting appropriate cooling and heating LG VRF models of outdoor units, indoor units, and control equipment. LG provide a wide range of options of the VRF systems. Please contact your local LG sales representatives for more details.

Importing Library

How to import library file into TRANE TRACE™ 700:

To open the **Library/Template Editor** window:

1. Click **Libraries** in the menu bar > select **Equipment** from the dropdown menu > select **Cooling.**

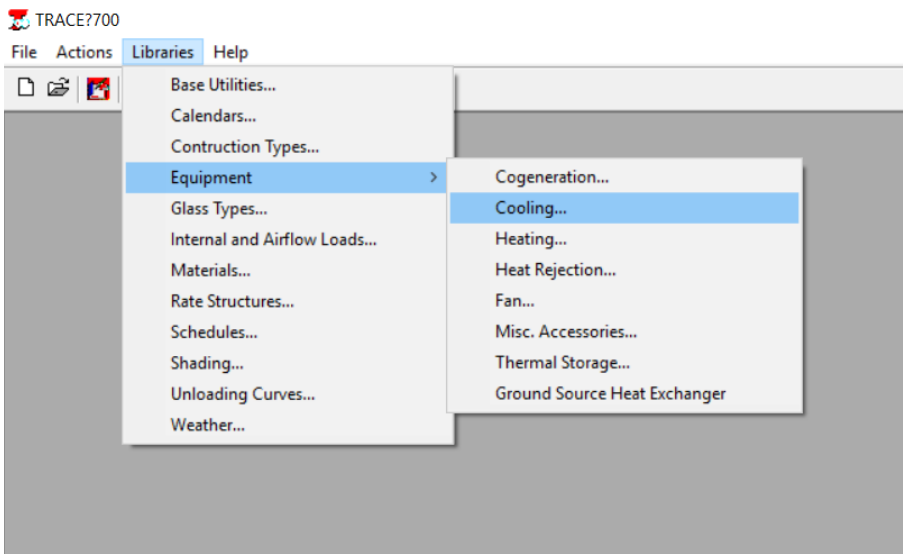

Figure 2: Libraries Dropdown Menu

2. In Library and Template Editors window, click **File** in the menu bar > select **Export Custom Library** from the dropdown menu**.**

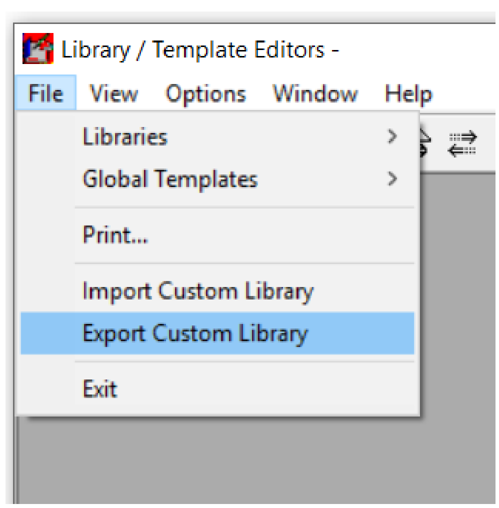

Figure 3: File Dropdown Menu

3. Rename the **library.exp** file to **original_libray.exp** so you can return to the default file if necessary.
4. Close the Library Export window.

Testing the Library File

1. Click **Libraries** in the menu bar > select **Equipment** from the dropdown menu > select **Cooling.**
2. View Equipment Type lists of the Cooling Equipment.

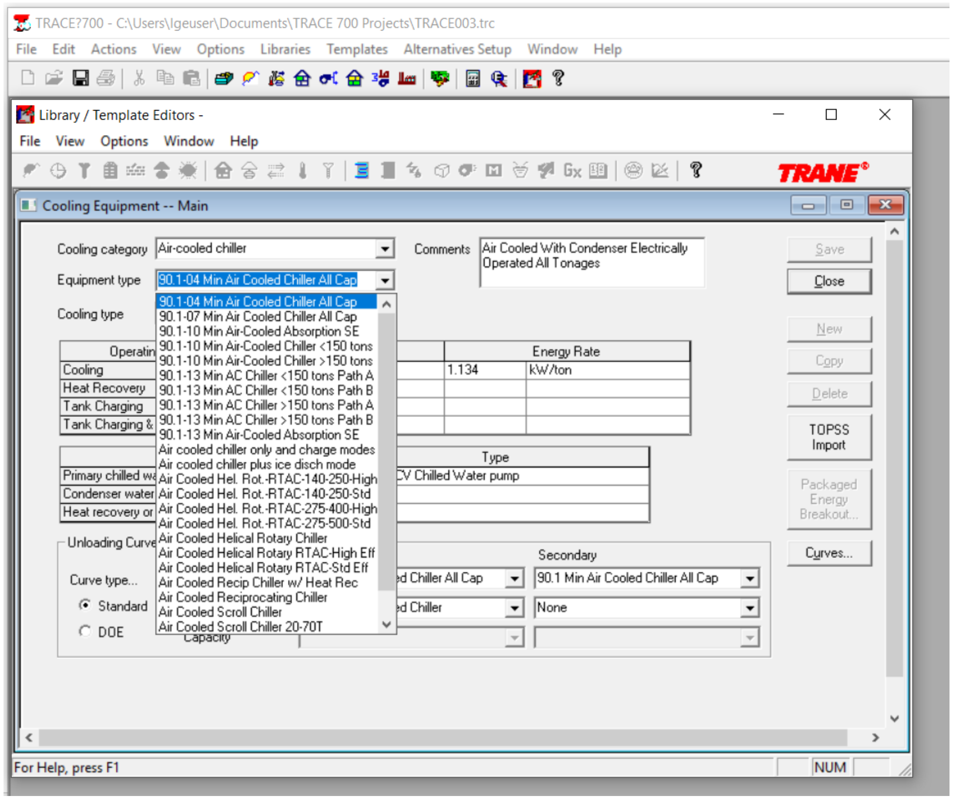

Figure 4: Cooling Equipment Window

3. Close the Cooling Equipment window.
4. Close the Library/Template Editors window.

Importing LG Multi V ™ Library File

How to import LG Multi V ™ library file into TRACE™ 700:

1. Obtain the Multi V ™ library files from your LG Sales Representative.
2. Double click the TRACE™ 700 icon on your desktop to open the program.
3. Click **Actions** in the menu bar > select **Edit Library/Template** from the dropdown menu to open Library/ Template Editors.

