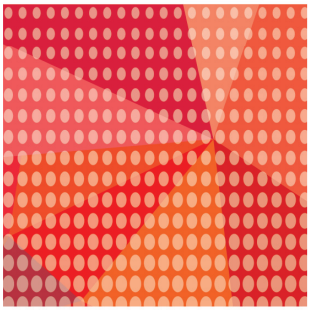
MITSUBISHI ELECTRIC

Changes for the Better

AIR CONDITIONING SYSTEMS

CITY MULTI



DATA BOOK

MODEL

PUMY-SP112-140VKM2 (-BS)

PUMY-SP112-140YKM2 (-BS)

GENERAL LINE-UP

Line-up of Outdoor Units of R410A CITY MULTI

Heat Pump S Series

PUMY-SP112VKM2(-BS)	PUMY-SP112YKM2(-BS)
PUMY-SP125VKM2(-BS)	PUMY-SP125YKM2(-BS)
PUMY-SP140VKM2(-BS)	PUMY-SP140YKM2(-BS)

4.5, 5, 6HP

CONTENTS

PUMY-SP-VKM2, PUMY-SP-YKM2

Model					PUMY-SP112VKM2(-BS)	PUMY-SP125VKM2(-BS)	PUMY-SP140VKM2(-BS)
Power source					1-phase 220-230-240 V, 50 Hz; 1-phase 220 V, 60 Hz		
Cooling capacity (Nominal)	*1	kW			12.5	14.0	15.5
	*1	kcal/h			10,750	12,040	13,330
	*1	BTU/h			42,650	47,768	52,886
	Power input	kW			4.46	5.11	5.34
	Current input	A			20.69-19.79-18.97, 20.69	23.71-22.68-21.73, 23.71	24.77-23.70-22.71, 24.77
	EER	kW/kW			2.80	2.74	2.90
Temp. range of cooling	Indoor	W.B.			15 ~ 24°C (59 ~ 75°F)		
	Outdoor *3*4	D.B.			−5 ~ 52°C (23 ~ 126°F)		
Heating capacity (Nominal)	*2	kW			14.0	16.0	16.5
	*2	kcal/h			12,040	13,760	14,190
	*2	BTU/h			47,768	54,592	56,298
	Power input	kW			3.66	4.31	4.36
	Current input	A			16.98-16.24-15.57, 16.98	20.00-19.13-18.33, 20.00	20.23-19.35-18.54, 20.23
	COP	kW/kW			3.83	3.71	3.78
Temp. range of heating	Indoor	D.B.			15 ~ 27°C (59 ~ 81°F)		
	Outdoor	W.B.			-20 ~ 15°C (-4~ 59°F)		
Indoor unit connectable	Total capacity				50 to 130% of outdoor unit capacity		
	Model/ Quantity	CITY MULTI			P10-P140/12	P10-P140/12	P10-P140/12
		Branch box *6			P15-P100/8	P15-P100/8	P15-P100/8
		Mixed system	Branch box 1unit *6	CITY MULTI	P10-P140/5	P15-P140/5	P10-P140/5
				Branch box	P15-P100/5	P15-P100/5	P15-P100/5
			Branch box 2unit *6	CITY MULTI	P10-P140/3	P10-P140/3	P10-P140/3
				Branch box	P15-P100/8	P15-P100/8	P15-P100/8
Sound pressure level (measured in anechoic room)		dB <A>			52/54	53/56	54/56
Sound power level (measured in anechoic room)		dB <A>			72/74	73/76	74/76
Refrigerant piping diameter	Liquid pipe	mm (in.)			9.52 (3/8) Flare		
	Gas pipe	mm (in.)			15.88 (5/8) Flare		
FAN	Type × Quantity				Propeller Fan × 1		
	Air flow rate	m³/min			77	83	83
		L/s			1283	1383	1383
		cfm			2719	2931	2931
	Control, Driving mechanism				DC control		
	Motor output	kW			0.20 × 1		
	External static press.				0Pa/30Pa *7		
Compressor	Type × Quantity				Twin rotary hermetic compressor × 1		
	Manufacture				Mitsubishi Electric Corporation		
	Starting method				Inverter		
	Motor output	kW			3.9	3.9	4.2
	Case heater	kW			0		
	Lubricant				FV50S (1.4litter)		
External finish					Galvanized Steel Sheet Munsell No. 3Y 7.8/1.1		
External dimension H × W × D		mm			981 × 1,050 × 330(+40)		
		in.			38-5/8 × 41-3/8 × 13 (+1-37/64)		
Protection devices	High pressure protection				High pressure Switch		
	Inverter circuit (COMP./FAN)				Overcurrent detection, Overheat detection(Heat sink thermistor)		
	Compressor				Compressor thermistor, Overcurrent detection, Compressor protector		
	Fan motor				Overheating, Voltage protection		
Refrigerant	Type × original charge				R410A×3.5 kg (8 lbs)		
	Control				Liner expansion valve		
Net weight		kg (lbs)			93 (205)*5		
Heat exchanger					Cross Fin and Copper tube		
HIC circuit (HIC: Heat Inter-Changer)					HIC circuit		
Defrosting method					Reversed refrigerant circuit		
Drawing	External				RK01B171		
	Wiring				BH79J995		
Standard attachment	Document				Installation Manual		
	Accessory				Grounded lead wire		
Optional parts					Joint: CMY-Y62-G-E Header: CMY-Y64/68-G-E Branch box: PAC-MK34/54BC		
Remarks					1. Nominal conditions *1, *2 are subject to ISO 15042. 2. Due to continuing improvement, above specifications may be subject to change without notice.		

