

# APPLICATION NOTES



## **Application Note 2005:**

### **Refrigerant Piping Lengths and Heights - Design Considerations**

## Y-Series Design Requirements

### Introduction

The K-generation of CITY MULTI Y-Series systems (PUHY-P\*\*T(S)KMU-A(-BS), PUHY-P\*\*Y(S)KMU-A(-BS)) have improved line length limitations from the J-generation, allowing for systems with longer line lengths. These improvements are summarized in Table 1.

**Table 1.** Summary of line length limitations for K-generation Y-Series systems.

	J-Generation	K-Generation
Max line length between first joint and IDU (ft)	180	295
Max Elevation Difference Between IDU and IDU (ft)	49	98

IDU = Indoor Unit

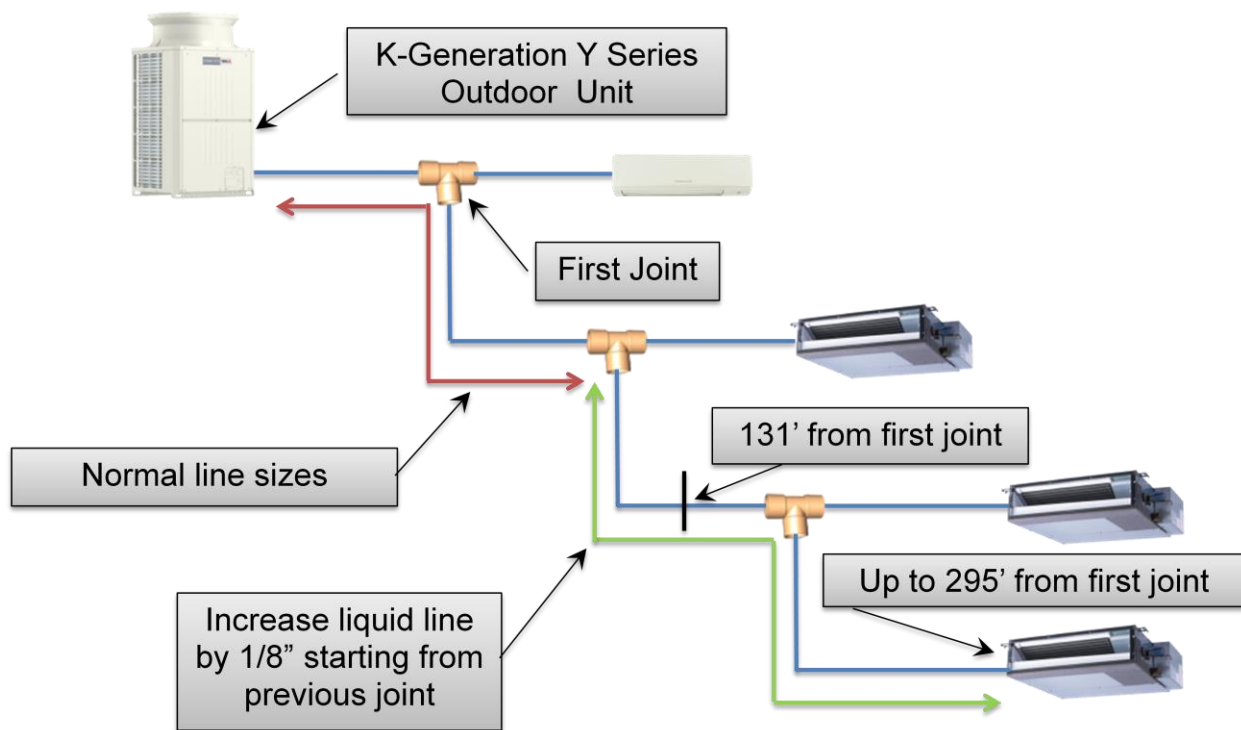
In order to take advantage of these improvements, there are special piping rules that must be implemented. These rules are described in this paper.