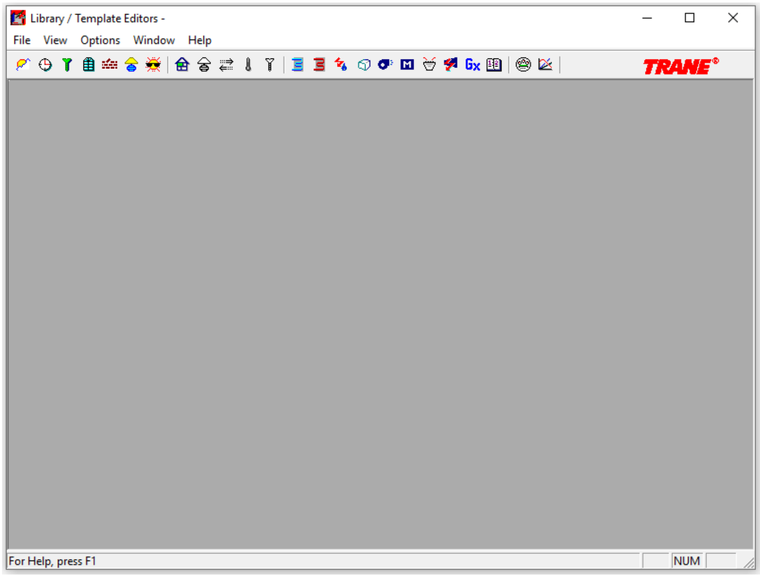

Figure 5: Library/Template Editors Window

4. In the Library and Template Editors window, click **File** > select **Import Custom Library** from the dropdown menu.

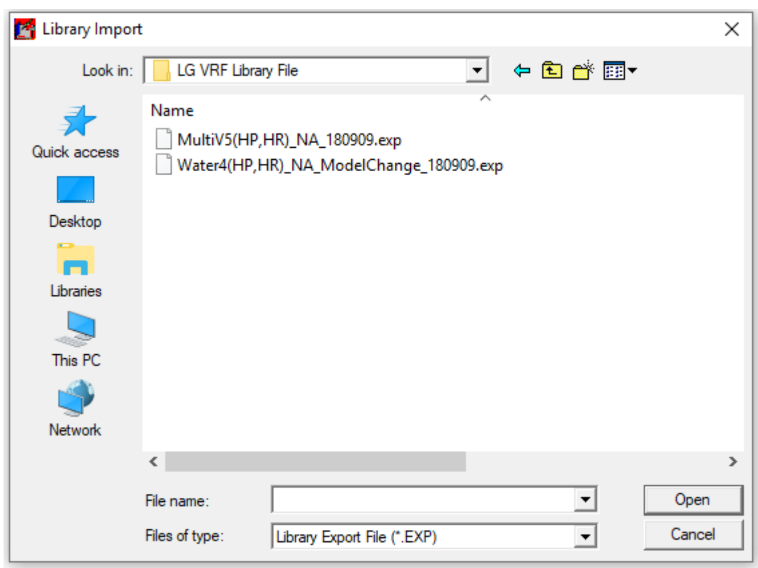

Figure 6: Library Import Window

Note: While importing the library file, if shown as an option to overwrite an existing duplicate library data for LG Multi V ™ products from the import file, set to "yes". It will overwrite an existing database.

5. Close the Library Import window.
6. Close the Library/Template Editors window.
7. Click **File** > **Exit** to close the program.

LG Multi V ™ (Air Source) System

Create Systems

How to create a system:

1. After setting up the project building, double click the box under Alternative 1 and **Create Systems**.
2. Select **Variable Refrigerant Volume** under System type for system-001. Click the **Apply** button.

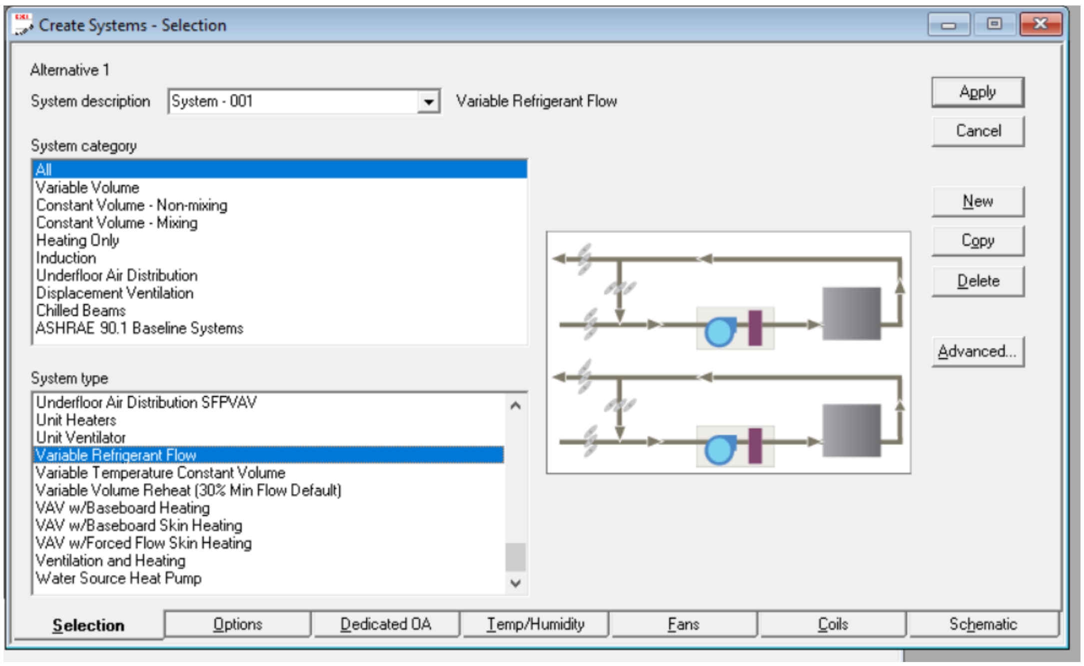

Figure 7: Create System Window

Select Fan

1. Click the **Fans** button on the bottom of the toolbox in the Create Systems window.
2. Select **VRV Indoor Fan** as the Primary Fan.
3. Enter the static pressure and the full load energy rate. Different type of LG indoor units have different static pressure and full load energy rate. No library files are provided for the zone level indoor VRF equipment.
4. Select an indoor unit (IDU) for each zone/space using LG Multi V ™ indoor units.
5. Set total static pressure of the indoor unit fan at design flow rate. Refer to the LG's engineering manual for LG Multi V ™ Indoor units and building design data. Pressure losses should include filters, coils, and distribution system. Design full-load power of the supply fan per unit of supply air flow rate at sea level.
6. TRACE™ 700 currently does not utilize library files for zone level air side equipment. Instead, a system type is defined in TRACE™, and that system is assigned to the appropriate TRACE™ "Plant" (each individual outdoor VRF compressor unit). At the system level only a single fan definition exists for the entire system, so an average assumed fan power density must be used for the system which is an average representation of the associated zones attached to that system.