Note:

	*1 Nominal cooling conditions	*2 Nominal heating conditions
Indoor :	27°C D.B./19°C W.B. [81°F D.B/66°F W.B.]	20°C D.B. [68°F D.B.]
Outdoor :	35°C D.B. [95°F D.B.]	7°C D.B./6°C W.B. [45°F D.B./43°F W.B.]
Pipe length :	7.5 m [24-9/16 ft]	7.5 m [24-9/16 ft]
Level difference :	0 m [0 ft]	0 m [0 ft]

*3 10 to 52°C D.B. [50 to 126 °F D.B.], when connecting following models: PKFY-P15/20/25VBM, PFFY-P20/25/32VLE(R)M, PFFY-P20/25/32VKM, and M series , S series , and P series type indoor unit with branch box , M series type indoor unit with connection kit.
*4 −15 to 52°C D.B. [5 to 126 °F D.B.]:, when using an optional air protect guide [PAC-SH95AG-E]. However, this condition does not apply to the indoor unit listed in *3.
*5 94 (207), for PUMY-SP112/125/140VKM2-BS.
*6 At least two indoor unit must be connected when using branch box.
*7 It is possible to set the External static pressure to 30 Pa by Dip Switch.

Unit converter

kcal/h = kW × 860
BTU/h = kW × 3,412
cfm = m³/min × 35.31
lb = kg/0.4536

Above specification data is subject to rounding variation.

1. SPECIFICATIONS

Model					PUMY-SP112YKM2(-BS)	PUMY-SP125YKM2(-BS)	PUMY-SP140YKM2(-BS)
Power source					3-phase 380-400-415V, 50 Hz; 3-phase 380 V, 60 Hz		
Cooling capacity (Nominal)	*1	kW			12.5	14.0	15.5
	*1	kcal/h			10,750	12,040	13,330
	*1	BTU/h			42,650	47,768	52,886
	Power input	kW			4.46	5.11	5.34
	Current input	A			7.14-6.78-6.54, 7.14	8.18-7.77-7.49, 8.18	8.55-8.12-7.83, 8.55
	EER	kW/kW			2.80	2.74	2.90
Temp. range of cooling	Indoor	W.B.			15 ~ 24°C (59 ~ 75°F)		
	Outdoor *3*4	D.B.			-5 ~ 52°C (23 ~ 126°F)		
Heating capacity (Nominal)	*2	kW			14.0	16.0	16.5
	*2	kcal/h			12,040	13,760	14,190
	*2	BTU/h			47,768	54,592	56,298
	Power input	kW			3.66	4.31	4.36
	Current input	A			5.86-5.57-5.36, 5.86	6.90-6.55-6.32, 6.90	6.98-6.63-6.39, 6.98
	COP	kW/kW			3.83	3.71	3.78
Temp. range of heating	Indoor	D.B.			15 ~ 27°C (59 ~ 81°F)		
	Outdoor	W.B.			−20 ~ 15°C (-4~ 59°F)		
Indoor unit connectable	Total capacity				50 to 130% of outdoor unit capacity		
	Model/ Quantity	CITY MULTI			P10-P140/12	P10-P140/12	P10-P140/12
		Branch box *6			P15-P100/8	P15-P100/8	P15-P100/8
		Mixed system	Branch box 1unit *6	CITY MULTI	P10-P140/5	P10-P100/5	P10-P140/5
				Branch box	P15-P100/5	P15-P100/5	P15-P100/5
			Branch box 2unit *6	CITY MULTI	P10-P140/3	P10-P140/3	P10-P140/3
				Branch box	P15-P100/8	P15-P100/8	P15-P100/8
Sound pressure level (measured in anechoic room)		dB <A>			52/54	53/56	54/56
Sound power level (measured in anechoic room)		dB <A>			72/74	73/76	74/76
Refrigerant piping diameter	Liquid pipe	mm (in.)			9.52 (3/8) Flare		
	Gas pipe	mm (in.)			15.88 (5/8) Flare		
FAN	Type × Quantity				Propeller Fan × 1		
	Air flow rate	m³/min			77	83	83
		L/s			1283	1383	1383
		cfm			2719	2931	2931
	Control, Driving mechanism				DC control		
	Motor output	kW			0.20 × 1		
	External static press.				0Pa/30Pa *7		
Compressor	Type × Quantity				Twin rotary hermetic compressor × 1		
	Manufacture				Mitsubishi Electric Corporation		
	Starting method				Inverter		
	Motor output	kW			3.9	3.8	4.1
	Case heater	kW			0		
	Lubricant				FV50S (1.4litter)		
External finish					Galvanized Steel Sheet Munsell No. 3Y 7.8/1.1		
External dimension H × W × D		mm			981 × 1,050 × 330(+40)		
		in.			38-5/8 × 41-3/8 × 13 (+1-37/64)		
Protection devices	High pressure protection				High pressure Switch		
	Inverter circuit (COMP./FAN)				Overcurrent detection, Overheat detection(Heat sink thermistor)		
	Compressor				Compressor thermistor, Overcurrent detection, Compressor protector		
	Fan motor				Overheating, Voltage protection		
Refrigerant	Type × original charge				R410A×3.5 kg (8 lbs)		
	Control				Liner expansion valve		
Net weight		kg (lbs)			94 (207) *5		
Heat exchanger					Cross Fin and Copper tube		
HIC circuit (HIC: Heat Inter-Changer)					HIC circuit		
Defrosting method					Reversed refrigerant circuit		
Drawing	External				RK01B171		
	Wiring				BH79J996		
Standard attachment	Document				Installation Manual		
	Accessory				Grounded lead wire		
Optional parts					Joint: CMY-Y62-G-E Header: CMY-Y64/68-G-E Branch box: PAC-MK34/54BC		
Remarks					1. Nominal conditions *1, *2 are subject to ISO 15042. 2. Due to continuing improvement, above specifications may be subject to change without notice.		

Note:

	*1 Nominal cooling conditions	*2 Nominal heating conditions
Indoor :	27°C D.B./19°C W.B. [81°F D.B/66°F W.B.]	20°C D.B. [68°F D.B.]
Outdoor :	35°C D.B. [95°F D.B.]	7°C D.B./6°C W.B. [45°F D.B./43°F W.B.]
Pipe length :	7.5 m [24-9/16 ft]	7.5 m [24-9/16 ft]
Level difference :	0 m [0 ft]	0 m [0 ft]

*3 10 to 52°C D.B. [50 to 126 °F D.B.], when connecting following models: PKFY-P15/20/25VBM, PFFY-P20/25/32VLE(R)M, PFFY-P20/25/32VKM, and M series , S series , and P series type indoor unit with branch box , M series type indoor unit with connection kit.
*4 −15 to 52°C D.B. [5 to 126 °F D.B.], when using an optional air protect guide [PAC-SH95AG-E]. However, this condition does not apply to the indoor unit listed in *3.
*5 95 (209), for PUMY-SP112/125/140YKM2-BS.
*6 At least two indoor unit must be connected when using branch box.
*7 It is possible to set the External static pressure to 30 Pa by Dip Switch.