**\*All line lengths referenced in this paper are equivalent line lengths. The equivalent line length is the sum of the linear/horizontal portions of the section and any bends that exist in the section of piping. Bend equivalents vary according by location and pipe size. Please consult the Piping Design section of the 2012 City Multi Engineering Manual for additional details.\***

## Line Length Between First Joint and Indoor Unit; K Generation Y-Series Systems

The rules for designing a system with the extended piping length to an indoor unit are as follows:

- When the distance from the first joint to the indoor unit exceeds 131', upsize the liquid line by 1/8" from the joint at which 131' was exceeded.
- The maximum distance from the first joint to an indoor unit is 295'.
- The most update to date versions of Design Tool and Diamond System Builder will keep track of these rules and display correct line sizes.

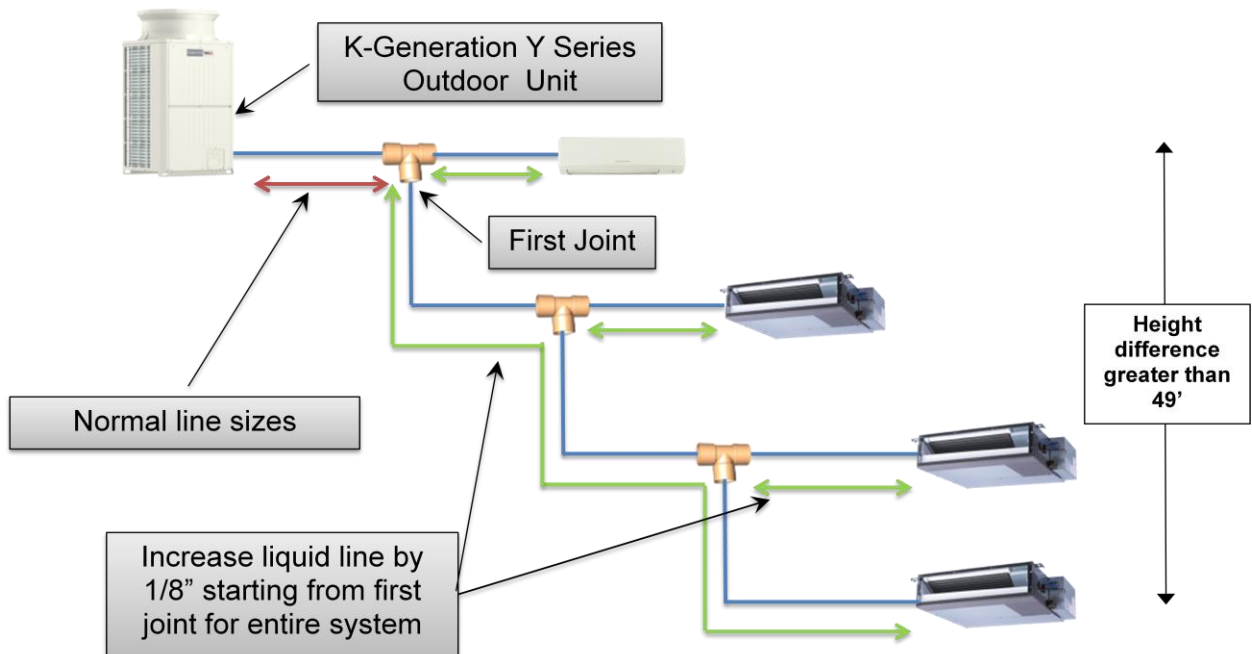


**Figure 1.** Upon exceeding 131', the liquid line is upsized.

## Height Between Indoor Units; K Generation Y-Series Systems

The rules for designing a system with the extended vertical height between two indoor units are as follows:

- If the height between two indoor units exceeds 49', then the liquid line for the entire system is upsized by 1/8" from the first joint.
- The maximum height difference between two indoor units is 98'.
- When utilizing the increased height between outdoor units, the total line length of the system is limited to 2500'.
- The most update to date version of Diamond System Builder will keep track of these rules and display correct line sizes. Design Tool **will not** recognize height differences. It's the responsibility of the designer to be cognizant of this fact when laying out the system and adjust pipe size and refrigerant charge manually.