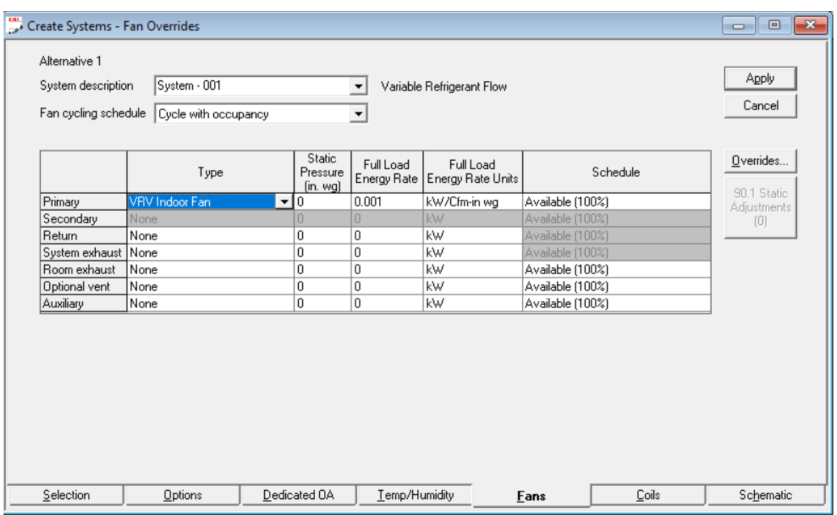

Figure 8: Fan Selection Window – Air Source

7. Click the **Apply** button.
8. Click the **Close** to close the Create Systems – Fan Overrides window.

Create Plants

How to create plants:

1. Double click the box under Alternative 1 and **Create Plants**.
2. In **Configuration** tab, drag the appropriate icons from the **Equipment Category** box to the **Configuration** box to assign heating and cooling plants. (LG VRF: Cooling – Air-cooled Unitary & Heating – Electric Resistance)
3. Select the plant and click the **Edit** button to rename the cooling plant as **VRF** and the heating plant as **Backup Electric Resistance.**

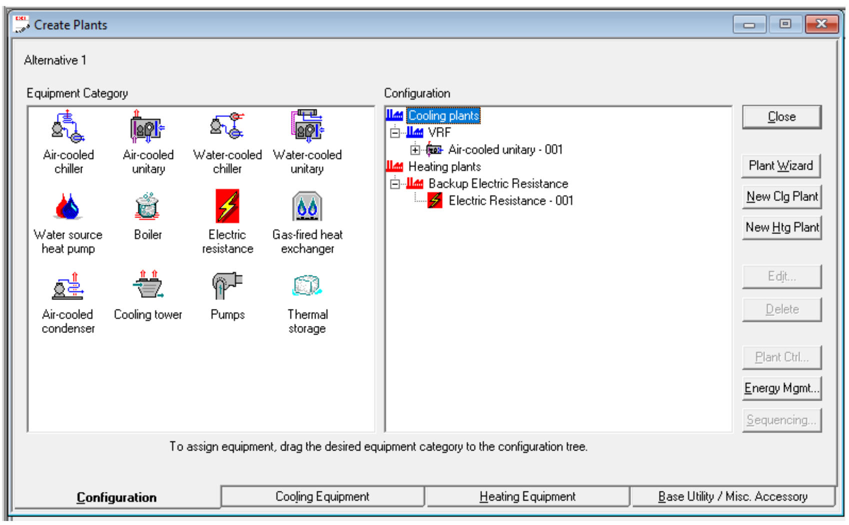

Figure 9: Create Plant Window – Air Source

4. In **Cooling Equipment** tab, select the desired LG VRF series and model types in the **Equipment type**. LG have two categories of plants available: VRF Heat Pump and VRF Heat Recovery.

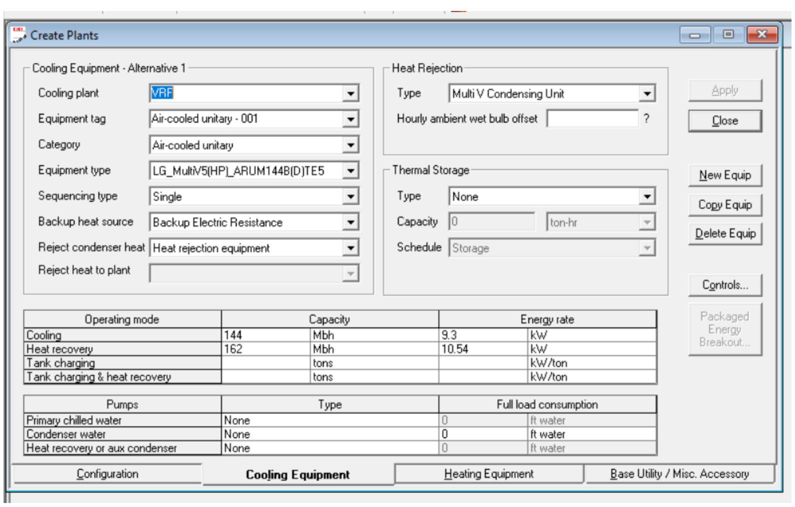

Figure 10: Equipment Selection Window

5. Select **Backup Electric Resistance** from the **Backup Heat Source** dropdown menu.
6. In the Heating Equipment tab, refine a backup heating plant, if necessary.
7. Click the **Apply** button and close the Create Plants window.

How to assign systems to plants:

1. Double click the box under Alternative 1 and **Assign Systems to Plants.**
2. **Drag** the Cooling system under the cooling plant while heating system to the heating plant
3. Close the Assign System Coils window.