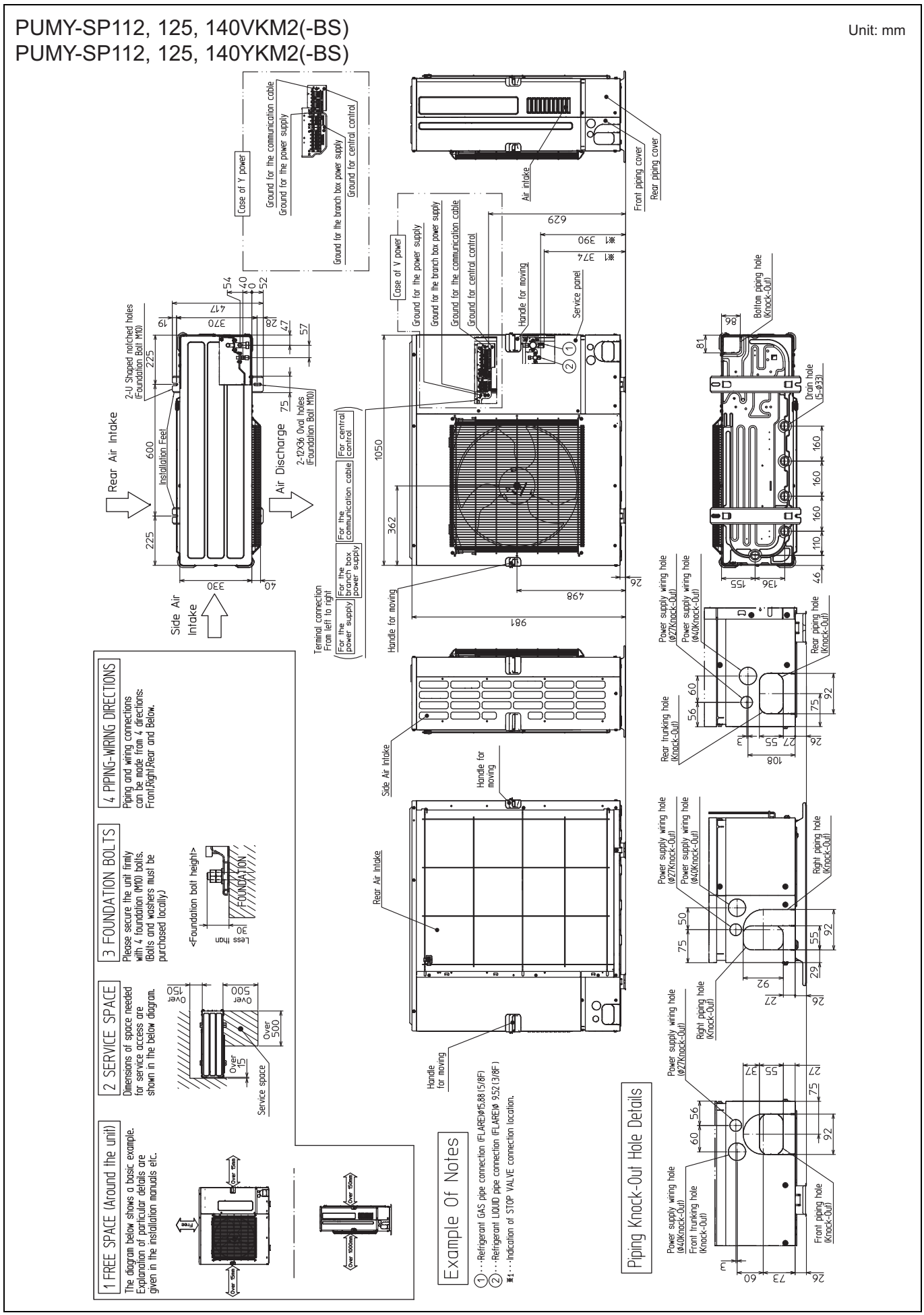
Unit converter

kcal/h = kW × 860
BTU/h = kW × 3,412
cfm = m³/min × 35.31
lb = kg/0.4536

Above specification data is subject to rounding variation.

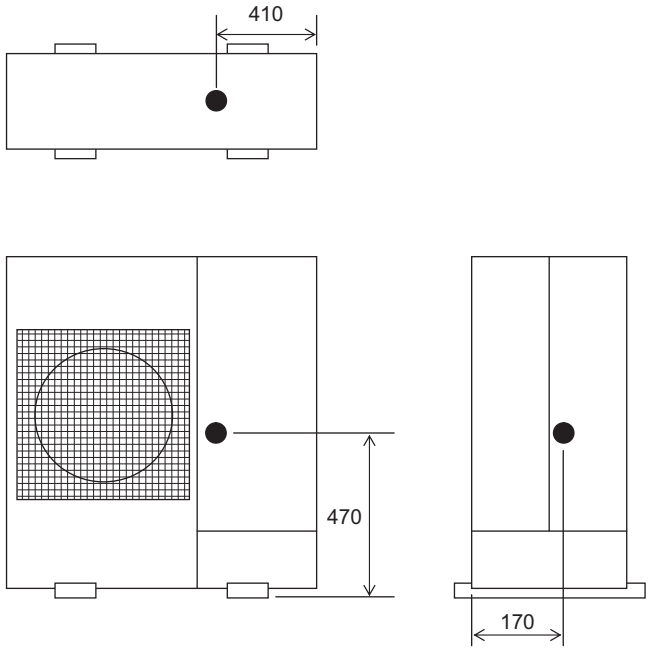
PUMY-SP112, 125, 140VKM2(-BS)
PUMY-SP112, 125, 140YKM2(-BS)

