Application Guide Form No. A20200630B

Supersedes Form No. A20200630A

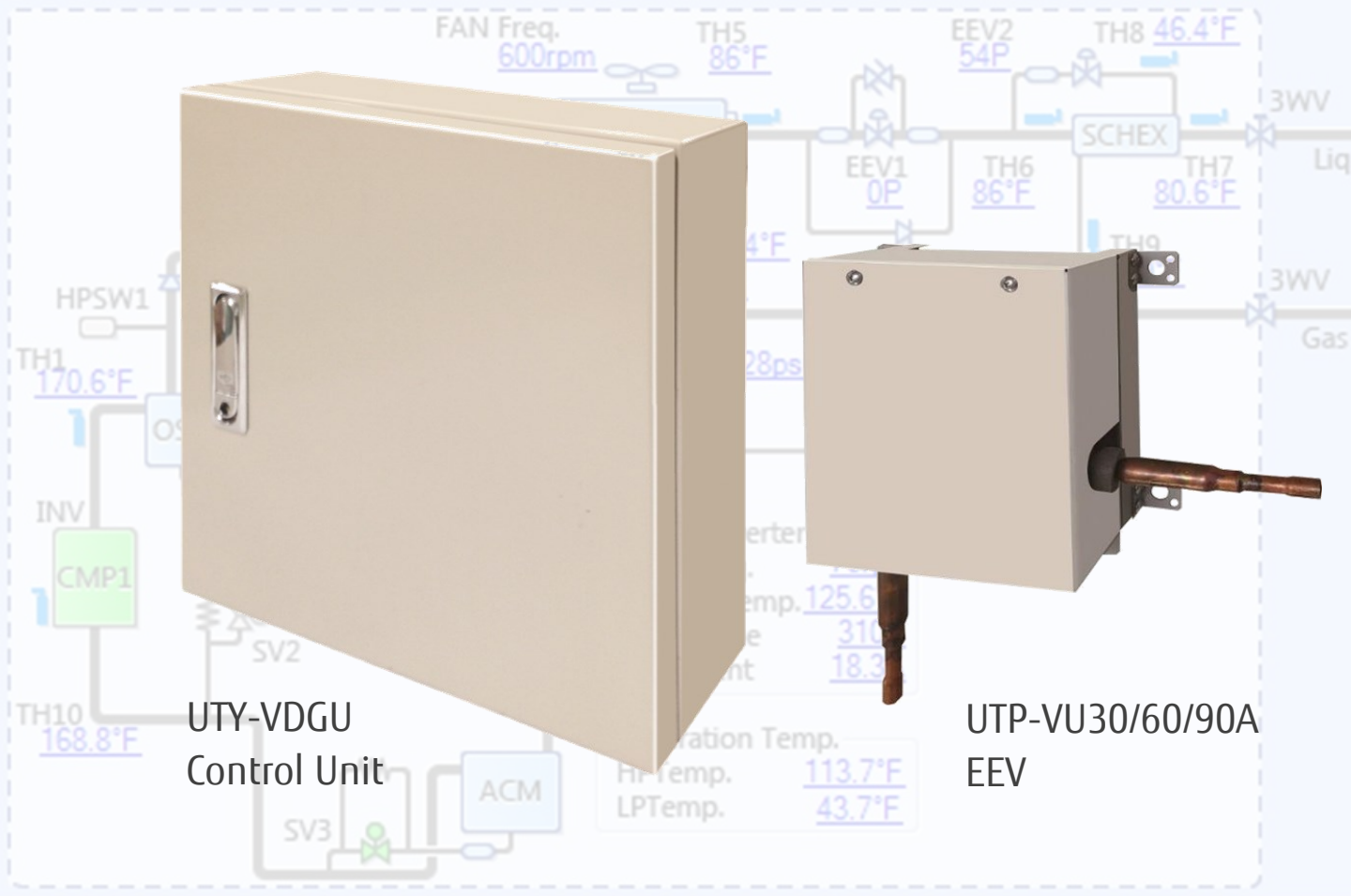
AIRSTAGE

FUJITSU

DX Kit

Airstage Integration of Non-Fujitsu Indoor Coils

1.5 through 14 tons



UTY-VDGU
Control Unit

UTP-VU30/60/90A
EEV

Application Guide

Form No. A20200630B

Table of Contents

1. Introduction

The DX Kit accessory will permit incorporation of a non-Fujitsu indoor unit into a Fujitsu Airstage VRF system. The purpose of this document is to provide both overview and detailed information regarding the Fujitsu Airstage "DX Kit". This Guide is to be used in conjunction with, and not replace, all applicable Fujitsu literature; Design and Technical Manual, Installation and Operation Manuals.

Information provided herein will assist the system designer in order to understand the scope of the DX Kit accessory, how it is applied, the components which are comprised within the DX Kit, and how to create projects inclusive of the DX Kit, within the "Design Simulator" selection software.

2. Product features

- Airstage integration with 3rd party air handling unit units
  - Comfort cooling and heating
  - Dedicated Outdoor Air Systems (DOAS)
  - Variable Air Volume (VAV) reheat
  - Ventacity ERV post-heat / cooling
- Airstage refrigerant system can support up to:
  - (16) DX Kit units per refrigerant circuit
  - 14,000 to 168,000 BTUH AHU capacity per DX Kit
  - 1:1 AHU to OU, or integrated with other Airstage IUs
- Compatible with all Airstage Remote Control and Central Control Panels
  - UTY-TTRX accessory facilitates 3rd party thermostat use
  - Dual Fuel compatible[1]
- Compatible with all Airstage VRF series outdoor units
- Compatible with most 3rd party tube type coils
- Selectable evaporator and condenser operating temperatures
- Minimum NEMA 3s rating for indoor or outdoor mounting
- Multiple external input and output options
- Optional BACnet, LonWorks or Modbus BMS integration
- Optional analog 0-10 VDC (1.0 to 9.0 VDC) input control

[1]Dual Fuel operation is a 3rd party thermostat function combined with the Fujitsu UTY-TTRX Converter accessory.

3. Specifications

UTY-VDGU Control Unit

Model name			UTY-VDGU
Power supply			208/230 V ~ 60 Hz
Sub power supply			198 to 264 V
Dimensions (H × W × D)	Net	in	15-3/4 × 15-3/4 × 4-3/4
		mm	400 × 400 × 120
	Gross	in	19-11/16 × 19-11/16 × 10-1/2
		mm	500 × 500 × 266
Weight	Net	lb	22.0
		kg	10.0
	Gross	lb	28.7
		kg	13.0

NOTE: Specifications are based on the following conditions:
- Cooling: Indoor temperature of 80 °FDB (26.67 °CDB) /67 °FWB (19.44 °CWB), and outdoor temperature of 95 °FDB (35 °CDB) / 75 °FWB (23.9 °CWB).
- Heating: Indoor temperature of 70 °FDB (21.11 °CDB) /59 °FWB (15 °CWB), and outdoor temperature of 47 °FDB (8.33 °CDB) /43 °FWB (6.11 °CWB).
- Pipe length: 24 ft 6 in (7.5 m), Height difference: 0 ft (0 m). (Between outdoor unit and indoor unit.)

UTP-VU30-60A EEV

Model name			UTP-VU30A			UTP-VU60A		
Ton			4			6		
Connectable capacity class		kBtu/h	18	24	30	36	48	60
Capacity	Cooling	kBtu/h	18	24	30	36	48	60
	Heating		20	27	34	40	54	67
Capacity range	Cooling	kBtu/h	14.0—18.0	18.1—24.0	24.1—30.0	30.1—36.0	36.1—48.0	48.1—60.0
	Heating		15.6—20.0	20.1—27.0	27.1—34.0	34.1—40.0	40.1—54.0	54.1—67.0
Airflow rate (reference)		CFM	624	706	895	941	1,177	1,318
		m^3/h	1,060	1,200	1,520	1,600	2,000	2,240
Dimensions (H × W × D)	Net	in	6-19/64 × 8-21/32 × 3-35/64					
		mm	160 × 220 × 90					
	Gross	in	16-9/16 × 16-9/16 × 5-7/8					
		mm	420 × 420 × 150					
Weight	Net	lb	4.4					
		kg	2.0					
	Gross	lb	6.7					
		kg	3.0					
Connection pipe diameter	Liquid	in (mm)	Ø 3/8 (Ø 9.52)					
	Connection method		Brazing					

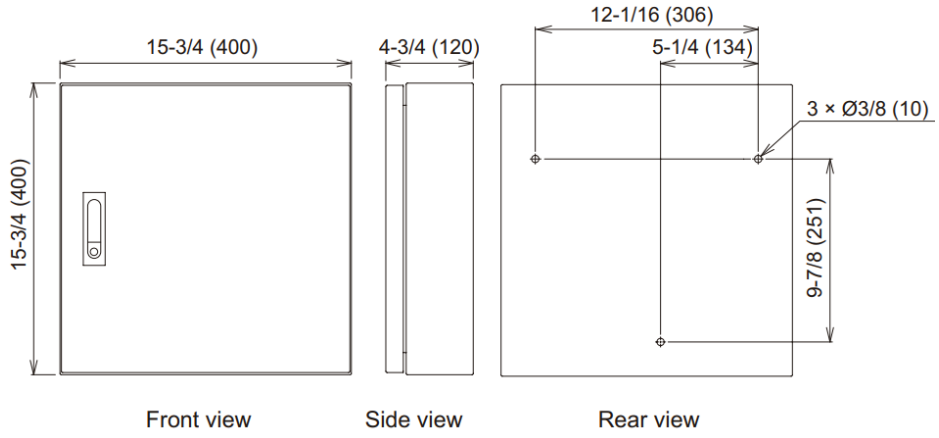
Model name			UTP-VU90A		UTP-VU90A × 2	
Ton			10		10 × 2	
Connectable capacity class		kBtu/h	72	96	144	180
Capacity	Cooling	kBtu/h	72	96	144	168
	Heating		81	108	162	188
Capacity range	Cooling	kBtu/h	60.1—72.0	72.1—96.0	96.1—144.0	144.1—168.0
	Heating		67.1—81.0	81.1—108.0	108.1—162.0	162.1—188.0
Airflow rate (reference)		CFM	2,095	2,354	3,767	4,709
		m^3/h	3,560	4,000	6,400	8,000
Dimensions (H × W × D)	Net	in	6-19/64 × 8-21/32 × 3-35/64		(6-19/64 × 8-21/32 × 3-35/64) × 2	
		mm	160 × 220 × 90		(160 × 220 × 90) × 2	
	Gross	in	16-9/16 × 16-9/16 × 5-7/8		(16-9/16 × 16-9/16 × 5-7/8) × 2	
		mm	420 × 420 × 150		(420 × 420 × 150) × 2	
Weight	Net	lb	4.4		4.4 × 2	
		kg	2.0		2.0 × 2	
	Gross	lb	6.7		6.7 × 2	
		kg	3.0		3.0 × 2	
Connection pipe diameter	Liquid	in (mm)	Ø 1/2 (Ø 12.70)			
	Connection method		Brazing			