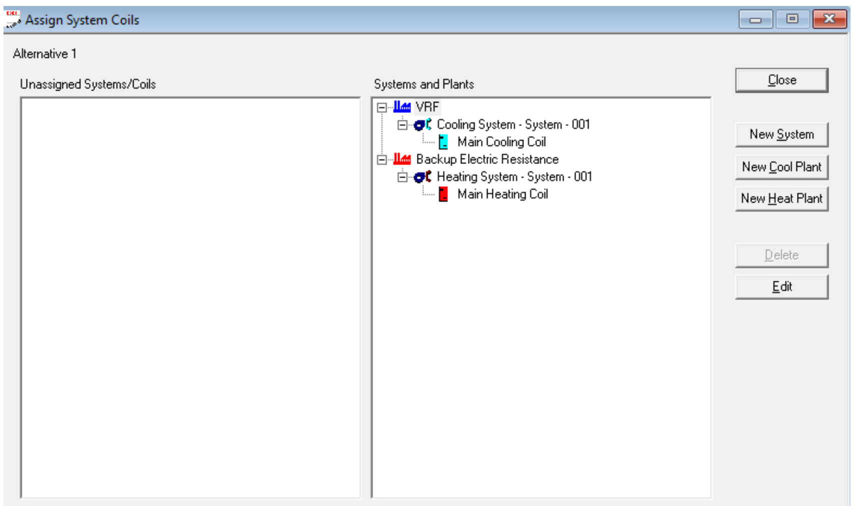

Figure 11: Assign Systems to Plants Window – Air Source

Note[1]: The VRF Heat Recovery option is able to recover heat from one VRF indoor unit and share it with other indoor units that are connected to the same refrigerant circuit. TRACE™ assumes that heat can be recovered between all zones that are assigned to the system. To accurately model VRF heat recovery, the design capacity of all the indoor units (zones) assigned to the system should be no larger than the available capacity of the VRF Heat Recovery outdoor unit. This might require the creation of several systems and several cooling plants. The TRACE™ 700 for air source heat pump system requires the option for the heat reject fan power however, LG Multi V ™ Air performance library data are already included fan power information in the performance curves.

LG Multi V ™ Water (Water Source) System

A WLHP loop is primarily intended to serve water-loop heat-pump systems. Individual WLHP units operate according to their zone thermostats, and reject heat to or take heat from this loop. Depending on the relative number of units operating in the heating or cooling mode, the loop will be thermally unbalanced and the loop temperature will either rise or fall. One or more boilers and one or more cooling towers operate to keep the loop within specified limits. In addition to WLHP units, any cooling unit with a water cooled condenser may be assigned to this loop.

Create Systems

How to create systems:

1. Double click the box under Alternative 1 and **Create Systems**.
2. Select **Water Source Heat Pump** under System type for system-001. Click the **Apply** button.

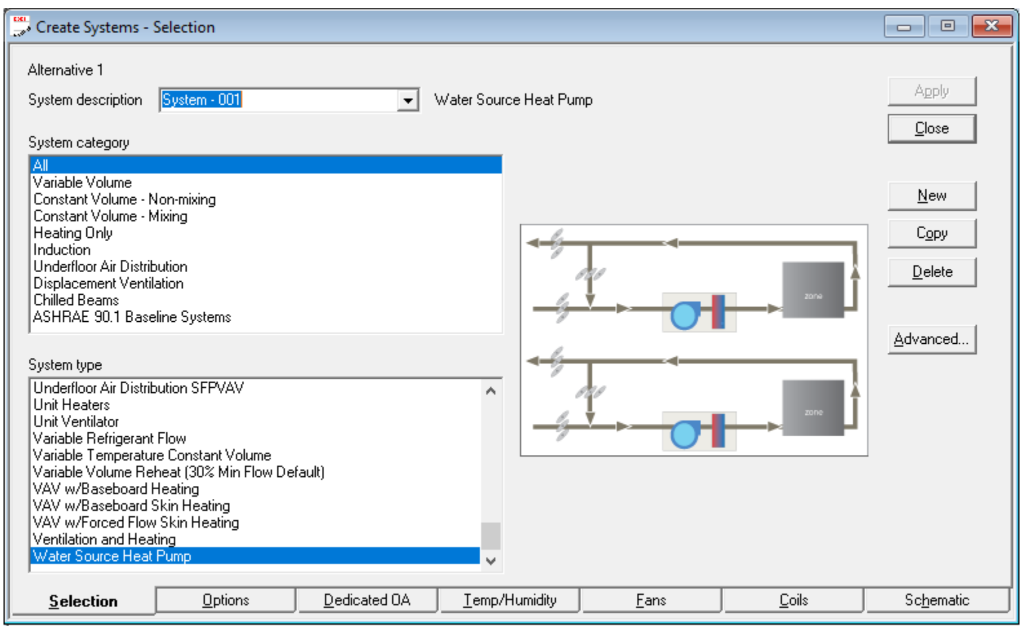

Figure 12: System Selection Window

Fan selection

1. Click the **Fans** button on the bottom of the toolbox in the Create Systems window.
2. Select **Hydronic in Heat Pump Fan** as the Primary Fan. Enter the static pressure and the full load energy rate. Different type of LG indoor units have different static pressure and full load energy rate.

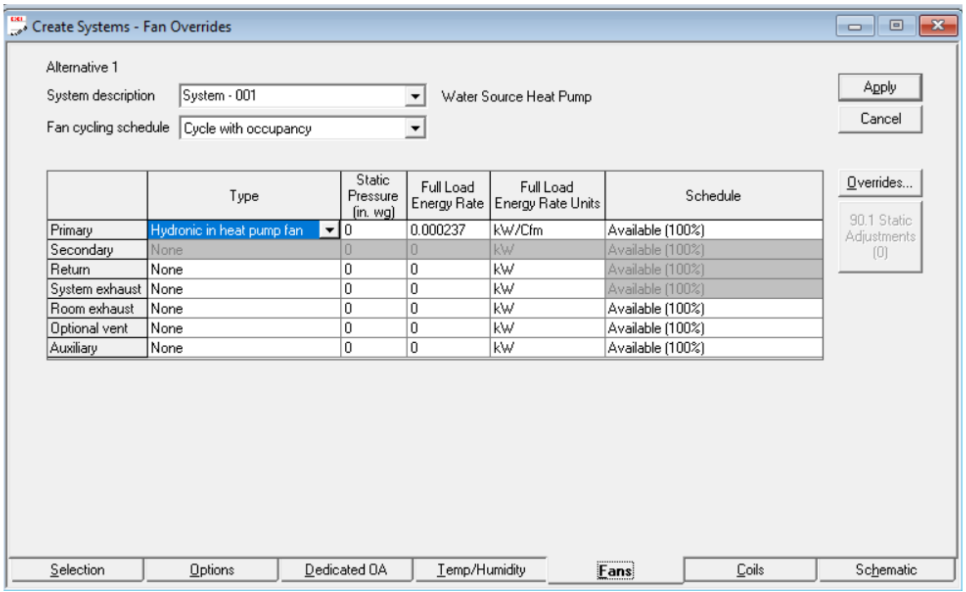

Figure 13: Fan Selection Window – Water Source

3. Set the total static pressure of the indoor unit fan at design flow rate. Refer to the LG's engineering manual for LG Multi V ™ Indoor units and building design data. Pressure losses should include filters, coils, and distribution system.