Unit: mm

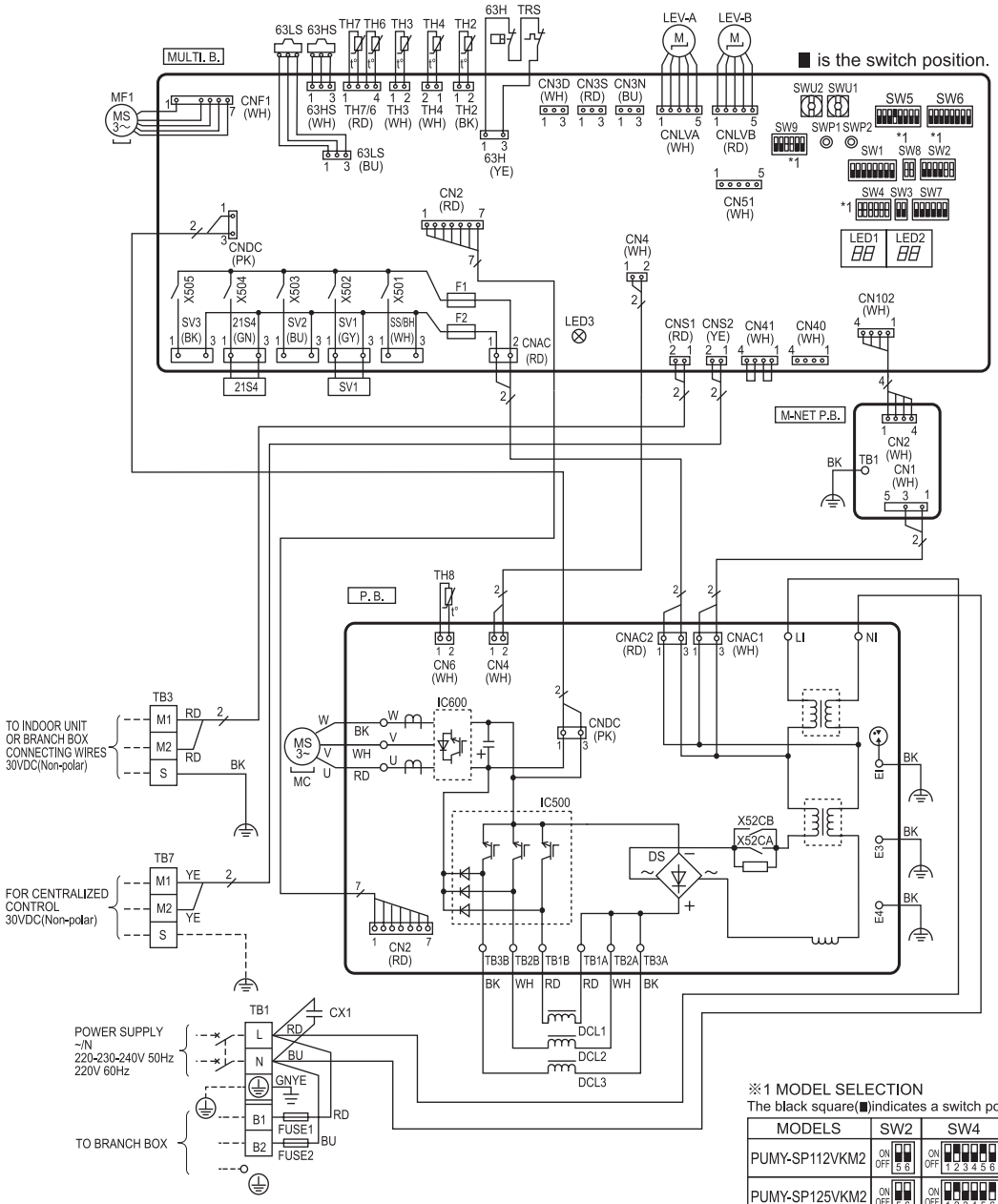


PUMY-SP112, 125, 140VKM2(-BS)
PUMY-SP112, 125, 140YKM2(-BS)

Unit: mm



PUMY-SP112, 125, 140VKM2(-BS)