NOTE: Specifications are based on the following conditions:
- Cooling: Indoor temperature of 80 °FDB (26.67 °CDB) /67 °FWB (19.44 °CWB), and outdoor temperature of 95 °FDB (35 °CDB) / 75 °FWB (23.9 °CWB).
- Heating: Indoor temperature of 70 °FDB (21.11 °CDB) /59 °FWB (15 °CWB), and outdoor temperature of 47 °FDB (8.33 °CDB) /43 °FWB (6.11 °CWB).
- Pipe length: 24 ft 6 in (7.5 m), Height difference: 0 ft (0 m). (Between outdoor unit and indoor unit.)

3.1. Dimensional data

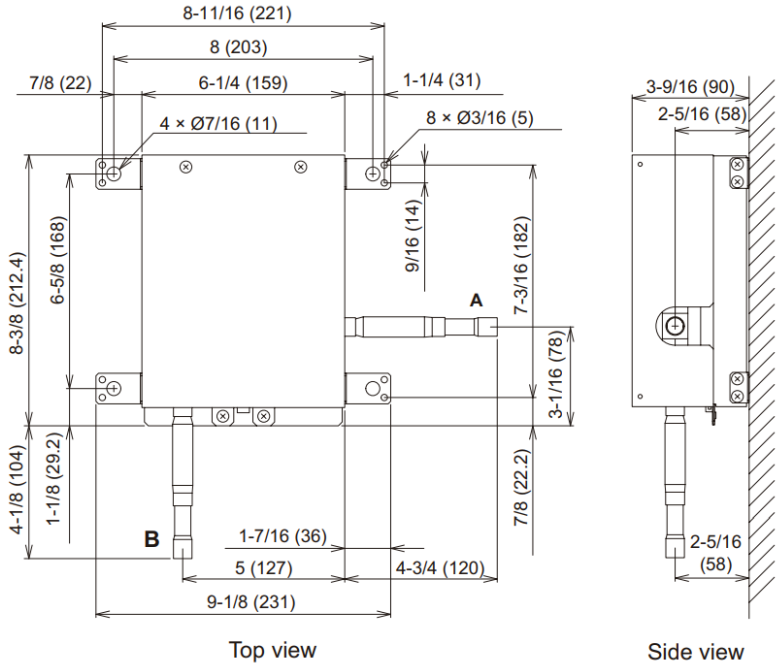
a. UTY-VDGU Control Unit

Unit of measure: In (mm)



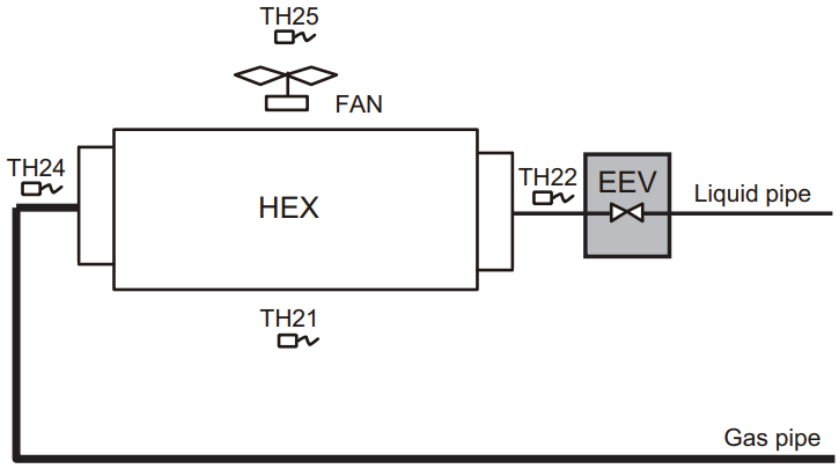
b. UTP-VU**A EEV (all models)

Unit of measure: In (mm)



3.2. Components

Symbol	Description
HEX	Heat exchanger (Locally purchased)
FAN	Fan (Locally purchased)
EEV	Electric expansion valve
TH21	Suction airflow temperature thermistor
TH22	Heat exchanger (inlet) thermistor
TH24	Heat exchanger (outlet) thermistor
TH25	Discharge airflow temperature thermistor



4. Application

The DX Kit is used to integrate 3rd party, non-Fujitsu air handling equipment with Airstage outdoor unit equipment to create a hybrid VRF system. In many instances, reuse of existing air handling equipment is feasible, where previous single or multi-stage capacity approach can be modernized to an efficient, modulating, Airstage VRF system. The DX Kit versatility provides both stand-alone, 1:1, and zoning applications to meet diverse requirements in both Design-Build (D-B) and Basis of Design (BOD), plan and specification projects. The non-Fujitsu air handling equipment may be existing, new or retrofitted with a new DX coil on site, and can employ multiple system types depending upon the application requirement. For example, the DX Kit may be used to integrate Airstage outdoor units for use with, but not limited to:

- Comfort conditioning- Residential and commercial indoor comfort heating and cooling; split systems and package units.
- DOAS- Dedicated Outdoor Air Systems- For tempering outdoor air, OA, introduced into a building for ventilation purposes.
- VAV reheat- Replace fossil fuel fired boilers and piping with DX reheat, for both pressure dependent and pressure independent VAV zoning.
- ERV / HRV post-conditioning- Bolt on Ventacity VS*DX module accessory can be used to provide additional post heating, and post sensible and latent cooling, when required.

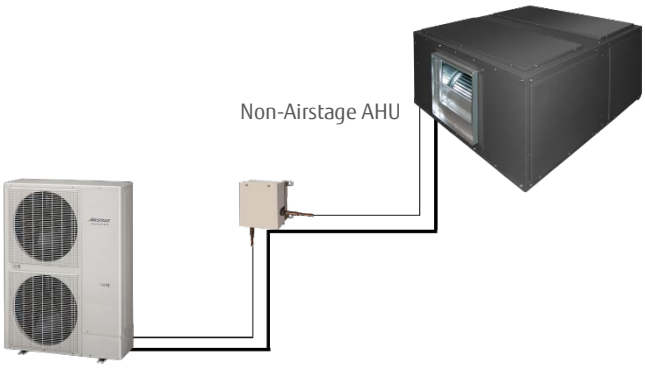
4.1. Combination range & conceptual diagrams

The connected capacity ranges (combination ratio) and conceptual diagrams listed below and in the following pages, are by nominal tonnage for quick reference only; actual system selection dependent upon ID / OD design conditions and BTUH requirements, as determined through the "Design Simulator" system selection software.

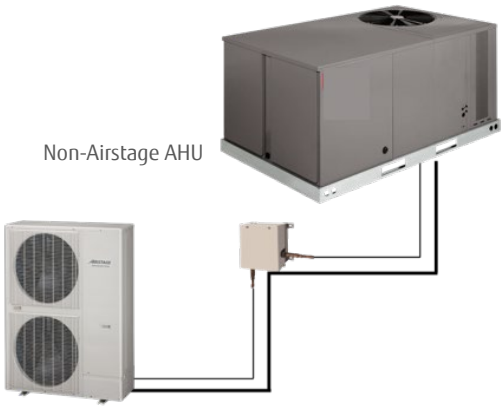
All combination ratios, 1:1 or multiple IU applications, are 50% to 100% only when using the DX Kit.