Create Plants

1. Double click the box under Alternative 1 and **Create Plants**.
2. In **Configuration** tab, drag the appropriate icons from the **Equipment Category** box to the **Configuration** box to assign each of heating and cooling plant. (LG VRF: Cooling – Water Source Heat Pump & Heating – Boiler)
3. Select the plant and click the **Edit** button to rename the cooling plant as **WSHP System** and the heating plant as **Backup Boiler.**

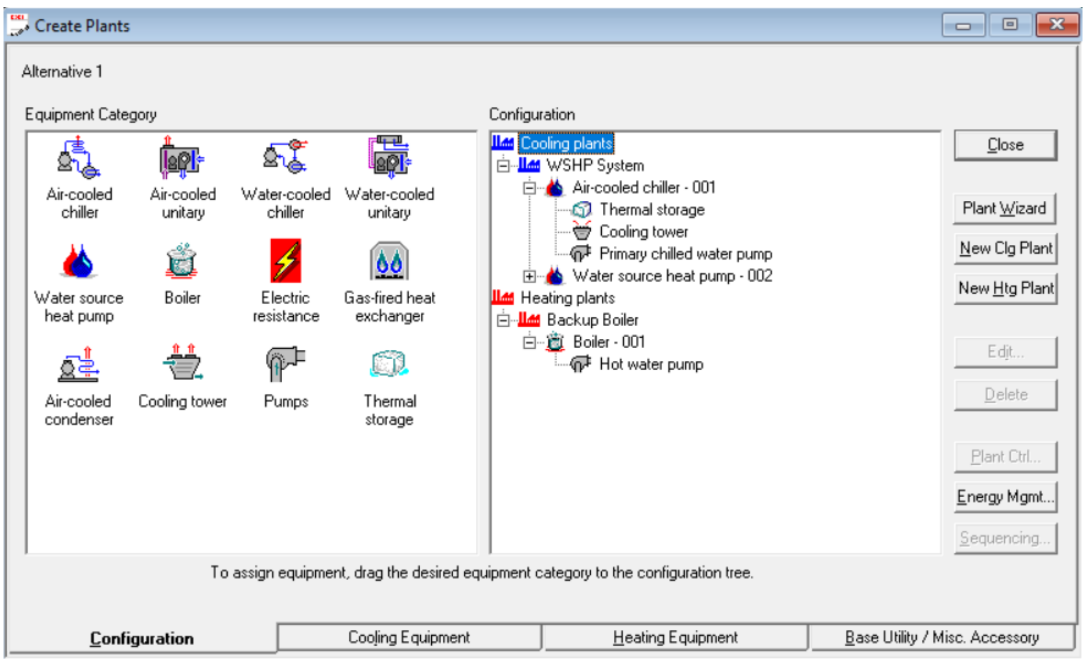

Figure 14: Create Plants Window – Water Source

4. In **Cooling Equipment** tab, select the desired LG VRF series and model types in the **Equipment type**.
5. Enter the full-load consumption of the pump that serves the common water loop—the primary chilled-water pump.
6. Click Controls tab to assign the excess heat from the common water loop to loads served by the heating plant identified as the energy source.

Note: Do not remove thermal storage. The water loop is modeled as a special thermal storage type in TRACE™ 700. Removing the thermal storage eliminates the water loop from the simulation.

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7. Be sure to apply your changes. On the Heating Equipment tab, pick the boiler that most closely matches the anticipated performance.
8. Enter the full-load consumption of the pump that circulates hot water from the boiler.

Note: The minimum operating condenser temperature of the selected heat pump determines when the boiler turns on to maintain the condenser water temperature. To view or alter this entry, use the Library/Template Editors program.

How to assign systems to plants:

1. Double click the box under Alternative 1 and **Assign Systems to Plants.**
2. **Drag** the Cooling system under the cooling plant while heating system to the heating plant.
3. Close the Assign System Coils window.

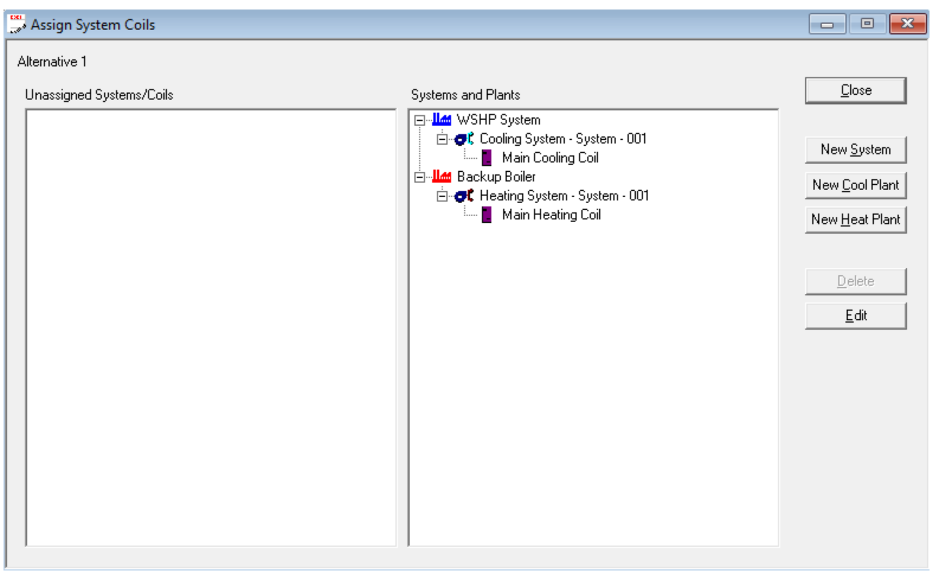

Figure 15: Assign Systems to Plants Window – Water Source

Dedicated Outdoor Air System /Energy Recovery Ventilator

An enthalpy wheel is a revolving cylinder filled with a desiccant treated medium that is suited for transferring sensible and latent heat. Heat transfer occurs when adjacent air streams (usually supply and exhaust) pass through the wheel in a counter flow arrangement. The exchange medium inside the wheel collects sensible heat from the warmer of the two air streams and releases it in the cooler air stream. Latent heat transfer occurs as the medium collects moisture from the more humid air stream and releases it, through evaporation, in the drier air stream.