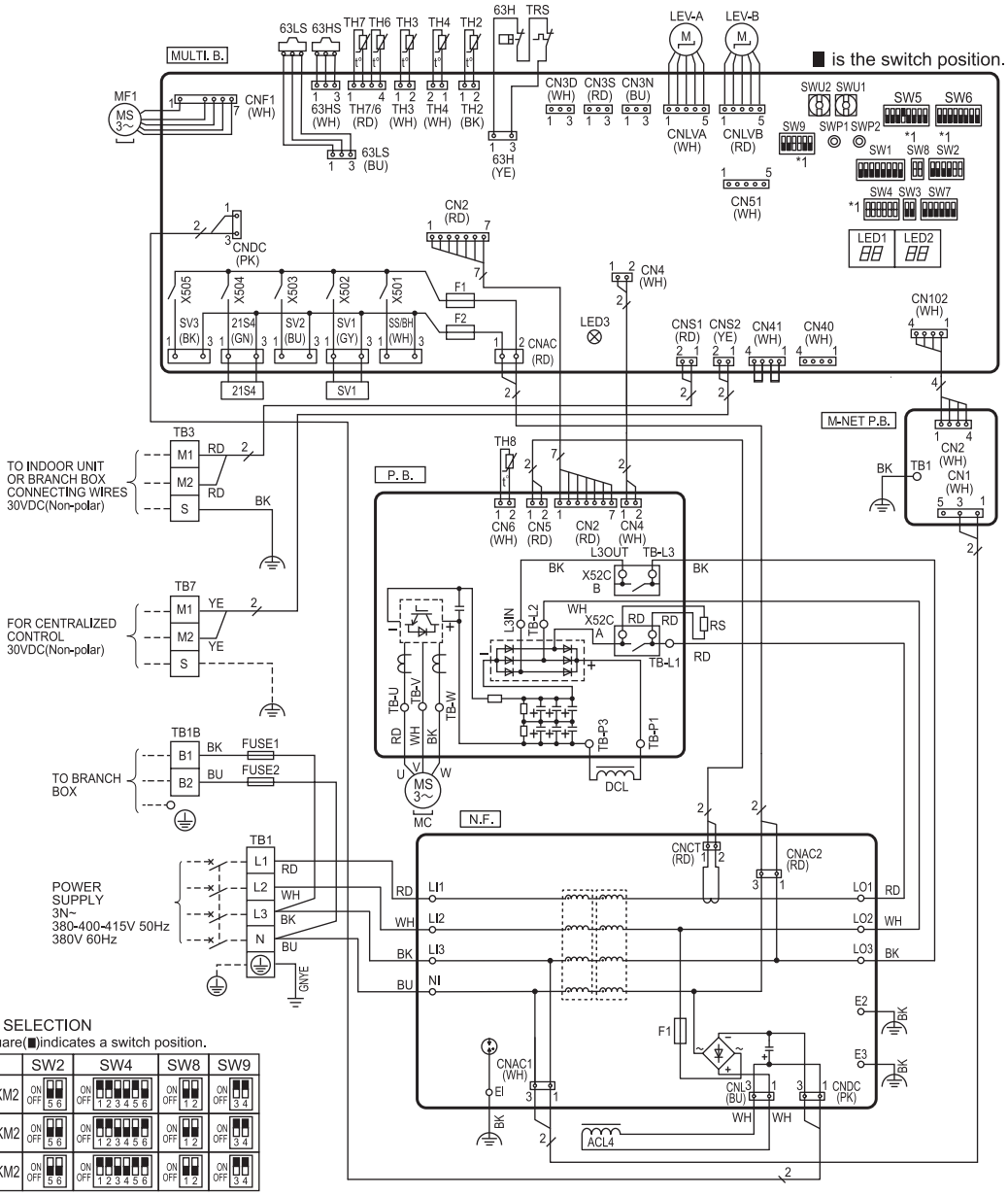
※1 MODEL SELECTION
The black square(■)indicates a switch position.

MODELS	SW2	SW4	SW8	SW9
PUMY-SP112VKM2	ON OFF 5 6	ON OFF 1 2 3 4 5 6	ON OFF 1 2	ON OFF 3 4
PUMY-SP125VKM2	ON OFF 5 6	ON OFF 1 2 3 4 5 6	ON OFF 1 2	ON OFF 3 4
PUMY-SP140VKM2	ON OFF 5 6	ON OFF 1 2 3 4 5 6	ON OFF 1 2	ON OFF 3 4

【LEGEND】

SYMBOL	NAME	SYMBOL	NAME	SYMBOL	NAME
TB1	Terminal Block <Power Supply/Branch Box>	TH8	Thermistor<Heat Sink>	SW7	Switch<Function Selection>
TB3	Terminal Block <Indoor/Outdoor, Branch Box/Outdoor Transmission Line>	LEV-A, LEV-B	Linear Expansion Valve	SW8	Switch<Model Selection>
		DCL1, DCL2, DCL3	Reactor	SW9	Switch<Function Selection>
TB7	Terminal Block <Centralized Control Transmission Line>	CX1	Capacitor	SWU1	Switch<Unit Address Selection, ones digit>
		P.B.	Power Circuit Board	SWU2	Switch<Unit Address Selection, tens digit>
TBD1	Terminal Block <DRED>	U/V/W	Connection Terminal<U/V/W-Phase>	CNS1	Connector<Indoor/Outdoor, Branch Box/ Outdoor Transmission Line>
TRS	Compressor protector	LI	Connection Terminal<L-Phase>		
FUSE1,FUSE2	Fuse <T20AL250V>	NI	Connection Terminal<N-Phase>	CNS2	Connector<Centralized Control Transmission Line>
MC	Motor for Compressor	TB1A, TB2A, TB3A, TB1B, TB2B, TB3B	Connection Terminal<Reactor>	SS	Connector<Connection for Option>
MF1	Fan Motor			CN3D	Connector<Connection for DRED>
63H	High Pressure Switch	EI, E3, E4	Connection Terminal<Electrical Parts Box>	CN3S	Connector<Connection for DRED>
63HS	High Pressure Sensor	X52C A/B	52C Relay	CN3N	Connector<Connection for Option>
63LS	Low Pressure Sensor	MULTI.B.	Multi Controller Circuit Board	CN51	Connector<Connection for Option>
SV1	Solenoid Valve Coil<Bypass Valve>	SW1	Switch<Display Selection>	LED1,LED2	LED<Operation Inspection Display>
21S4	Solenoid Valve Coil<4-Way Valve>	SW2	Switch<Function Selection>	LED3	LED<Power Supply to Main Microcomputer>
TH2	Thermistor<Hic Pipe>	SW3	Switch<Test Run>	F1,F2	Fuse<T6.3AL250V>
TH3	Thermistor<Outdoor Liquid Pipe>	SW4	Switch<Model Selection>	X501～505	Relay
TH4	Thermistor<Compressor>	SW5	Switch<Function Selection>	M-NET P.B.	M-NET Power Circuit Board
TH6	Thermistor<Suction Pipe>	SW6	Switch<Function Selection>	TB1	Connection Terminal<Electrical Parts Box>
TH7	Thermistor<Ambient>				

PUMY-SP112, 125, 140YKM2(-BS)



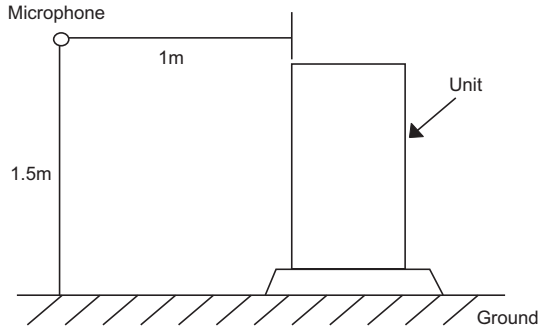
※1 MODEL SELECTION
The black square(■)indicates a switch position.