Split or Package system capacity range:

a. J-Series Heat Pump
   1. 1.5 to 3 tons- J-IIS
   2. 2.5 to 5 tons- J-II
   3. 3 to 10 tons- J-IIIL

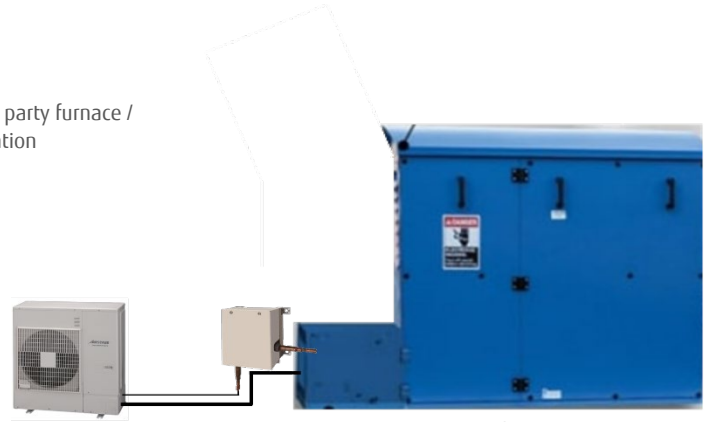


J-IV example



J-IIIL example

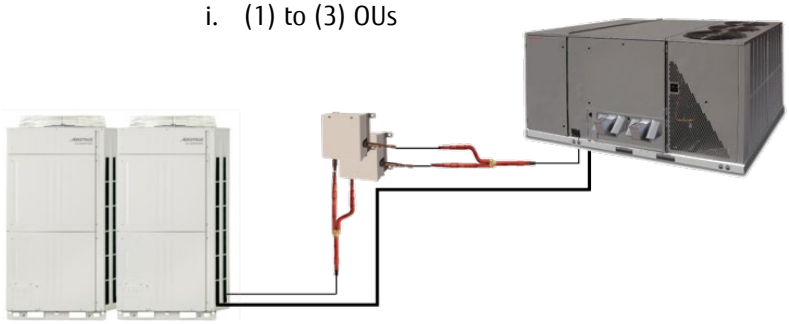
J-IV example


J-IVS

Ventacity ERV / HRV & VS*DX post-heat / cool coil

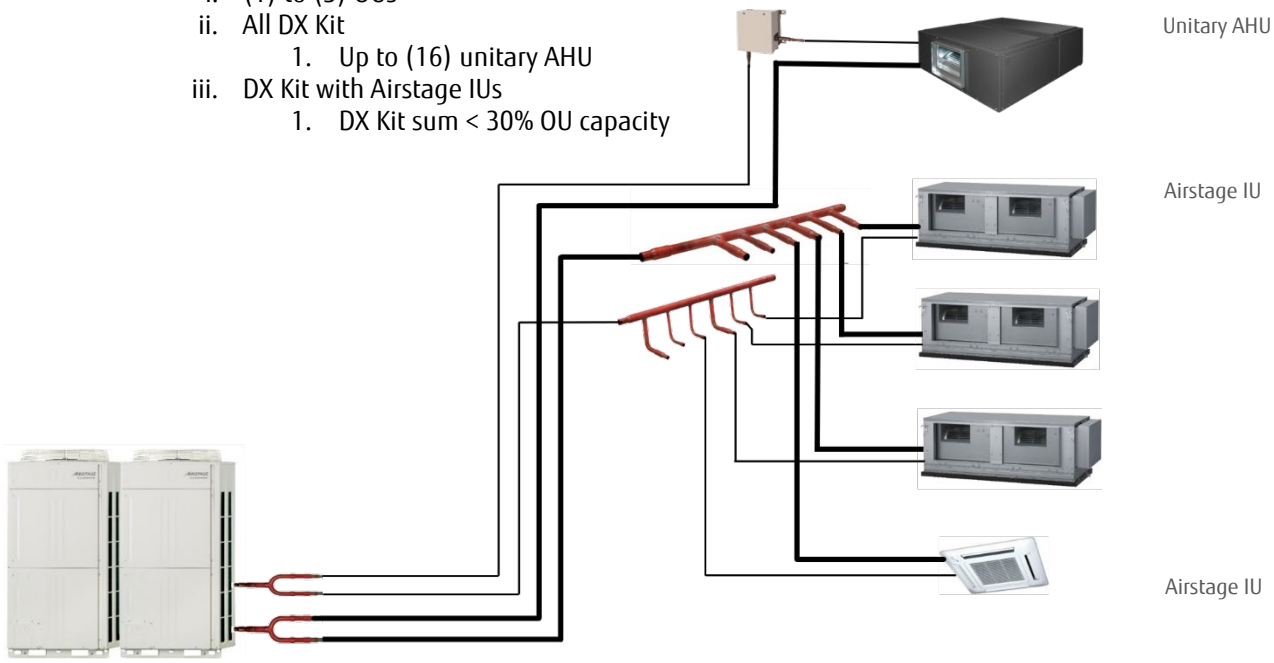
b. V-Series

1. Heat Pump, 1:1- 3 to 14 tons
    i. (1) to (3) OUs



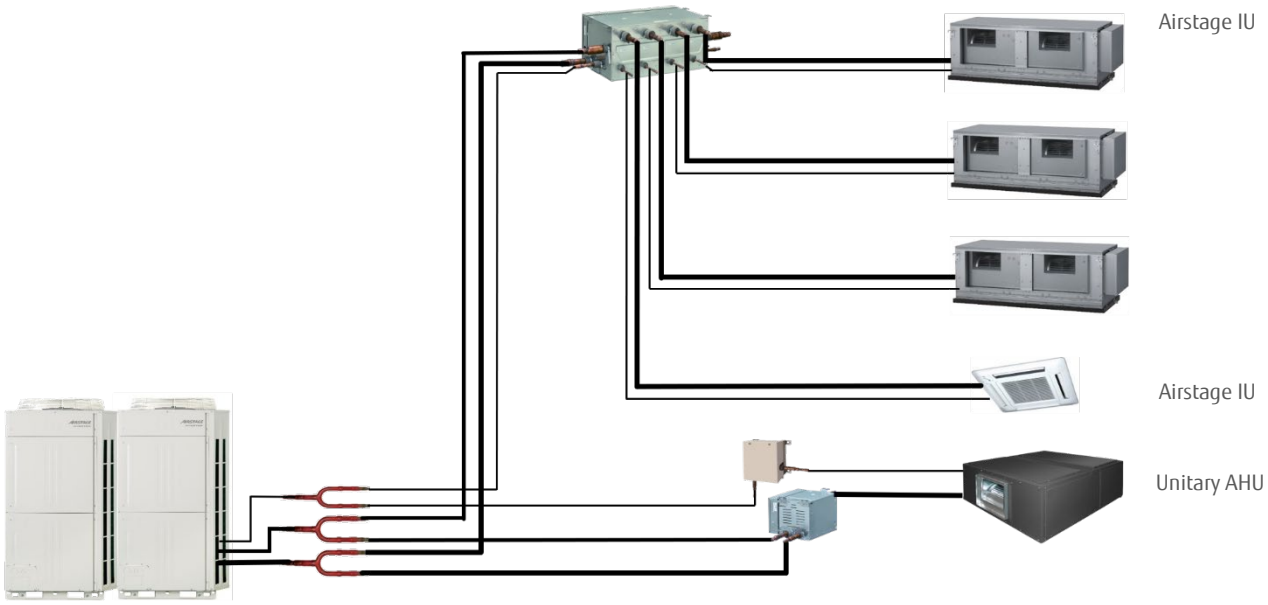
V-II Heat Pump 1:1 example

2. V-II Heat Pump, zoning- Up to 24 tons
    i. (1) to (3) OUs
    ii. All DX Kit
        1. Up to (16) unitary AHU
    iii. DX Kit with Airstage IUs
        1. DX Kit sum < 30% OU capacity



V-II Heat Pump "Mixed IU" zoning example

3. VR-II Heat Recovery- Up to 24 tons
    i. (1) to (3) OUs
    ii. All DX Kit
        1. Up to (16) unitary AHU
    iii. DX Kit with Airstage IUs
        1. DX Kit sum <30% OU capacity



VR-II Heat Recovery "Mixed IU" zoning example

5. Compatibility

Outdoor unit series- The DX Kit is compatible with all Airstage VRF systems, with EEV(s) as defined:

Series	DX kit (EEV unit)			
	UTP-VU30A	UTP-VU60A	UTP-VU90A	UTP-VU90A × 2
J-IVS series	○	—	—	—
J-IV series	○	○	—	—
J-IIIL series	○	○	○	—
V-II series	○	○	○	○
VR-II series	○	○	○	—

As each Airstage system has unique capacity and combination guidelines specific to DX Kit compatibility. The details will be discussed in Chapter 6, "Design".

The table below provides a summary of connectible DX Kits in refrigerant configurations of:

a. DX Kit only- Defined as the refrigerant system consisting entirely of non-Airstage indoor units.
b. Mixed connection- Defined as non-Airstage and Airstage indoor units in the same refrigeration system.
    1. DX Kit total capacity must be less than 30% of the outdoor unit capacity.

Series	Connectable unit number*1	
	DX kit only	DX kit and VRF indoor units
J-IVS series	1 to 2 units	Prohibited*2
J-IV series	1 to 3 units	Prohibited*2
J-IIIL series	1 to 6 units	Prohibited*2
V-II series	1 to 16 units	2 to 63 units
VR-II series	1 to 16 units	2 to 45 units

*1 connectible unit number (quantity) depends upon capacity requirements at ID / OD design conditions.

5.1. 3rd party coils

The DX Kit is compatible with most traditional finned tube type coils. Due to the limited internal volume of Microchannel type coils, only traditional fin tube coils should be considered. All 3rd party coil consideration must be qualified for Airstage system integration through use of the "Design Simulator" selection software, to be discussed in Section 6. Design. In order to qualify the 3rd party air handling equipment for use, the following variables must be obtained.

a. BTUH requirement at design conditions:
    1. Heating
    2. Cooling (TC, total capacity)

b. Coil internal volume:
    1. Cubic inches
    2. Cubic centimeters, if SI / metric

5.2. Controls:

The UTY-VDGU Control Unit is compatible with:

a. All Fujitsu RC controls
    1. 2-wire
    2. 3-wire
    3. UTY-XSZX- Remote Analog Temperature Sensor
b. All Fujitsu Controllers
    1. UTY-DTGYZ*- Touch Panel Controller
    2. UTY-DCGYZ*- Central Remote Controller
c. All Fujitsu Software
    1. UTY-APGX- System Controller
    2. UTY-ALGXZ*- System Controller Lite
    3. UTY-ASGXZ*- Service Tool (all 1.X and 2.X versions)
d. WiFi
    1. FJ-IR-WIFI-1NA
    2. FJ-RC-WIFI-1NA
    3. UTY-TFSXZ2 FGLair

e. BMS
   1. FUJ-VRF-8000 Airstage Integration Manager (AIM)
   2. UTY-VBGX- BACnet Gateway (Hardware device)
   3. UTY-VGLX- LonWorks Network Converter
   4. UTY-VMGU- MODBUS Converter

