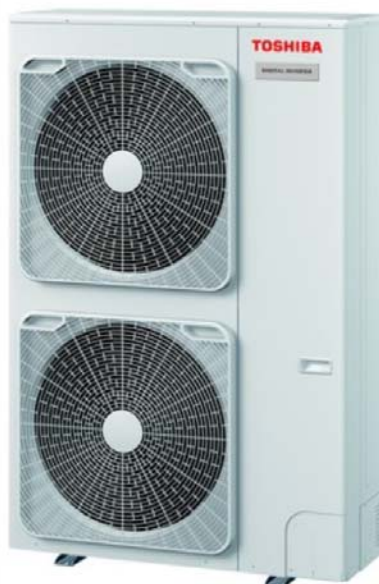


## **SUBJECT: DI-Big Series 6 Re-use of Existing Pipework**

**TOSHIBA** are pleased to provide the following data to enable “The Re-Use of Existing Pipework for the 6-Series DI-Big”.



### 1. Introduction

This bulletin is designed to help the designer to understand the restrictions and implications when re-using existing pipework, particularly when the pipework is the wrong size.

### 2. Applicable Models

RAV-SM2246AT8-E

RAV-SM2806AT8-E

### 3. Standard Piping Conditions

Below are the standard design conditions when using the correct pipe sizes. Please refer to section 4 when using the non-standard pipe sizes.

#### ■Single

Outdoor unit	Allowable Pipe Length (m)		Height Difference (m)	
	Total Length L		Indoor - Outdoor H	
	Minimum	Maximum	Indoor Unit : Above	Outdoor Unit : Above
RAV-SM2246AT8-E	5	100	30	30
RAV-SM2806AT8-E	5	100	30	30

■ Simultaneous Twin, Triple

Outdoor unit	Allowable Pipe Length (m)			Height Difference (m)		
	Total length	Branch Piping	Branch Piping	Indoor - Outdoor H		Indoor-Indoor ( $\Delta h$ )
	·L1+L2 ·L1+L3 ·L1+L4 (maximum)	·L2 ·L3 ·L4 (maximum)	·L3-L2 ·L4-L2 ·L4-L2 (maximum)	Indoor Unit: Above	Outdoor Unit: Above	
RAV-SM2246AT8-E	100	20	10	30	30	0.5
RAV-SM2806AT8-E	100	20	10	30	30	0.5

Outdoor Unit	Pipe Diameter (mm)				Number of Bends
	Main Pipe		Branch Piping		
	Gas Side	Liquid Side	Gas Side	Liquid Side	
RAV-SM2246AT8-E	$\phi 28.6$	$\phi 12.7$	$\phi 15.9$	$\phi 9.5$	10 or less
RAV-SM2806AT8-E	$\phi 28.6$	$\phi 12.7$	$\phi 15.9$	$\phi 9.5$	10 or less

■ Simultaneous Double Twin

Outdoor Unit	Allowable Pipe Length (m)				Height Difference (m)		
	Total Length	Branch Piping	Branch Piping	Branch Piping	Indoor - Outdoor H		Indoor-Indoor ( $\Delta h$ )
	·L1+L2+L4 ·L1+L2+L5 ·L1+L3+L6 ·L1+L3+L7 (maximum)	·L4 ·L5 ·L6 ·L7 (maximum)	·L4+L2 ·L5+L2 ·L6+L3 ·L7+L3 (maximum)	·(L4+L2)-(L5+L2) ·(L4+L2)-(L6+L2) ·(L4+L2)-(L7+L2) ·(L5+L2)-(L6+L3) ·(L5+L2)-(L7+L3) ·(L6+L3)-(L7+L3) (maximum)	Indoor unit: Above	Outdoor Unit: Above	
RAV-SM2246AT8-E	100	15	20	6	30	30	0.5
RAV-SM2806AT8-E	100	15	20	6	30	30	0.5

Outdoor Unit	Pipe Diameter (mm)				Number of Bends
	Main Pipe		Branch Piping		
	Gas Side	Liquid Side	Gas Side	Liquid Side	
RAV-SM2246AT8-E	$\phi 28.6$	$\phi 12.7$	L2,L3 : $\phi 15.9$ L4,L5,L6,L7 : $\phi 12.7$	L2,L3 : $\phi 9.5$ L4,L5,L6,L7 : $\phi 6.4$	10 or less
RAV-SM2806AT8-E	$\phi 28.6$	$\phi 12.7$	$\phi 15.9$	$\phi 9.5$	10 or less