MODELS	SW2	SW4	SW8	SW9
PUMY-SP112YKM2	ON OFF 5 6	ON OFF 1 2 3 4 5 6	ON OFF 1 2	ON OFF 3 4
PUMY-SP125YKM2	ON OFF 5 6	ON OFF 1 2 3 4 5 6	ON OFF 1 2	ON OFF 3 4
PUMY-SP140YKM2	ON OFF 5 6	ON OFF 1 2 3 4 5 6	ON OFF 1 2	ON OFF 3 4

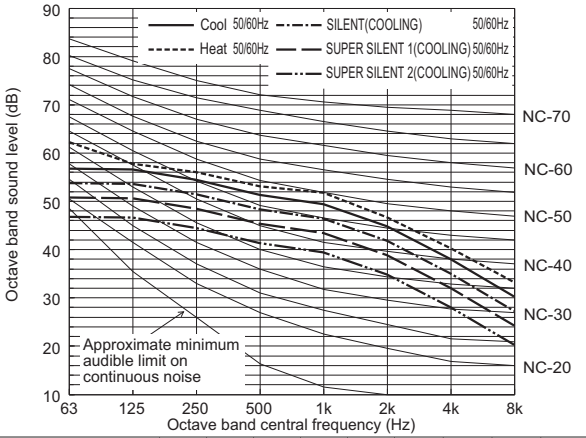
【LEGEND】

SYMBOL	NAME	SYMBOL	NAME	SYMBOL	NAME
TB1	Terminal Block<Power Supply>	TH8	Thermistor<Heat Sink>	SW6	Switch<Function Selection>
TB1B	Terminal Block<Branch Box>	RS	Rush Current Protect Resistor	SW7	Switch<Function Selection>
TB3	Terminal Block<Indoor/Outdoor, Branch Box/Outdoor Transmission Line>	LEV-A, LEV-B	Linear Expansion Valve	SW8	Switch<Model Selection>
		ACL4	Reactor	SW9	Switch<Function Selection>
TB7	Terminal Block <Centralized Control Transmission Line>	DCL	Reactor	SWU1	Switch<Unit Address Selection, ones digit>
		P.B.	Power Circuit Board	SWU2	Switch<Unit Address Selection, tens digit>
TBD1	Terminal Block <DRED>	TB-U/V/W	Connection Terminal<U/V/W-Phase>	CNS1	Connector<Indoor/Outdoor, Branch Box/ Outdoor Transmission Line>
TRS	Compressor protector	TB-L1/L2/L3	Connection Terminal<L1/L2/L3-Power Supply>		
FUSE1,FUSE2	Fuse<T20AL250V>	TB-P1/P3	Connection Terminal	CNS2	Connector<Centralized Control Transmission Line>
MC	Motor for Compressor	X52CA/B	52C Relay	SS	Connector<Connection for Option>
MF1	Fan Motor	N.F.	Noise Filter Circuit Board	CN3D	Connector<Connection for DRED>
63H	High Pressure Switch	LO1/LO2/LO3	Connection Terminal<L1/L2/L3-Power Supply>	CN3S	Connector<Connection for DRED>
63HS	High Pressure Sensor	LI1/LI2/LI3/NI	Connection Terminal<L1/L2/L3-Power Supply>	CN3N	Connector<Connection for Option>
63LS	Low Pressure Sensor	EI, E2, E3	Connection Terminal<Electrical Parts Box>	CN51	Connector<Connection for Option>
SV1	Solenoid Valve Coil<Bypass Valve>	F1	Fuse<T6.3AL250V>	LED1,LED2	LED<Operation Inspection Display>
21S4	Solenoid Valve Coil<4-Way Valve>	MULTI.B.	Multi Controller Circuit Board	LED3	LED<Power Supply to Main Microcomputer>
TH2	Thermistor<Hic Pipe>	SW1	Switch<Display Selection>	F1,F2	Fuse<T6.3AL250V>
TH3	Thermistor<Outdoor Liquid Pipe>	SW2	Switch<Function Selection>	X501～505	Relay
TH4	Thermistor<Compressor>	SW3	Switch<Test Run>	M-NET P.B.	M-NET Power Circuit Board
TH6	Thermistor<Suction Pipe>	SW4	Switch<Model Selection>	TB1	Connection Terminal<Electrical Parts Box>
TH7	Thermistor<Ambient>	SW5	Switch<Function Selection>		

Measurement condition
PUMY-SP112, 125, 140VKM2(-BS)
PUMY-SP112, 125, 140YKM2(-BS)



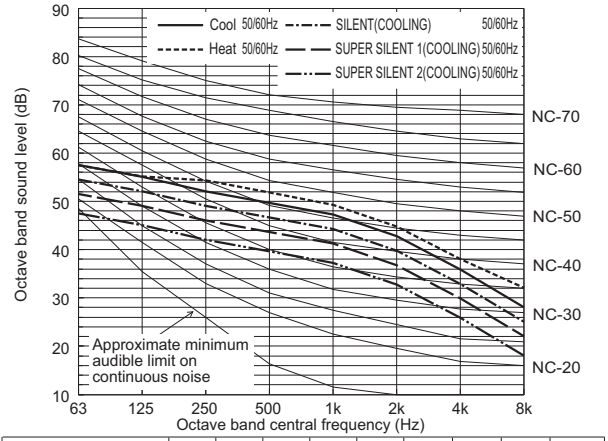
Sound level of PUMY-SP140VKM2, YKM2(-BS)



		63	125	250	500	1k	2k	4k	8k	dB(A)
Standard Cooling	50/60Hz	56.8	56.6	54.5	51.3	49.4	44.8	38.0	30.3	54.0
Standard Heating	50/60Hz	62.3	57.8	56.1	53.1	51.8	46.7	40.3	33.2	56.0
SILENT(COOLING)	50/60Hz	53.8	53.6	51.5	48.3	46.4	41.8	35.0	27.3	51.0
SUPER SILENT 1(COOLING)	50/60Hz	50.8	50.6	48.5	45.3	43.4	38.8	32.0	24.3	48.0
SUPER SILENT 2(COOLING)	50/60Hz	46.8	46.6	44.5	41.3	39.4	34.8	28.0	20.3	44.0

When Silent/Super Silent1/Super Silent2 mode is set,the A/C system's capacity is limited. The system could return to normal operation from Silent/Super Silent1/Super Silent2 mode automatically in the case that the operation condition is severe.