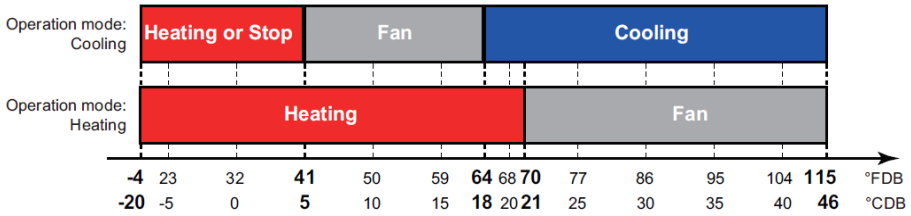
f. Conventional
   1. UTY-TTRXZ1- 3rd Party Thermostat Interface

5.3. Control method

The DX Kit provides either DOAS or comfort conditioning functionality based upon thermistor control selection:
a. DOAS / reheat- Outlet air temperature sensing, TH25 (DIP SW SET 3-3 OFF- default)
b. Comfort conditioning- Inlet air temperature sensing, TH21 (DIP SW SET 3-3 ON)

5.4. Mode operating range

The DX Kit operation is enabled based return air temperature (RAT) per mode:



a. Cool mode:
   1. RAT ≥ 64° F.
   2. RAT < 64° F. = Fan only

b. Heat mode:
   1. RAT ≥ -4° F.
   2. RAT ≤ 70° F.
      i. RAT < 41° = Forced heat operation

6. Design

Integrating the DX-Kit into an Airstage VRF system is an exclusive function of the Fujitsu "Design Simulator" selection software. Design Simulator software provides expanded, detailed reports, including project and design specifics:

- Indoor unit- Interpolated delivered IU capacity based upon:
  - ID and OD design conditions
  - Refrigerant line:
    - frictional losses
    - vertical separation
- Outdoor unit- Interpolated OU capacity based upon:
  - ID and OD design conditions
  - Combination Ratio (OU BTUH / IU BTUH)

Successful completion of a proposed design necessitates the system designer to obtain the 3rd party coil information, preferably from the equipment manufacturer, when available. Details for Design Simulator calculations and report generation include:

a. Required:
    1. Design conditions
        i. Cooling- If other than 80/67/95:
            1. Indoor entering dry bulb, DB
            2. Indoor entering wet bulb, WB
            3. Outdoor dry bulb, DB
        ii. Heating- If other than 70/47
            1. Indoor entering dry bulb, DB
            2. Outdoor dry bulb, DB
        iii. Discharge air temperature- DOAS / reheat applications only
    2. 3rd party AHU
        i. Cooling BTUH, total capacity
        ii. Heating BTUH
        iii. Coil internal volume (cubic inches, in^3) See also "3rd party AHU coil volume" below

b. Optional 3rd party AHU information- The following may be added to for Design Simulator report reference, but is not used for coil qualification:
    1. Cooling sensible capacity, SC
    2. CFM
    3. ESP, "w.g.
    4. Sound pressure, dBA
    5. MCA
    6. Power (W)
    7. Dimensional data

6.1. 3rd party AHU coil volume

There are two methods to obtain internal volume of the proposed coil(s):

a. OEM data- This is the preferred method to ensure accuracy. However, many manufacturers may not publish or even provide this data upon request, as it can be considered proprietary.
b. Manual calculation- In the absence of OEM data, the coil volume will need to be determined manually. Cubic inch calculation requires knowing:
    1. Tubing cross sectional area (square inches, in^2)
    2. Coil width
    3. Number of u-bends
        i. Note: U-bends is also referred to as "hairpin" in Fujitsu literature

Obtaining coil volume other than through OEM reference may be performed through two methods:

1. FGAI DX Kit Coil Volume Calculator- fillable PDF document. Click here to download.
    i. Must be downloaded in order to enable fillable feature
2. Manual calculation

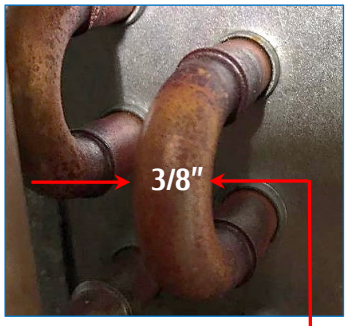
For explanation purposes, the "Manual calculation" will outlined in the following steps. By definition, the coil volume (in^3) is expressed as:

(Tubing cross sectional Area [in^2]) X Coil Width (inches) X Number of U-bends

Thus, to calculate the coil volume, determine the (3) variables as discussed:

1. Tubing cross sectional area- Generic ACR tubing charts are available for this information. Example:
   - Tubing size = 3/8" OD
   - Wall thickness = 0.032"

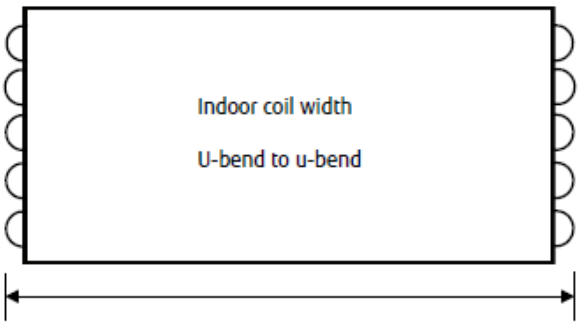
   Tubing cross sectional area = 0.076 in^2



Nominal or Standard Size, inches		Nominal Dimensions, inches			Calculated
		Outside Diameter	Inside Diameter	Wall Thickness	Cross Sectional Area of Bore, sq inches
1/8	A	.125	.065	.030	.00332
3/16	A	.187	.128	.030	.0129
1/4	A	.250	.190	.030	.0284
5/16	A	.312	.248	.032	.0483
3/8	A	.375	.311	.032	.076
	D	.375	.315	.030	.078
1/2	A	.500	.436	.032	.149
	D	.500	.430	.035	.145
5/8	A	.625	.555	.035	.242
	D	.625	.545	.040	.233

2. Coil width (in.)- To ensure an accurate coil volume calculation, be certain to measure to the apex of the u-bend.

   Example: 43"

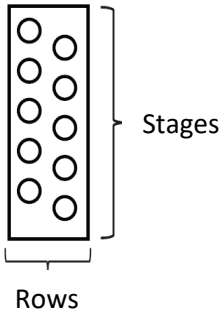


3. Number of u-bends

   U-bends = (# of rows) X (Stage)

   The number of rows and stages may be counted from visual inspection of the coil, or obtained from the coil manufacturer. Due to coil circuiting, do not attempt to count the actual quantity of u-bends, as the result may be incorrect for volume calculation.

   Example:
   U-bends = (# of rows) X (Stages)
   = (3) rows X (30) stages
   = (90) u-bends or "hairpins"

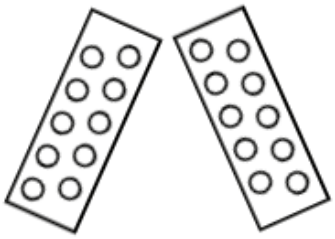


Example summary- Coil volume, in^3
= (Tubing cross sectional Area [in^2]) X Coil Width (inches) X Number of U-bends
= (.076") X (43") X (90)
= 294.1 in^3

Note: If the proposed coil has multiple, equal sized slabs, calculate the internal volume of a single slab, and multiply by the number of slabs.

A-coil example:

Each slab = 87 in^3
Total coil volume
= (87) X (2 slabs)
= 174 in^3



6.2. Design Simulator

Use of the Fujitsu "Design Simulator" selection software is required for all projects where the DX-Kit is to be applied. Design Simulator will enforce all Design & Technical Manual rules for 3rd party AHU selection, piping and wiring.

The D&T manual for both the DX Kit and the Airstage outdoor unit series will serve as a valuable guide for additional information regarding 3rd party equipment qualification and selection. If Design Simulator is not used, or if inaccurate information is entered, the system operation and performance may be compromised, resulting in nuisance protective function cycling and system malfunction. Therefore, care must be taken to ensure accuracy when obtaining and entering 3rd party coil information.

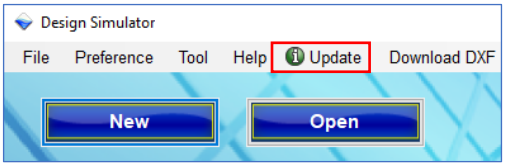
It is important to note that Design Simulator is not a load calculation program. All cooling, heating and discharge air temperature requirements (DOAS, post heat/cool, reheat) must be obtained prior to Design Simulator entry.

This Guide will provide an example of simple Airstage system design using a DX Kit system selection. The following pages provide detail with the assumption the system designer is proficient with the Design Simulator software, and focuses on steps unique to DX Kit selection. If you are not familiar with the Design Simulator software, please obtain assistance from your regional Manufacturer Sales Representative or Fujitsu Distributor.

6.2.1 Design Simulator update

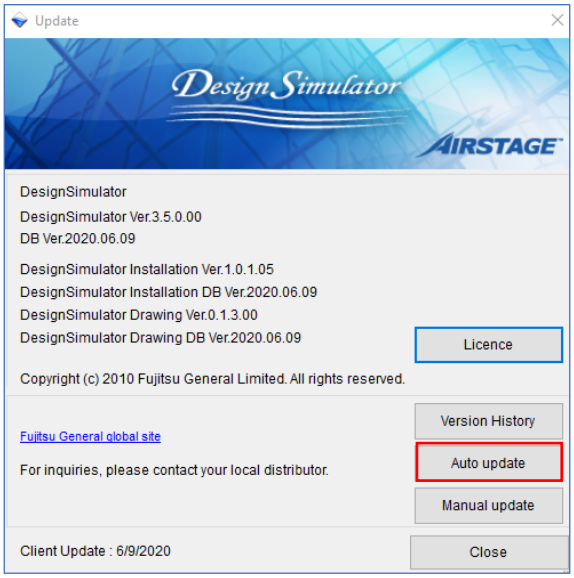
Prior to Design Simulator use, confirm the latest software version is installed on your device.