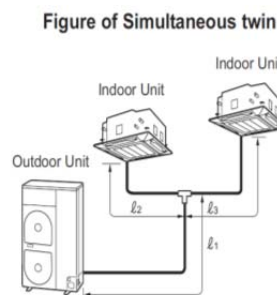
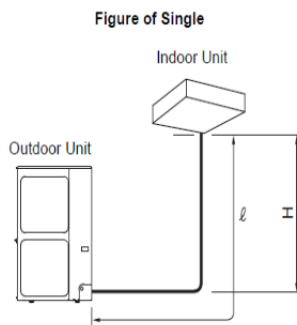


Figure of Simultaneous triple

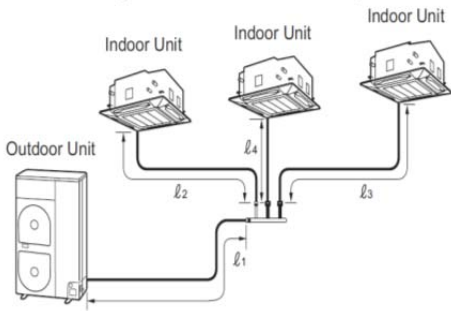
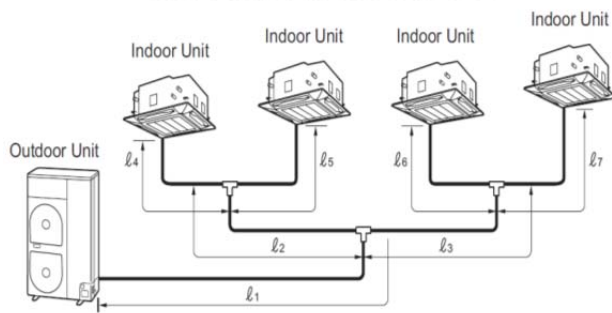


Figure of Simultaneous double twin



Additional Refrigerant Calculation

Single

Diameter of Connecting Pipe (Liquid Side)		Additional Refrigerant (g/m)		Additional Refrigerant Amount (g) =
L		$\alpha$		
$\phi 12.7$		90		
				$\alpha \times (L - 30)$

Simultaneous Twin

Diameter of Connecting Pipe (Liquid Side)			Additional Refrigerant (g/m)			Additional Refrigerant Amount (g) =
L1	L2	L3	$\alpha$	$\beta$		
$\phi 12.7$	$\phi 9.5$	$\phi 9.5$	90	45		
						$\alpha \times (L1 - 28) + \beta \times (L2 + L3 - 4)$

Simultaneous Triple

Diameter of Connecting Pipe (Liquid Side)		Additional Refrigerant (g/m)			Additional Refrigerant Amount (g) =
L1	L2 to L4	$\alpha$	$\beta$		
$\phi 12.7$	$\phi 9.5$	90	45		
					$\alpha \times (L1 - 28) + \beta \times (L2 + L3 + L4 - 6)$

Simultaneous Double Twin

Outdoor unit	Diameter of Connecting Pipe (liquid side)			Additional Refrigerant (g/m)			Additional Refrigerant Amount (g) =
	L1	L2, L3	L4 to L7	$\alpha$	$\beta$	$\gamma$	
RAV-SM2246AT8-E	$\phi 12.7$	$\phi 9.5$	$\phi 6.4$	90	45	20	$\alpha \times (L1 - 28) + \beta \times (L2 + L3 - 4) + \gamma \times (L4 + L5 + L6 + L7)$
RAV-SM2806AT8-E	$\phi 12.7$	$\phi 9.5$	$\phi 9.5$	90	45	45	


## 4. Piping Connections with Different Diameter Pipework

This section is used to determine what non standard pipework is acceptable and it also includes any capacity loss and additional restrictions on pipe lengths that must be considered.