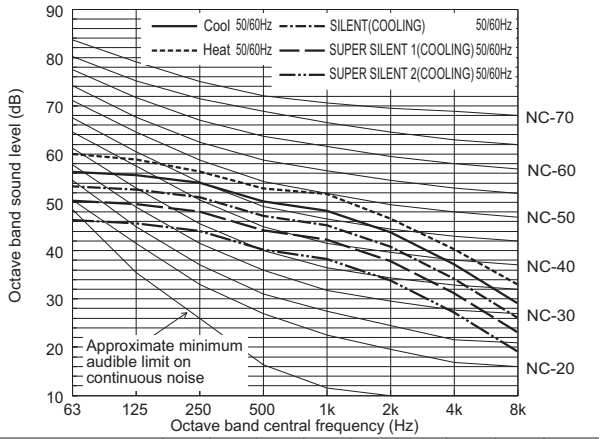
Sound level of PUMY-SP112VKM2, YKM2(-BS)



		63	125	250	500	1k	2k	4k	8k	dB(A)
Standard Cooling	50/60Hz	57.5	55.1	52.0	49.6	47.3	42.8	35.9	28.1	52.0
Standard Heating	50/60Hz	57.4	55.1	54.3	51.8	49.3	44.8	38.0	32.1	54.0
SILENT(COOLING)	50/60Hz	54.5	52.1	49.0	46.6	44.3	39.8	32.9	25.1	49.0
SUPER SILENT 1(COOLING)	50/60Hz	51.5	49.1	46.0	43.6	41.3	36.8	29.9	22.1	46.0
SUPER SILENT 2(COOLING)	50/60Hz	47.5	45.1	42.0	39.6	37.3	32.8	25.9	18.1	42.0

When Silent/Super Silent1/Super Silent2 mode is set,the A/C system's capacity is limited. The system could return to normal operation from Silent/Super Silent1/Super Silent2 mode automatically in the case that the operation condition is severe.

Sound level of PUMY-SP125VKM2, YKM2(-BS)

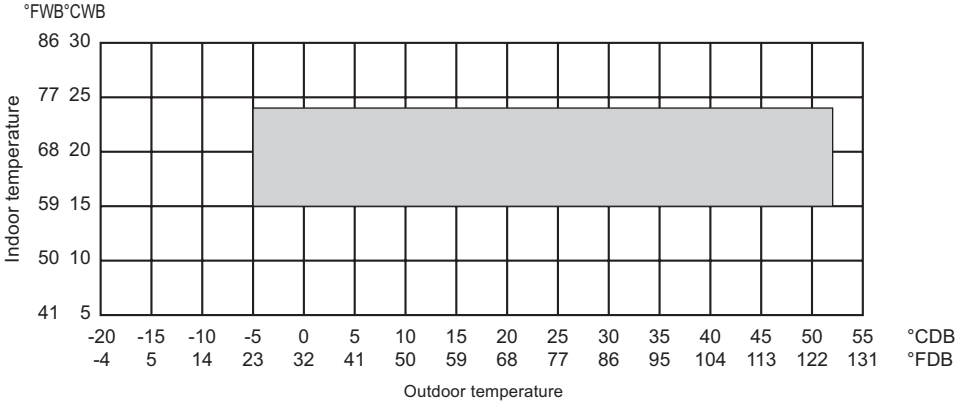


		63	125	250	500	1k	2k	4k	8k	dB(A)
Standard Cooling	50/60Hz	56.3	55.6	54.1	50.2	48.3	43.8	37.2	29.1	53.0
Standard Heating	50/60Hz	60.0	58.9	56.4	52.9	51.8	46.6	40.3	33.0	56.0
SILENT(COOLING)	50/60Hz	53.3	52.6	51.1	47.2	45.3	40.8	34.2	26.1	50.0
SUPER SILENT 1(COOLING)	50/60Hz	50.3	49.6	48.1	44.2	42.3	37.8	31.2	23.1	47.0
SUPER SILENT 2(COOLING)	50/60Hz	46.3	45.6	44.1	40.2	38.3	33.8	27.2	19.1	43.0

When Silent/Super Silent1/Super Silent2 mode is set,the A/C system's capacity is limited. The system could return to normal operation from Silent/Super Silent1/Super Silent2 mode automatically in the case that the operation condition is severe.

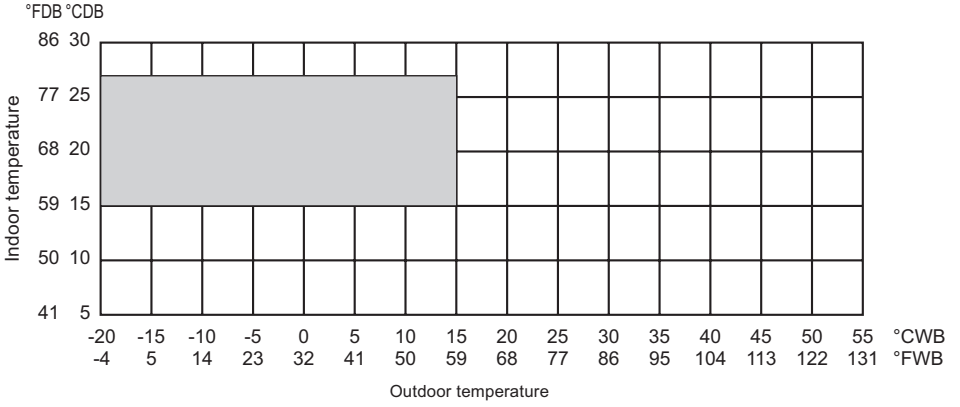
6. OPERATION TEMPERATURE RANGE

• Cooling



* 10 to 52°CDB (50 to 126°FDB): in case of connecting PKFY-P15/P20/P25VBM, PFFY-P20/P25/P32VKM, PFFY-P20/P25/P32VLE(R)M type indoor unit and M series , S series , and P series type indoor unit with branch box , M series type indoor unit with connection kit.