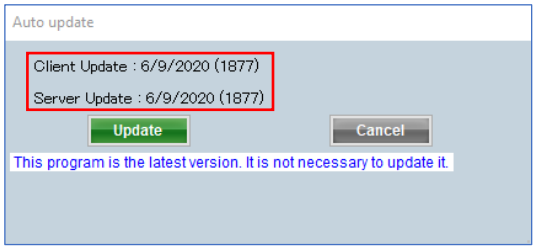
Select "Update" from the home screen toolbar:

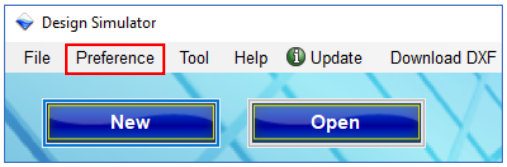


Note- Internet connection is required to complete the validation and update steps.

Next, select "Auto update" and compare the "Client update" to the "Server update". If the dates are not the same, please select "Update" to install the latest update(s), to ensure the most current software use.

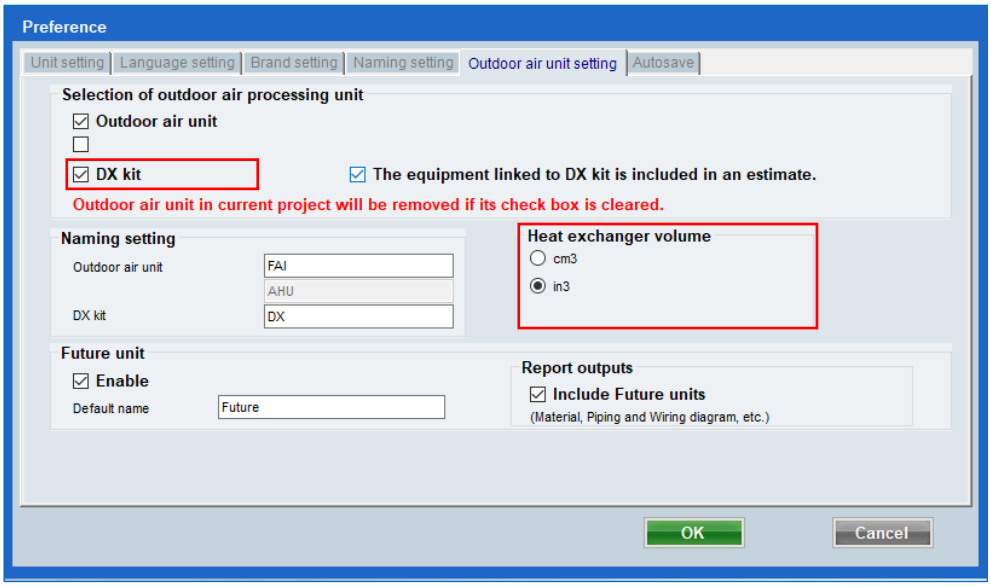






6.2.2 Outdoor air unit setting

Select this tab and check at least the "DX Kit" and "Heat exchanger volume" boxes as shown. The "Outdoor air unit" is optional, to allow selection of the Airstage AAUA DOAS indoor units in addition to the DX Kit. Select "in3" for the "Heat exchanger volume" unless metric unit of measure is desired. You may enter descriptive text or prefix template naming for the DX Kit within the "Name setting" field, or modified at each unit individually.



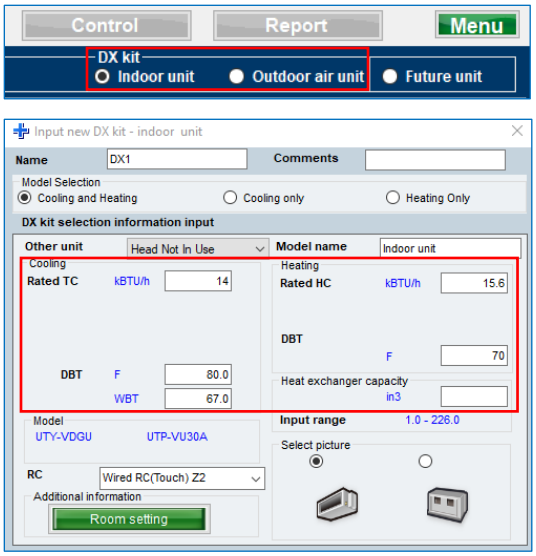
6.2.3 Add Indoor unit – DX Kit

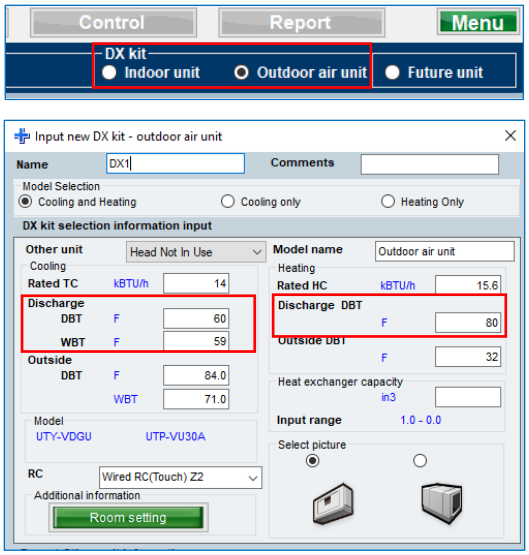
The input criteria between Indoor unit and Outdoor unit are similar, however the "Outdoor air unit" selection requires entry of design discharge air temperatures.

Note- The DAT must be determined and provided independent of Design Simulator.

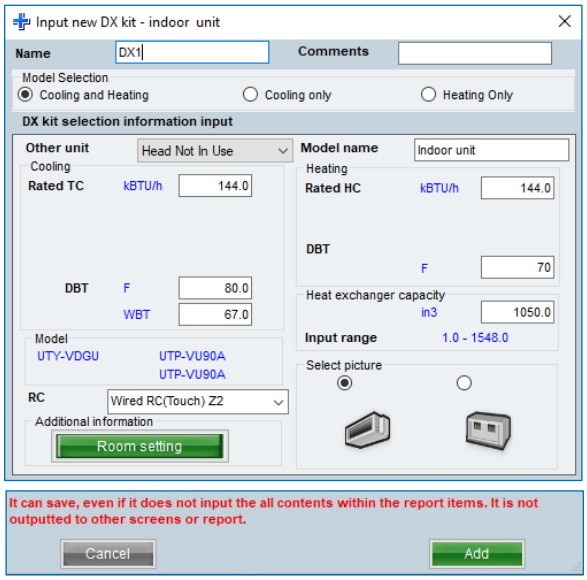
From the "Indoor unit" entry, select the radio button for DK Kit:

- Indoor unit- DX Kit used in comfort conditioning
- Outdoor air unit- DX Kit used for DOAS, post heat / cool and VAV reheat





Example: Nominal 12 ton AHU entries



Important note- The heating and cooling rated / required capacities to be entered are determined independently of Design Simulator.

These values will be referenced by the software for outdoor unit selection; thus, attention must be made when entering or modifying these values.

Model selection- Select if AHU is to be used for heating and cooling, or dedicated mode only.

Rated TC- Enter total cooling capacity in KBTUH.

DBT- Modify if design indoor conditions are other than the AHRI Standard 80 DB /67 WB.

NOTE- Unless otherwise determined by the engineer or system designer, these values may be left at their default. Changing these values will affect equipment performance and selection, thus attention to detail is required.

Rated HC- Enter total heating capacity in KBTUH.

Heat exchanger capacity- Enter this value as obtained from the 3rd party coil OEM, or as manually calculated.

Note- The allowable cubic inch range is initially based upon the 3rd party AHU BTUH capacity, *and is only an estimated value at this point*, prior to outdoor unit selection. Once the OU is selected, Design Simulator may revise the permissible 3d party AHU in^3 range, to factor an acceptable volumetric ratio.

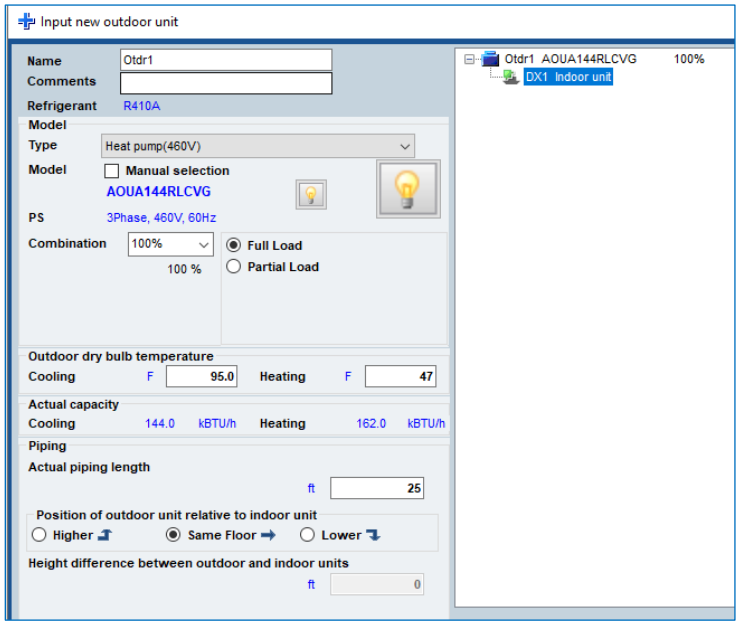
Model- The DX Kit Control Unit model number will be displayed, to include the EEV model number and quantity. The Control Unit and EEV selection is not editable, determined from the entered 3rd party AHU BTUH capacity.

Report- Other information- These fields are for reference only, to be listed in reporting, and will not have any affect in equipment selection.