**Figure 2.** Increase all liquid lines after the first joint by 1/8" when the height difference between two indoor units exceeds 49'.

## Line Length from Outdoor Unit to First Joint; K Generation Y-Series Systems

The main liquid line size for the PUHY-P96T/YKMU-A(-BS) & PUHY-P120T/YKMU-A(-BS) single module systems is dependent on the line length from the outdoor unit to the first joint.

- PUHY-P96T/YKMU-A(-BS): When the distance from the outdoor unit to the first joint exceeds 295', upsize the liquid line from 3/8" to 1/2"
- PUHY-P120T/YKMU-A(-BS): When the distance from the outdoor unit to the first joint exceeds 131', upsize the liquid line from 3/8" to 1/2"
- The most update to date versions of Design Tool and Diamond System Builder will keep track of these rules and display correct line sizes.

**Table 2.** Increase main trunk liquid line size if exceeding beyond values below:

Model #	Standard Liquid Line Size	Distance from OU to joint	Upsized Liquid Line Size
PUHY-P96T/YKMU-A(-BS)	3/8"	>=295'	1/2"
PUHY-P120T/YKMU-A(-BS)	3/8"	>=131'	1/2"

## Special Considerations

- Both improved line length and improved height limitations above can be utilized simultaneously; it is acceptable to exceed 131' from the first joint as well as 49' height difference with the same indoor unit.
- The rules outlined in this Application Note supplements Section 3-2: Piping Design in the 2013 CITY MULTI Y-Series System Design manual. See the complete documentation on piping design at [www.mylinkdrive.com](http://www.mylinkdrive.com).

## R2-Series Design Requirements

### Introduction

An R2-Series system has special piping rules for specific circumstances. These rules are affected by the presence of high capacity indoor units on a system (6 & 8 ton PEFY-NMH(S)U-E units).

### Traditional Piping Design

The maximum horizontal piping length from a Single/Main BC is a function of the height difference between the Single/Main BC and the highest/lowest indoor unit. A maximum vertical separation of 49' is allowed either between indoor units or between the Single/Main BC and the indoor unit, whichever limit is reached first. See examples below in **Table 3**:

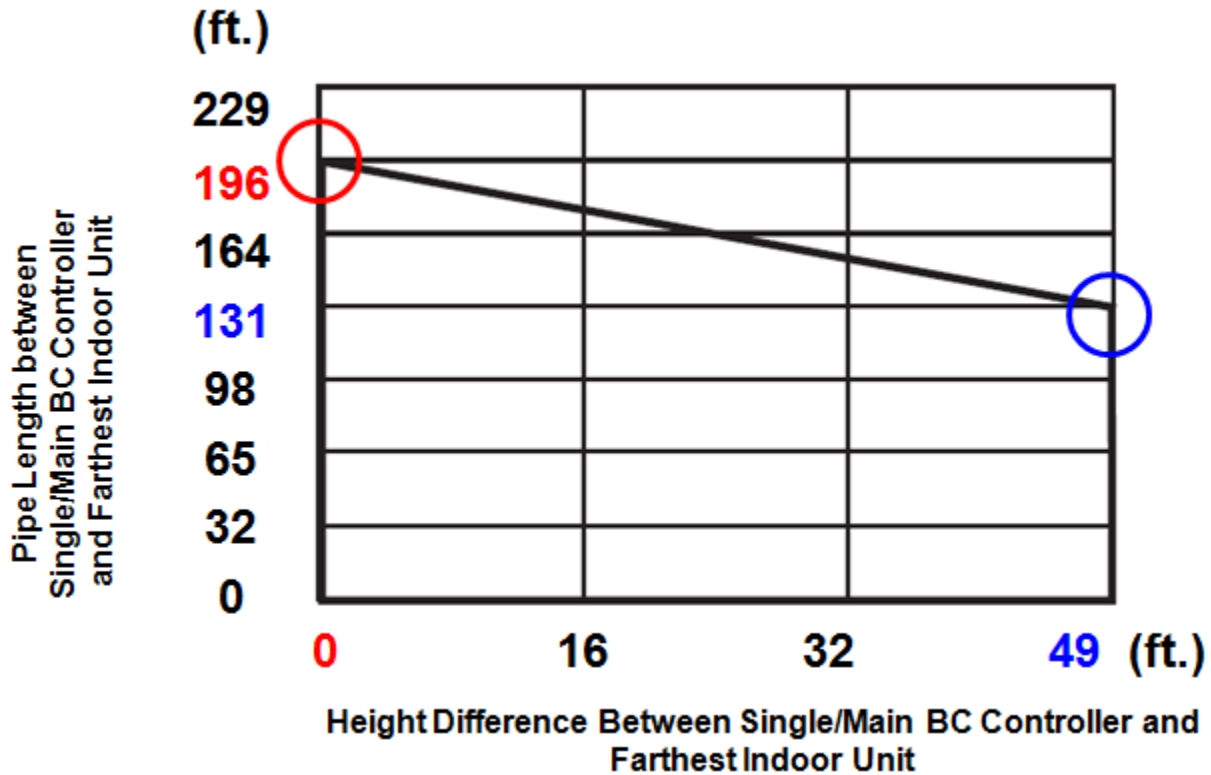
**Table 3:** Maximum Height Differential Examples (red represents limiting components):