Like other energy-recovery devices, enthalpy wheels can yield significant energy savings in systems that exhaust large amounts of air. Their recent growth in popularity can be attributed, at least in part, to the increased ventilation requirements mandated by ASHRAE Standard 62 to provide acceptable indoor air quality.

Application considerations

The air streams targeted for energy transfer (usually exhaust air and ventilation air) must be situated near each other.

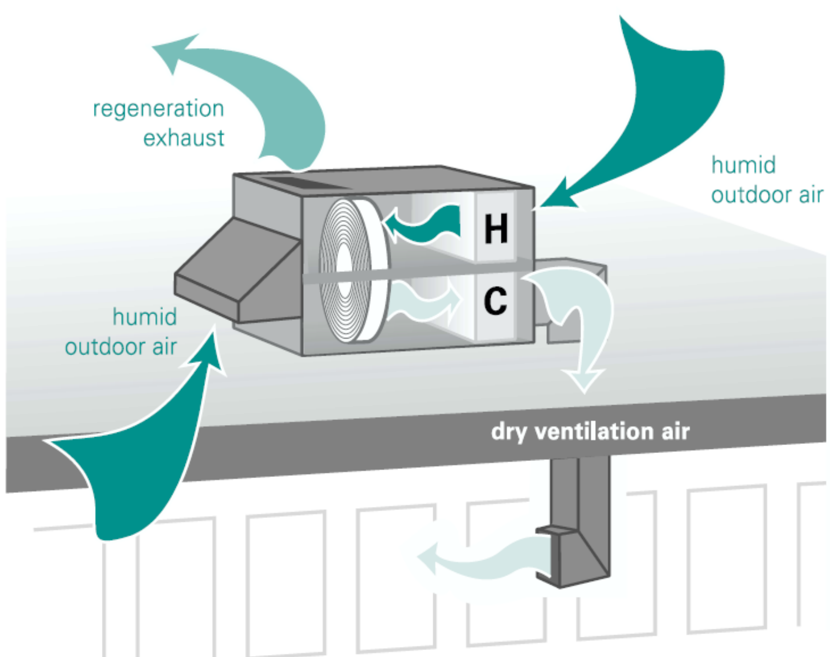

Figure 16: Enthalpy wheel

Enthalpy wheels can recover both latent heat and sensible heat with an effectiveness that typically ranges from 65 percent to 80 percent. Adding a wheel usually increases the system static pressure by 0.4 in. wg to 0.7 in. wg.

Cross-contamination between air streams is possible. To minimize air carryover in critical applications, add an effective purge arrangement. Placement of the fan in relation to the wheel should promote leakage from the outdoor (ventilation) air stream to the exhaust air stream rather than the reverse.

The relatively compact size of an enthalpy wheel can permit factory installation in air handlers, rooftop air conditioners, and some terminal devices such as unit ventilators.

Climates that economically favor heat pumps are good candidates for successful enthalpy-wheel applications. When applied in cold climates, it may be necessary to supplement the heating capacity of the wheel by adding preheat.

Sample Scenario

The air-distribution system for a building includes an enthalpy wheel with an effectiveness of 70 percent. The wheel pre-conditions the outdoor air entering the building by exchanging both sensible and latent heat with the main exhaust-air stream.

When operating in the heating mode, the wheel warms and humidifies the outdoor air; during the cooling mode, it cools and dehumidifies.

Page 4-22 illustrates how to model the enthalpy wheel in this example.

After choosing an airside system:

1. Pick the desired type of exhaust-air heat recovery from the options available. For this example, select enthalpy wheel. By default, its process air stream is located on the ventilation deck.

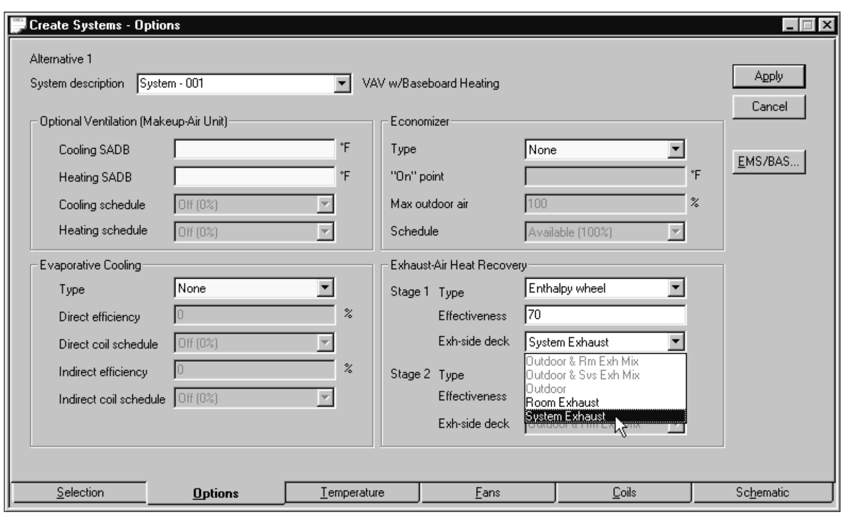

Figure 17: Exhaust-Air Heat Recovery

2. Describe the wheel's effectiveness—that is, how efficiently it recovers energy.

3. Identify the scavenger air stream by describing the location of the exhaust side deck.
4. Choose the schedule that describes when the enthalpy wheel is permitted to operate.