Select "Add" when done. Check to ensure there are no errors displayed at this time. If so, review and adjust entries until there are no errors present. See also "Design Simulator Error Notification" section on p. 15.

6.2.4 Add outdoor unit

When adding an outdoor unit, Design Simulator will enforce all application and connected capacity rules as defined in the system Design & Technical Manual.



Manual selection- The outdoor unit selection is identical to the process when selecting Airstage IUs. The "Manual selection" box, when checked, will permit an override to an automatically selected OU, however the 100% combination ratio cannot be overridden.

Important reminders:

- Combination ratio ≤100%
- "Mixed" applications- DX Kit sum must be <30% OU capacity

Outdoor dry bulb temperature- The OD design values may be left in their default, or adjusted if needed, typically in D-B, Design-Build applications. Default values are set within Design Simulator, or may be adjusted for template use within "Preferences". OD design temperature values will be compared to the actual outdoor unit performance as referenced in the respective system D&T Manual.

6.2.5 Design Simulator error notification

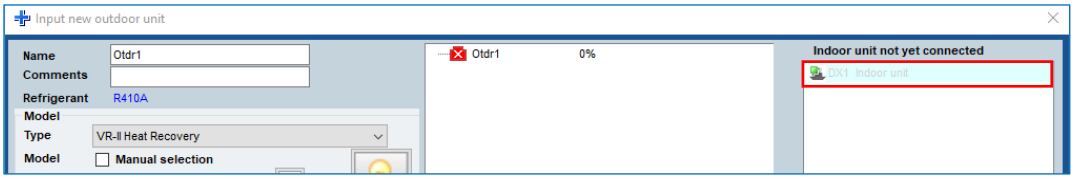
The following narrative will focus on scenarios specific to creating Design Simulator projects when applying the DX Kit. Awareness of differences between DX Kit AHU and standard Airstage IU entries will assist the system designer with successful completion of ".fgf" files. The DX Kit Design and Technical Manual is resourceful to expound upon methods which Design Simulator uses to enforce all application rules. This includes, but is not limited to, product series compatibility, BTUH capacity range, internal volume, and refrigerant piping. As determining the cause of an error can appear to be challenging to navigate, a comprehensive check of input values will often reveal where an adjustment will be required to successfully create the project. When quantitative input is not valid, a notification will be displayed with a general explanation. However, if an intended application is prohibited, Design Simulator will not permit an indoor unit to be assigned to the desired outdoor unit; that is, an "error" will not be displayed.

The system designer must be able to identify and adjust input values to eliminate all errors. It is not possible within the scope of this Guide to address every contingency which prohibits completion of the Design Simulator file, however, the following descriptions of DX Kit design structure are common causes of Design Simulator errors:

- Nominal tonnage- values may not align with actual capacities for a desired outdoor unit.
  - Example- AOU120RLAVM can support up to 96,000 BTUH maximum.
  - IU capacities ≥ 97,000 BTUH exceed VR-II RBU capacity.
- Combination ratio- is limited to 100% regardless of DX Kit IU or DOAS application.
  - When selecting "mixed" DX Kit and Airstage IUs in the same refrigerant system:
    - DX Kit BTUH sum must be less than 30% of outdoor unit total capacity
    - Mixed systems are not permitted for outdoor unit J-IIS, J-II or J-IIIL use.
- Heat exchanger capacity error- The input range provided by Design Simulator in the initial entry of the 3rd party AHU coil is an estimate. Once the OU is selected, the AHU coil internal volume will be compared to the acceptable range of the selected outdoor unit.
- Insufficient capacity- The selected outdoor unit capacity is compared to the required AHU capacity at the selected "Outdoor unit dry bulb temperature".
- Refrigerant piping- When piping lengths are entered, a capacity coefficient is factored within Design Simulator to account for piping frictional and elevation losses. An adjusted AHU capacity will be displayed based upon piping capacity loss.

The following "error" examples will help illustrate common cause prevention of system design, and suggested corrective action(s):

Example #1- Indoor unit (DX1) is not able to be connected to any VR-II series OU.

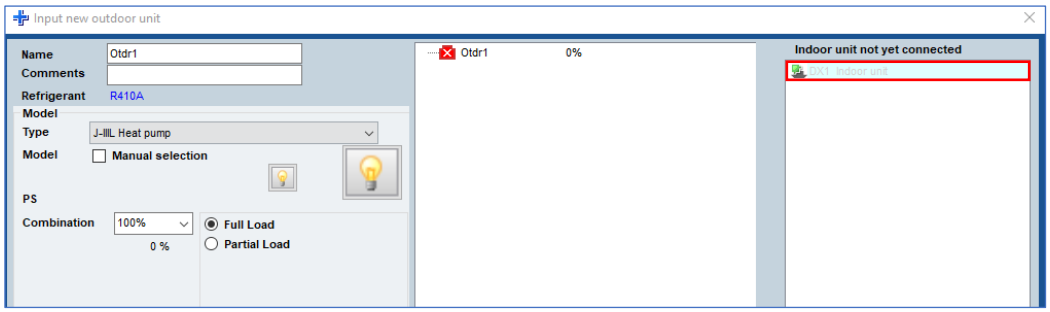


Given:
IU- AHU requirement= 72,000 BTUH
OU- AOUA***T*BV (VR-II)

Problem: "One-to-One", 1:1 application is not compatible with VR-II Heat Recovery

Recommendation: select V-II Heat Pump OU Series

Example #2: Indoor unit (DX1) is not able to be connected to any J-IIIL series OU.



Given:
IU- AHU requirement= 97,000 BTUH
OU- AOU96/120RLAVM (J-IIIL)

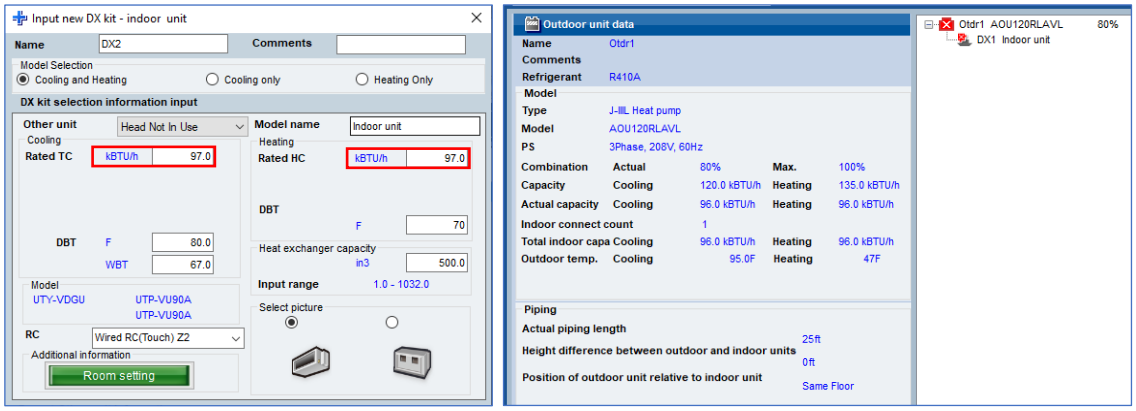
Problem: DX Kit capacities are out of range for the desired OU series; DX1 highlighted

Recommendation:

- review and adjust the DX Kit capacities as needed
- select V-Series OU

Example #3:

The capacity of the outdoor unit is insufficient.

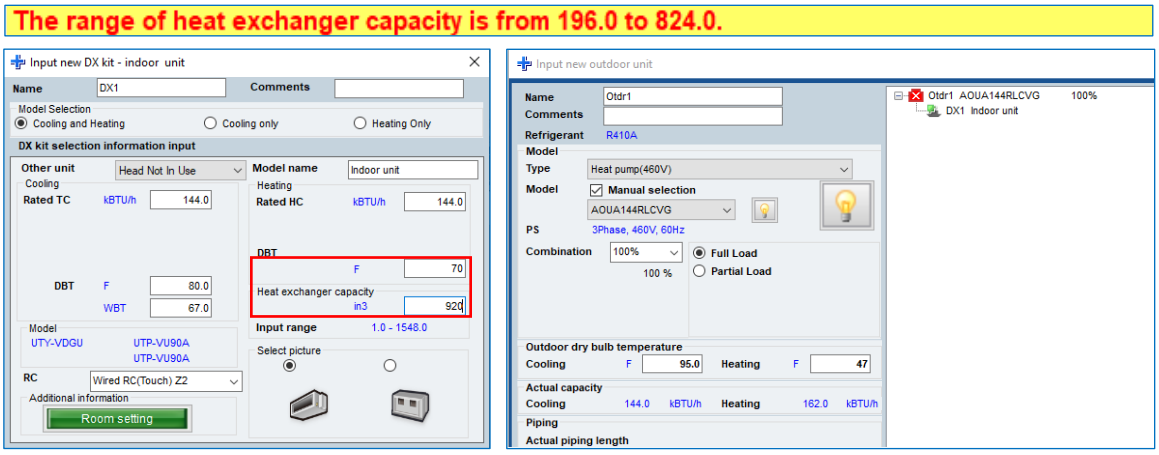


Given:
IU- AHU requirement= 97,000 BTUH
OU- AOU120RLAVM (J-IIIL)

Problem: Even though the OU is a 10 ton capacity, any requirement >96,000 BTUH requires V-Series chassis

Recommendation: Select AOUA*** V-Series outdoor unit

Example #4:



Given:
IU- AHU requirement:

- 144,000 BTUH
- in3 = 920

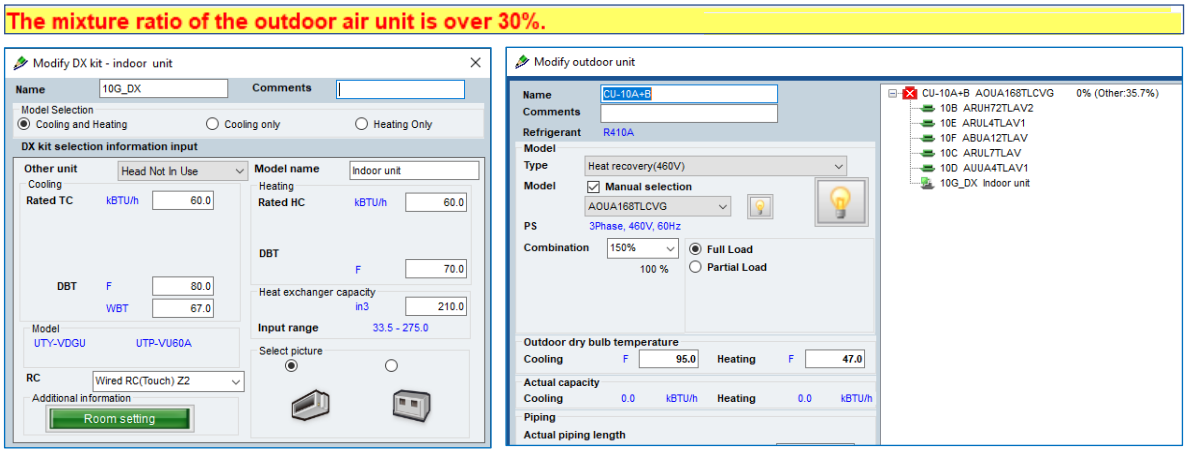
OU- AOUA144RLCVG (V-II)

Problem: When the AHU was entered prior to the selection of the OU, the estimated 3rd party coil volume range was 1 to 1548 in^3. Thus, the 920 in^3 value was presumed to be acceptable.

An AOUA144RLCV(G) was manually selected, with an acceptable 100% combination ratio. However, once this OU was selected, the permissible DX Kit coil cubic inch range is 196 to 824 in^3.

Recommendation: The system designer would need to review the 3rd party AHU coil volume data for accuracy, or if correct, select the next larger OU and recheck (AOUA168RLCVG)

Example #5:



Given:
IU- AHU requirement= 60,000 BTUH

- Mixed application, DK Kit and Airstage IUs

OU- AOUA168TLCVG (VR-II)

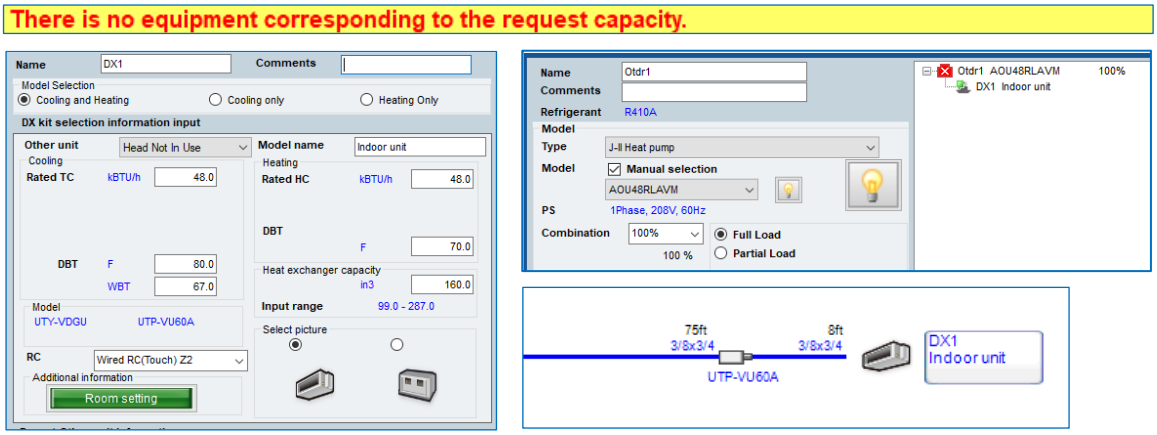
Problem: Although the total connected capacity is 95%, the ratio of the DX Kit AHU is 35.7%. The DX Kit sum must be < 30% of the OU capacity.

Increasing the OU from an AOUA168TLCVG to an :

- AOUA192TLCVG still yields the DX Kit >30% of the OU capacity
- AOUA216TLCVG is acceptable

Recommendation: The system designer would need to review the required TC of the 3rd party AHU. If the required TC of 60,000 BTUH is correct and increasing the OU capacity is not an option, restructure the IU and DX Kit arrangement within the project to obtain acceptable ratios. If no other options are available, provide a separate J-II heat pump for the DX Kit 3rd party AHU.

Example #6:



Given:
IU- AHU requirement = 48,000 BTUH
OU- AOU48RLAVM4 (J-IV)
Piping = 83' total

Problem: The 48,000 BTUH DX Kit was shown as a compatible match to the AOU48RLAVM4, at a 100% combination ratio. However, when the refrigerant piping lengths were added, the OU capacity was prohibited. Piping lengths >25', when entered into Design Simulator, will calculate capacity loss as a function of vapor piping frictional losses (pressure drop) which affect the delivered capacity.

The system designer must account for capacity loss from refrigerant piping and analyze the delivered capacity to the load at the selected ID and OD design conditions.

Recommendation: There are multiple options which could be considered:

- Reduce the piping to ≤ 25'
  - Any installed piping length >25' will result in an incremental capacity loss at the AHU. Depending upon the piping length, this may be negligible.

- Reduce the DX Kit TC total capacity slightly, to offset the capacity loss for the piping.
  - The system designer must determine if the revised DX Kit capacity will meet the demand at the selected design conditions.
- Increase the OU capacity
  - If refrigerant piping losses prevents meeting the load at design conditions with "like tonnage", the OU capacity may need to be increased.

6.2.6 Piping

Application of the DX Kit provides unique piping requirements when compared to traditional Airstage IUs. Within the Design Simulator "Piping" tab, it is suggested to input values to ensure all piping minimum and maximum lengths are enforced.

DX Kit capacities ≥ 97,000 BTUH will require:

- (2) UTP-VU090 EEVs
- UTP-LX180 Separation Tube Kit (2- Separation Tubes)

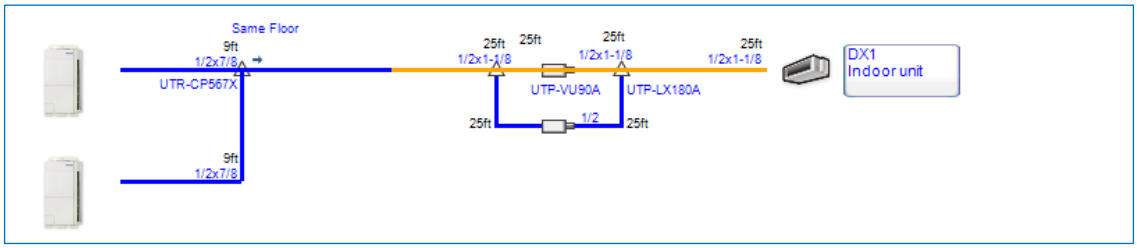
In conjunction with the DX Kit Installation Manual, the Design Simulator generated Piping Report, which provides piping details and length requirements can be conveyed to the installing contractor for additional reference and for completion of an "As-Built" document for permanent record.

Design Simulator piping errors

Example:

Name	Error message
DX1	Pipe length between EEV unit and separation tube must be less than 6ft.

Name	Error message
DX1	Pipe length between EEV unit and heatexchange unit must be less than 16ft.



Given:
Piping =

- 25' from Separation Tube(s) to EEV
- 25' from EEV to IU

Problem: The system designer chose to enter an estimated 25' for every length input, with exception to the OU Branch Kit piping. An error is displayed to state:

- the pipe length between the EEV and Separation Tube must be less than 6'.
- The pipe length from the EEV to the IU is 16' maximum.
    - Note- 16' includes piping from Separation Tube

Recommendation:

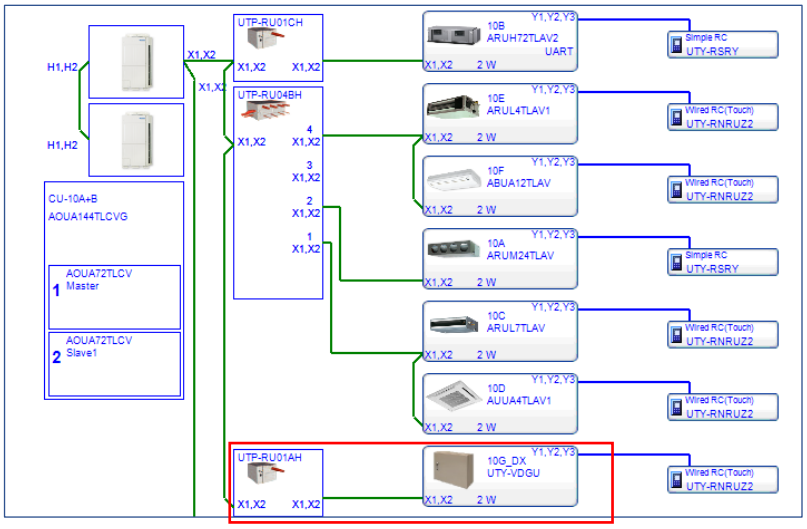
- Pipe lengths between the EEVs and Separation Tubes must be revised to less than 6'.
- Maximum distance from Separation Tube to IU is 16'.