	Single/Main BC	Indoor Unit #1	Indoor Unit #2
Example 1	Elevation 0'	Elevation 30'	Elevation 49'
Example 2	Elevation 10'	Elevation 0'	Elevation 49'

If 49' of vertical separation isn't required then the maximum horizontal separation from the Single/Main BC to the farthest indoor unit can increase based upon the following linear relationship:

$$L = -1.3265H + 196$$

Where  $L$  is the maximum horizontal separation between Single/Main BC and the furthest indoor unit and  $H$  is the maximum vertical separation between components. This is shown graphically in **Figure 3**:



**Figure 3.** Relationship between maximum horizontal separation and vertical separation.

### High Capacity Piping Design

Vertical Design: The 6 & 8 ton ducted units (PEFY-P72/96NMH(S)U-E) are limited to 32' maximum vertical separation from a Single/Main BC to an indoor unit or from indoor unit to indoor unit. Other, smaller indoor units on the system can potentially have 49' of vertical separation from the Single/Main BC as long as they aren't greater than 32' vertical separation from the P72/96. See examples below in **Table 4:**

**Table 4:** Maximum Height Differential Examples (red represents limiting components):

	Single/Main BC	P72 Indoor Unit	Indoor Unit #2
Example 1	Elevation 0'	Elevation 32'	Elevation 49'
Example 2	Elevation 0'	Elevation -10'	Elevation 22'

Horizontal Design: The 6 & 8 ton ducted units (PEFY-P72/96NMH(S)U-E) are limited to 131' maximum horizontal separation from a Single/Main BC to an indoor unit, these can't use the extension rule. All other units on the system can potentially achieve 196' of maximum horizontal separation depending on the vertical separation from the Single/Main BC.



## Additional Considerations

- Diamond System Builder will take these rules into account when accurate elevations (relative to the ground) for every component are entered into the program. The horizontal separation will change in response to the elevation inputs
- Design Tool **will not** support any of these rules as it doesn't have elevation inputs. It's the responsibility of the designer to stay within these limits and manually adjust the refrigerant charge for pipe lengths utilizing the extended horizontal application or when using high capacity indoor units.
- The rules outlined in this Application Note supplements Section 3-2: Piping Design in the 2013 CITY MULTI R2-Series System Design manual. See the complete documentation on piping design at [www.mylinkdrive.com](http://www.mylinkdrive.com) .