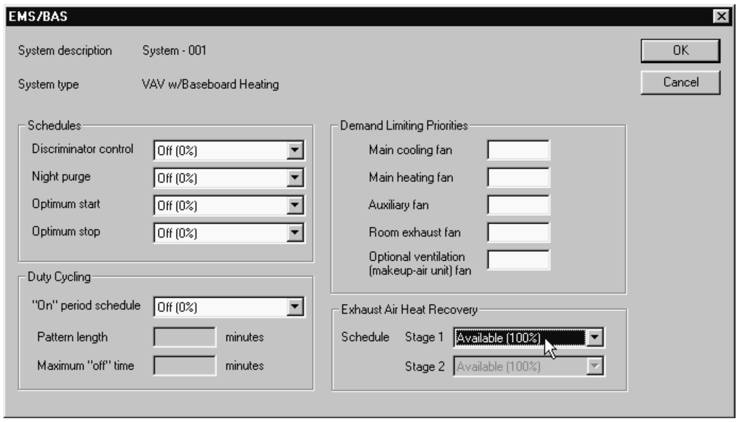

Figure 18: Schedule of Exhaust Air Heat Recovery

Appendix: LG Multi V ™ performance Data Library

Please visit https://www.lghvac.com/ to contact LG Multi V ™ Sales Representatives.

Design Parameters

For more detail info, please contact to LG Electronics USA, Inc. or LG LG Multi V ™ Sales Representatives.

LG Multi V ™ VRF (air)

	Cooling				Heating			
Model Name	**Capacity (MBh)**	**Power Input (kW)**	**EER**	**COP**	**Capacity (MBh)**	**Power Input (kW)**	**EER**	**COP**
ARUM072B(D)TE5	72	4.28	16.82	**4.9**	81	5.39	15.0	**4.4**
ARUM096B(D)TE5	96	5.33	18.01	**5.3**	108	6.74	16.0	**4.7**
ARUM121B(D)TE5	120	7.72	15.54	**4.6**	135	9.2	14.7	**4.3**
ARUM144B(D)TE5	144	9.3	15.48	**4.5**	162	10.54	15.4	**4.5**
ARUM168B(D)TE5	168	12.23	13.74	**4.0**	189	13.98	13.5	**4.0**
ARUM192B(D)TE5	192	13.61	14.11	**4.1**	216	15.46	14.0	**4.1**
ARUM216B(D)TE5	216	15.37	14.05	**4.1**	243	17.75	13.7	**4.0**
ARUM241B(D)TE5	240	16.8	14.29	**4.2**	243	17.75	13.7	**4.0**
ARUM264B(D)TE5	264	17.56	15.03	**4.4**	297	20.72	14.3	**4.2**
ARUM288B(D)TE5	288	18.94	15.21	**4.5**	324	22.2	14.6	**4.3**
ARUM312B(D)TE5	312	20.7	15.07	**4.4**	351	24.49	14.3	**4.2**
ARUM336B(D)TE5	336	23.09	14.55	**4.3**	378	26.95	14.0	**4.1**
ARUM360B(D)TE5	360	24.67	14.59	**4.3**	405	28.29	14.3	**4.2**
ARUM384B(D)TE5	384	27.6	13.91	**4.1**	432	31.73	13.6	**4.0**
ARUM408B(D)TE5	408	28.98	14.08	**4.1**	459	33.21	13.8	**4.1**
ARUM432B(D)TE5	432	30.74	14.05	**4.1**	486	35.5	13.7	**4.0**
ARUM456B(D)TE5	456	30.81	14.80	**4.3**	513	36.15	14.2	**4.2**
ARUM480B(D)TE5	480	32.39	14.82	**4.3**	540	37.49	14.4	**4.2**
ARUM504B(D)TE5	504	35.32	14.27	**4.2**	567	40.93	13.9	**4.1**

LG Multi V ™ VRF (water)

	Cooling (EWT = 86 °F/ RA = 67°F WB)			Heating (EWT = 68 °F / RA = 70°F DB)		
208-230V	**Capacity (MBh)**	**Power Input (kW)**	**COP**	**Capacity (MBh)**	**Power Input (kW)**	**COP**
ARWN(B)072BAS4	72	3.91	**5.40**	79.3	3.96	**5.87**
ARWN(B)096BAS4	96	5.41	**5.20**	105.7	5.46	**5.67**
ARWN(B)121BAS4	120	7.03	**5.00**	132.1	7.09	**5.46**
ARWN(B)144BAS4	144	8.79	**4.80**	158.5	8.83	**5.26**
ARWN(B)168BAS4	168	9.32	**5.28**	185	9.42	**5.76**
ARWN(B)192BAS4	192	10.94	**5.14**	211.4	11.05	**5.61**
ARWN(B)216BAS4	216	12.7	**4.98**	237.8	12.79	**5.45**
ARWN(B)288BAS4	288	17.58	**4.80**	317	17.66	**5.26**
ARWN(B)360BAS4	360	21.49	**4.91**	396.3	21.62	**5.37**
ARWN(B)432BAS4	432	26.37	**4.80**	475.5	26.49	**5.26**
460V	**Capacity (MBh)**	**Power Input (kW)**	**COP**	**Capacity (MBh)**	**Power Input (kW)**	**COP**
ARWN(B)072DAS4	72	3.98	**5.30**	79.3	3.96	**5.87**
ARWN(B)096DAS4	96	5.41	**5.20**	105.7	5.46	**5.67**
ARWN(B)121DAS4	120	6.9	**5.10**	132.1	7.09	**5.46**
ARWN(B)144DAS4	144	8.12	**5.20**	158.5	8.83	**5.26**
ARWN(B)168DAS4	168	9.66	**5.10**	185	9.42	**5.76**
ARWN(B)192DAS4	192	11.26	**5.00**	211.4	11.05	**5.61**
ARWN(B)240DAS4	240	13.53	**5.20**	264.2	13.3	**5.82**
ARWN(B)288DAS4	288	16.56	**5.10**	317	17.66	**5.26**
ARWN(B)336DAS4	336	19.32	**5.10**	369.9	19.48	**5.57**
ARWN(B)384DAS4	384	22.52	**5.00**	422.8	22.67	**5.47**
ARWN(B)480DAS4	480	27.5	**5.12**	528.4	27.51	**5.63**
ARWN(B)576DAS4	576	33.78	**5.00**	634.1	34.01	**5.46**