Liquid Pipe	φ 9.5 (1-Size smaller)					
Gas Pipe	φ 22.2 (1-Size smaller)		φ 28.6 (Standard)		φ 34.9 (1-Size larger)	
Pipe Length	Max	Pre-Charged	Max	Pre-Charged	Max	Pre-charged
RAV-SM2246AT8-E	100m	30m	100m	30m	45m	30m
RAV-SM2806AT8-E	100m	30m	100m	30m	45m	30m

Liquid Pipe	φ 12.7 (Standard)					
Gas Pipe	φ 22.2 (1-Size smaller)		φ 28.6 (Standard)		φ 34.9 (1-Size larger)	
Pipe Length	Max	Pre-Charged	Max	Pre-Charged	Max	Pre-Charged
RAV-SM2246AT8-E	100m	30m	100m	30m	45m	30m
RAV-SM2806AT8-E	100m	30m	100m	30m	45m	30m

Liquid Pipe	φ15.9 (1-Size larger)					
Gas Pipe	φ22.2 (1-Size smaller)		φ28.6 (Standard)		φ34.9 (1-Size larger)	
Pipe Length	Max	Pre-Charged	Max	Pre-Charged	Max	Pre-Charged
RAV-SM2246AT8-E	70m	20m	70m	20m	45m	20m
RAV-SM2806AT8-E	70m	20m	70m	20m	45m	20m

 = Cooling Capacity is lower due to the diameter of gas pipe is smaller than standard pipe

The Capacity Correction factor for the highlighted sections in the previous tables can be found by using the following tables:

Cooling Capacity Correction						
Unit	Gas pipe	5 to 10 m	10 to 20 m	20 to 30 m	30 to 40 m	40 to 50 m
RAV-SM2246AT8-E	φ 22.2	92 to 91 %	91 to 89 %	89 to 87 %	87 to 86 %	86 to 84 %
RAV-SM2806AT8-E						

Cooling Capacity Correction						
Unit	Gas pipe	50 to 60 m	60 to 70 m	70 to 80 m	80 to 90 m	90 to 100 m
RAV-SM2246AT8-E	φ 22.2	84 to 81 %	81 to 79 %	79 to 77 %	77 to 75 %	77 to 75 %
RAV-SM2806AT8-E						

To determine the additional gas charge when using non-standard pipe sizes, please use the tables below:

Additional Refrigerant Calculation

Single

Diameter of Connecting Pipe (Liquid Side)	Additional Refrigerant (g/m)	Additional Refrigerant Amount (g) =
L	$\alpha$	
$\phi 9.5$	45	$\alpha \times (L - 30)$
$\phi 15.9$	120	$\alpha \times (L - 20)$

Simultaneous Twin

Diameter of Connecting Pipe (Liquid Side)			Additional Refrigerant (g/m)			Additional Refrigerant Amount (g) =
L1	L2	L3	$\alpha$	$\beta$		
$\phi 9.5$	$\phi 9.5$	$\phi 9.5$	45	45		$\alpha \times (L1 - 28) + \beta \times (L2 + L3 - 4)$
$\phi 15.9$	$\phi 9.5$	$\phi 9.5$	120	45		$\alpha \times (L1 - 18) + \beta \times (L2 + L3 - 4)$

Simultaneous Triple

Diameter of Connecting Pipe (Liquid Side)		Additional Refrigerant (g/m)			Additional Refrigerant Amount (g) =
L1	L2 to L4	$\alpha$	$\beta$		
$\phi 9.5$	$\phi 9.5$	45	45		$\alpha \times (L1 - 28) + \beta \times (L2 + L3 + L4 - 6)$
$\phi 15.9$	$\phi 9.5$	120	45		$\alpha \times (L1 - 18) + \beta \times (L2 + L3 + L4 - 6)$

Simultaneous Double Twin

Outdoor Unit	Diameter of Connecting Pipe (Liquid Side)			Additional Refrigerant (g/m)			Additional Refrigerant Amount (g) =
	L1	L2, L3	L4 to L7	$\alpha$	$\beta$	$\gamma$	
RAV-SM2246AT8-E	$\phi 9.5$	$\phi 9.5$	$\phi 6.4$	45	45	20	$\alpha \times (L1 - 28) + \beta \times (L2 + L3 - 4) + \gamma \times (L4 + L5 + L6 + L7)$
	$\phi 15.9$	$\phi 9.5$	$\phi 6.4$	120	45	20	$\alpha \times (L1 - 18) + \beta \times (L2 + L3 - 4) + \gamma \times (L4 + L5 + L6 + L7)$
RAV-SM2806AT8-E	$\phi 9.5$	$\phi 9.5$	$\phi 9.5$	45	45	45	$\alpha \times (L1 - 28) + \beta \times (L2 + L3 - 4) + \gamma \times (L4 + L5 + L6 + L7)$
	$\phi 15.9$	$\phi 9.5$	$\phi 9.5$	120	45	45	$\alpha \times (L1 - 18) + \beta \times (L2 + L3 - 4) + \gamma \times (L4 + L5 + L6 + L7)$



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