6.2.7 Wiring

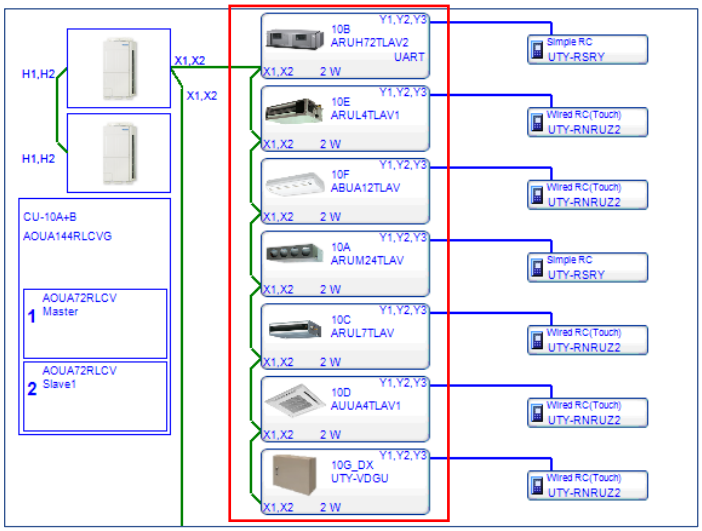
The wiring structure of transmission and power wiring for the DX Kit can be simplified if it is considered similar to an Airstage IU. (-TLAV1) Design Simulator will provide DX Kit Control Unit transmission line and power wiring diagrams similar to Airstage IUs. The primary difference with DX Kit application is Design Simulator will not determine the power requirements of the 3rd party AHU; this must be in compliance with the AUH manufacturer, and can be notated in the "Add Indoor Unit" details, section 6.2.3, p. 16.

Transmission wiring- The UTY-VDGU Control Unit is connected into the Airstage transmission line network X1/X2 identical Airstage IUs, by system type.

- VR-II- The UTY-VDGU Control Unit is connected to its respective single or Multi RBU:



- Heat Pump, all models- The UTY-VDGU Control Unit is connected as other Airstage IUs:



Line voltage, "Power line" wiring

- UTY-VDGU- The DX Kit Control Unit is powered in the same manner as other Airstage IUs.
  - 208/230/1/60
  - wired independently or with other IUs / DX Kit in the same system
- 3rd Party AHU- Design Simulator is not capable of determining power requirements of non-Airstage AHU's, thus voltage, MCA, and MOCP data must be provided by the AHU manufacturer.

7. Function Settings

DX Kit Function settings are similar to Airstage IUs, which can be configured through the Remote Control, RC, or Service Tool. As with Airstage IUs, Function Settings can manipulate an operational feature, e.g. "Auto Restart", or an external output function which can be assigned by operation state, e.g. "Cooling operation / Stop".

DX Kit settings are limited to the following:

Function	Function number	Setting number		Factory setting	Details		
Filter indicator interval	11	00	Standard (400 h)	♦	Adjust the filter cleaning interval notification. If the notification is too early, change the setting number to "01". If the notification is too late, change the setting number to "02".		
		01	Longer (1,000 h)				
		02	Shorter (200 h)				
Filter indicator action	13	00	Enable	♦	Enables or disables the filter indicator. Setting number "02" is for use with a central remote controller.		
		01	Disable				
		02	Display only on central remote controller				
Auto restart	40	00	Enable		Enables or disables automatic system restart after a power outage.		
		01	Disable	♦			
Cool air prevention	43	00	Super low		Restrain the cold airflow with making the airflow lower when starting heating operation. If using outlet temperature control (DIP switch SET3—3: Off), set the setting number to "01".		
		01	Follow the setting on the remote controller	♦			
Error report target	47	00	All	♦	Change the target for reporting errors. Errors can be reported either in all locations, or only on the central remote controller.		
		01	Display only on central remote controller				
Switching functions for external inputs and outputs terminals	60	00	Mode 0	♦	60—00	CNA01, 02	Operation/Stop
						CNA03, 04	Heating/Cooling
		01	Mode 1		60—01	CNA01, 02	Cooling Operation/Stop
						CNA03, 04	Heating Operation/Stop
Selecting stop operation during an external error	64	00	Mode 0	♦	Thermostat off		
		01	Mode 1		Thermostat off and fans top		
		02	Mode 2		Thermostat off, fan stop, and outdoor unit stop		

8. External input and output

External input and output structure of the DX Kit is similar to Airstage, however there are significant differences which will be discussed herein. Use of external input and output features are optional, to be used at the discretion of the installing contractor, architect or engineer. The DX Kit D&T Manual is a comprehensive reference for the system designer; thus, the following explanations are to compliment external input and output understanding.

8.1. External input

External input functions of the DX Kit are nearly identical to Airstage IUs, used to provide an override to the DX Kit and AHU operation.

- Input select- The "Input select" offers (2) methods for external input, however, most applications will only require a "dry contact" via a 3rd party device. A dry contact can be defined as a switch closure; it does not provide an output voltage to the PCB.

- Analog signal- The DX Kit is capable of analog, external input control from a 3rd party controller. (1 to 9 VDC) When an analog input signal is used, it is exclusive to IU operation; no other control is permitted, e.g. RC, etc.

External input and output function		Terminal	Connector	Input select
External input	On/Off signal	EX6	CNA01	Apply voltage
			CNA02	Dry contact
	Cool/heat signal	EX8	CNA03	Apply voltage
			CNA04	Dry contact
	Float switch signal	EX10	CNA05	Dry contact
	Error signal	EX7	CNA06	Apply voltage
			CNA07	Dry contact
	Analog signal	EX9	—	—

8.2. External output

The external output structure of the DX Kit Control Unit provides similar functionality to Airstage IUs. However, the default hardware configuration within the UTY-VDGU Control Unit incorporates a relay board which provides dry contact connection via terminal block for external output control.

The DX Kit Control Unit provides two means of external output control:

- Dry contact output (Type-I)
  - Default setting
- 12 VDC output (Type-ii)
  - Configurable via provided accessory cabling

The table below details the external output functions:

Function	Terminal	Output select		Status
		Type-i	Type-ii	
		DX kit internal relay status	DX kit output level	
On/Off signal	EX1	On (Open)	Off	Stop
		Off (Short)	On (DC 12 V)	Operation
Error signal	EX2	On (Open)	Off	Normal
		Off (Short)	On (DC 12 V)	Error
Fan signal	EX3	On (Open)	Off	Fan stop
		Off (Short)	On (DC 12 V)	Fan operation
Defrost signal	EX4	On (Open)	Off	Normal
		Off (Short)	On (DC 12 V)	Defrosting
Thermostat on/off signal	EX5	On (Open)	Off	Thermostat off
		Off (Short)	On (DC 12 V)	Thermostat on
Drain pump signal	D1	Off		Drain pump off
		On (DC 12 V)		Drain pump on

When controlling the 3rd party AHU from the DX Kit Control Unit, there are two primary external outputs may be used to provide functionality for:

- AHU blower- Fan Signal, EX3
  - The Control Unit provides a fan ON state
  - The 3rd party AHU mfg. reference required for specific fan speed details, DIP switch, etc.:
    - ECM
      - Constant torque
      - Constant CFM
    - Motor starter- Larger HP motors
    - PSC
    - VFD
- Defrost- Defrost Signal, EX4
  - Can be used to enable auxiliary heat control to temper supply air during defrost

External input / output wiring requirements:

- Fujitsu "Pink" transmission cable (Honeywell #3254)
- External input- 492' maximum
- External output- 82' maximum

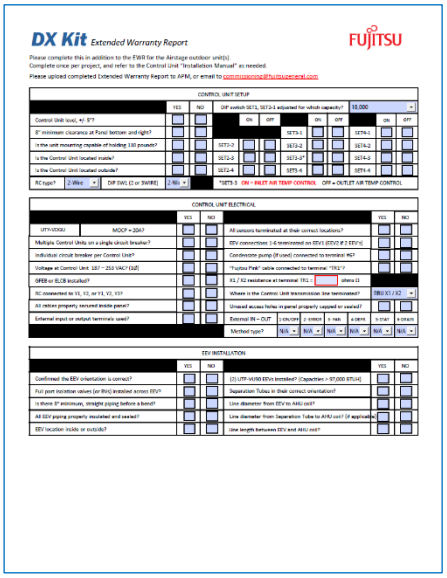
9. Extended Warranty Report- EWR

The Extended Warranty Report, "EWR", is to be completed for each Airstage project, in conjunction with the applicable outdoor unit EWR form. The EWR is a fillable PDF document, which can be completed via tablet or smartphone with requiring the Adobe Reader app. The EWR precedes system commissioning by documenting the installation details and to be completed by the installing contractor.

The EWR is a prerequisite for system commissioning, the prescribed process in order to obtain the Fujitsu issued, 10 Year Parts Warranty. See also section 10, "Warranty".

The EWR is available from the link here or from the Fujitsu CONNECT site.

- EWR must be downloaded to enable fillable feature



10. Warranty

QUALIFIED SYSTEMS (including outdoor model(s), indoor model(s), RBU(s), control(s) and DX Kit

A "Qualified System" is defined as follows:
a) Installed by an Airstage Trained Contractor and
b) Designed using Fujitsu Airstage Design Simulator; and
c) Installed for human thermal comfort or other approved applications as specifically outlined in an FGAI engineering bulletin (AE Bulletin); and
d) Commissioned by a FGAI registered commissioning agent within 120 days of installation and start-up; and
e) Submitted within 21 days of completing commissioning, full commissioning report(s); including but not limited to Design Simulator, Extended Warranty Report Pre-Commissioning Report, Service Tool Run Data and
f) In the case of a newly constructed building, written notification of the transaction must be received within 60 days of the Purchaser's purchase of the building; and
g) Received approval from FGAI that all reports are complete and without errors and received from FGAI an Extended Warranty Approval Letter.

PROPER INSTALLATION – This Limited Warranty applies only to Systems that are installed by contractors who are licensed for HVAC installation under applicable local and state law (Licensed Contractor), and who install the System in accordance with: (a) all applicable building codes and permits; (b) FGAI's installation and operation instructions; and (c) good trade practices.

TERMS OF WARRANTY – BEFORE REQUESTING SERVICE please review the user instructions and technical documentation for your System to confirm that the electric power is supplied and user controls are properly adjusted.

DISCLOSURE- Cooling, heating and airflow performance for all 3rd party air handling equipment cannot be guaranteed by FGAI.