LG Multi V ™ VRF Indoor Units

Non-ducted Type

Type	Model	Capacity (MBh)	Max Input kW	CFM (High)	Power Input(kW) High Mode
4Way 2X2 CST	ARNU053TRD4	5.5	0.03	265	**0.013**
4Way 2X2 CST	ARNU073TRD4	7.5	0.03	265	**0.013**
4Way 2X2 CST	ARNU093TRD4	9.6	0.03	283	**0.014**
4Way 2X2 CST	ARNU123TRD4	12.3	0.03	307	**0.017**
4Way 2X2 CST	ARNU153TRD4	15.4	0.03	388	**0.024**
4Way 2X2 CST	ARNU183TQD4	19.1	0.03	396	**0.025**
4Way 3X3 CST	ARNU243TPC4	24.2	0.033	600	**0.031**
4Way 3X3 CST	ARNU283TPC4	28	0.033	671	**0.04**
4Way 3X3 CST	ARNU073TNA4	7.5	0.144	459	**0.018**
4Way 3X3 CST	ARNU093TNA4	9.6	0.144	477	**0.019**
4Way 3X3 CST	ARNU123TNA4	12.3	0.144	494	**0.022**
4Way 3X3 CST	ARNU153TNA4	15.4	0.144	530	**0.025**
4Way 3X3 CST	ARNU183TNA4	19.1	0.144	565	**0.027**
4Way 3X3 CST	ARNU243TNA4	24.2	0.144	742	**0.051**
4Way 3X3 CST	ARNU363TNC4	36.2	0.144	883	**0.07**
4Way 3X3 CST	ARNU243TMA4	24.2	0.144	777	**0.047**
4Way 3X3 CST	ARNU283TMA4	28	0.144	812	**0.052**
4Way 3X3 CST	ARNU363TMA4	36.2	0.144	918	**0.064**
4Way 3X3 CST	ARNU423TMC4	42	0.144	1,059	**0.104**
4Way 3X3 CST	ARNU483TMC4	48.1	0.144	1,130	**0.12**
1Way CST	ARNU073TUD4	7.5	0.04	290	**0.02**
1Way CST	ARNU093TUD4	9.6	0.04	325	**0.022**
1Way CST	ARNU123TUD4	12.3	0.04	353	**0.024**
1Way CST	ARNU183TTD4	19.1	0.07	470	**0.038**
1Way CST	ARNU243TTD4	24.2	0.07	515	**0.051**
2Way CST	ARNU183TSA4	19.1	0.07	459	**0.034**
2Way CST	ARNU243TSA4	24.2	0.07	601	**0.04**
Wall Mount	ARNU053SJA4	5.5	0.021	230	**0.009**
Wall Mount	ARNU073SJA4	7.5	0.021	247	**0.01**
Wall Mount	ARNU093SJA4	9.6	0.021	290	**0.012**
Wall Mount	ARNU123SJA4	12.3	0.021	336	**0.016**
Wall Mount	ARNU153SJA4	15.4	0.021	371	**0.021**
Wall Mount	ARNU183SKA4	19.1	0.0395	441	**0.023**
Wall Mount	ARNU243SKA4	24.2	0.0395	494	**0.039**
Wall Mount	ARNU303SVA4	30	0.104	918	**0.054**
Wall Mount	ARNU363SVA4	35.5	0.104	812	**0.085**

Ducted Type

Type	Model	Capacity (MBh)	Max Input kW	CFM (High)	Power Input(kW) High Mode
Vertical Air Handling Unit	ARNU123NJA4	12	0.228	530	**0.080**
Vertical Air Handling Unit	ARNU183NJA4	18	0.228	580	**0.090**
Vertical Air Handling Unit	ARNU243NJA4	24	0.228	710	**0.120**
Vertical Air Handling Unit	ARNU303NJA4	30	0.228	880	**0.180**
Vertical Air Handling Unit	ARNU363NJA4	36	0.228	990	**0.230**
Vertical Air Handling Unit	ARNU423NKA4	42	0.366	1,250	**0.260**
Vertical Air Handling Unit	ARNU483NKA4	48	0.366	1,400	**0.330**
Vertical Air Handling Unit	ARNU543NKA4	54	0.366	1,475	**0.370**
Ducted(Low)	ARNU073L1G4	7.5	0.04	270	**0.031**
Ducted(Low)	ARNU093L1G4	9.6	0.04	320	**0.039**
Ducted(Low)	ARNU123L2G4	12.3	0.085	360	**0.041**
Ducted(Low)	ARNU153L2G4	15.4	0.085	450	**0.056**
Ducted(Low)	ARNU183L2G4	19.1	0.085	530	**0.071**
Ducted(Low)	ARNU243L3G4	24	0.115	710	**0.103**
High Static Duct	ARNU073BHA4	7.5	0.15	230	**0.058**
High Static Duct	ARNU093BHA4	9.6	0.15	286	**0.067**
High Static Duct	ARNU123BHA4	12.3	0.15	339	**0.078**
High Static Duct	ARNU153BHA4	15.4	0.15	399	**0.090**
High Static Duct	ARNU183BHA4	19.1	0.15	459	**0.103**
High Static Duct	ARNU243BHA4	24.2	0.15	565	**0.132**
High Static Duct	ARNU073M2A4	7.5	0.43	468	**0.038**
High Static Duct	ARNU093M2A4	9.6	0.43	468	**0.038**
High Static Duct	ARNU123M2A4	12.3	0.43	512	**0.043**
High Static Duct	ARNU153M2A4	15.4	0.43	512	**0.043**
High Static Duct	ARNU183M2A4	19.1	0.43	673	**0.067**
High Static Duct	ARNU243M2A4	24.2	0.43	673	**0.067**
High Static Duct	ARNU283M2A4	28	0.43	845	**0.123**
High Static Duct	ARNU363M2A4	36	0.43	1,031	**0.184**
High Static Duct	ARNU423M2A4	42	0.43	1,260	**0.231**
High Static Duct	ARNU283M3A4	28	0.65	1,250	**0.109**
High Static Duct	ARNU363M3A4	36.2	0.65	1,449	**0.161**
High Static Duct	ARNU423M3A4	42	0.65	1,449	**0.161**
High Static Duct	ARNU483M3A4	48.1	0.65	1,482	**0.172**
High Static Duct	ARNU543M3A4	54	0.65	1,744	**0.260**
High Static Duct	ARNU363B8A4	36.2	0.8	1,730	**0.478**
High Static Duct	ARNU423B8A4	42	0.8	1,814	**0.528**
High Static Duct	ARNU483B8A4	48.1	0.8	2,019	**0.538**
High Static Duct	ARNU763B8A4	76.4	0.8	2,260	**0.765**
High Static Duct	ARNU963B8A4	95.9	0.8	2,542	**0.800**

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