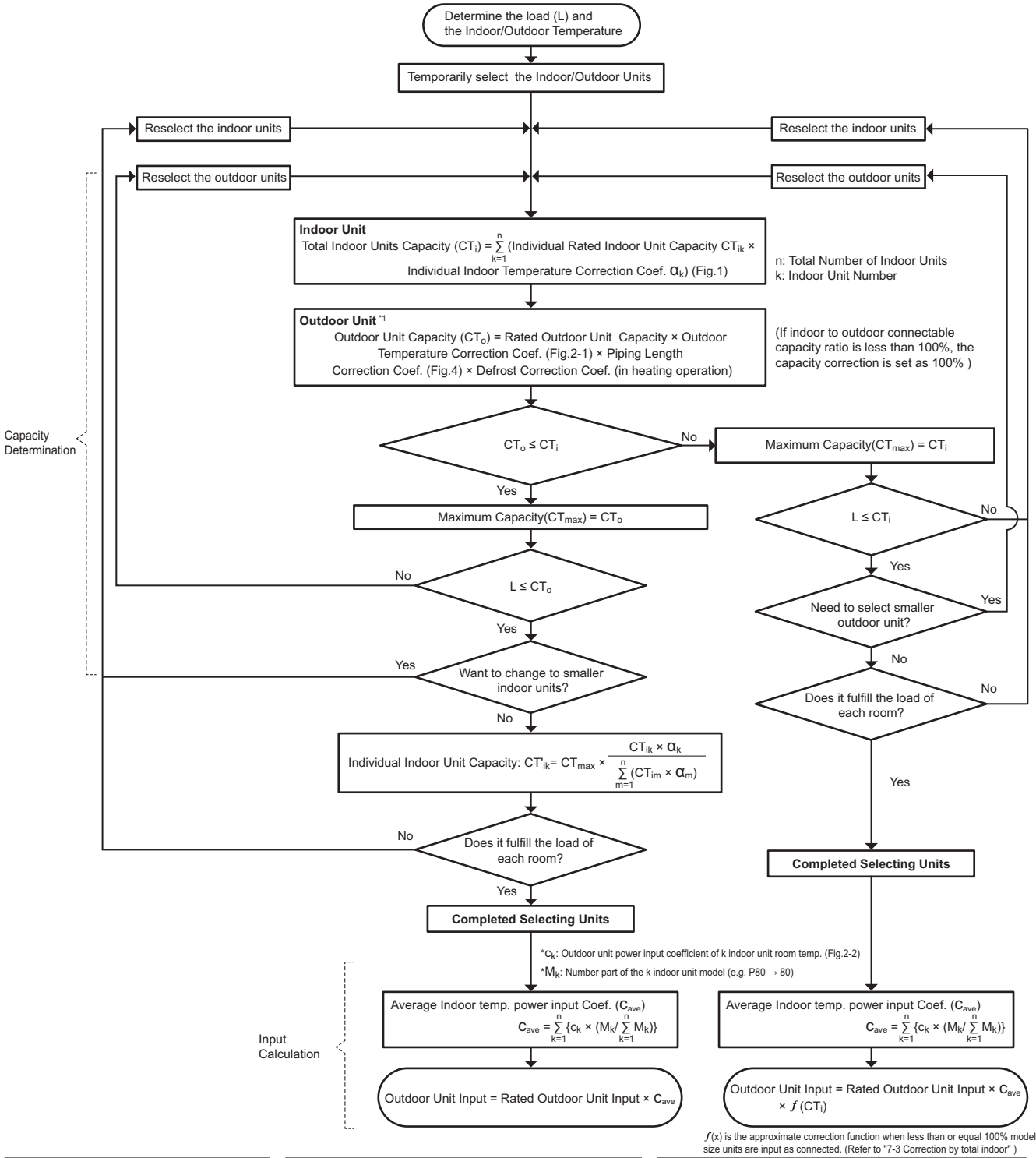
• Heating



7-1. Selection of Cooling/Heating Units

How to determine the capacity when less than or equal 100% indoor model size units are connected in total:

The purpose of this flow chart is to select the indoor and outdoor units. For other purposes, this flow chart is intended only for reference.



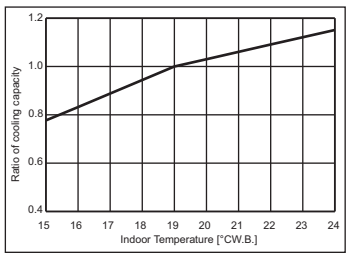


Fig.1 Indoor unit temperature correction *2

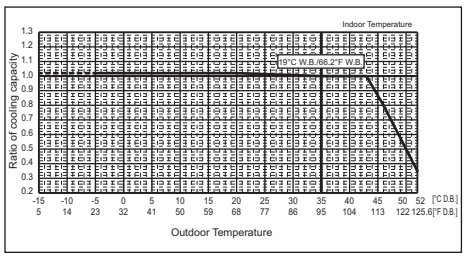


Fig.2-1 Outdoor unit temperature correction (capacity) *3

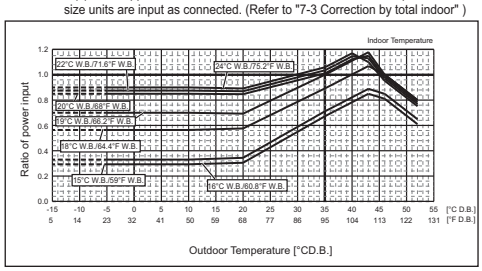


Fig.2-2 Outdoor unit temperature correction (power input) *3

* Values in the temperature correction diagram in the range below -5°C (23°F) are reference values and not guaranteed values. Do not use these reference values for selecting outdoor unit models.

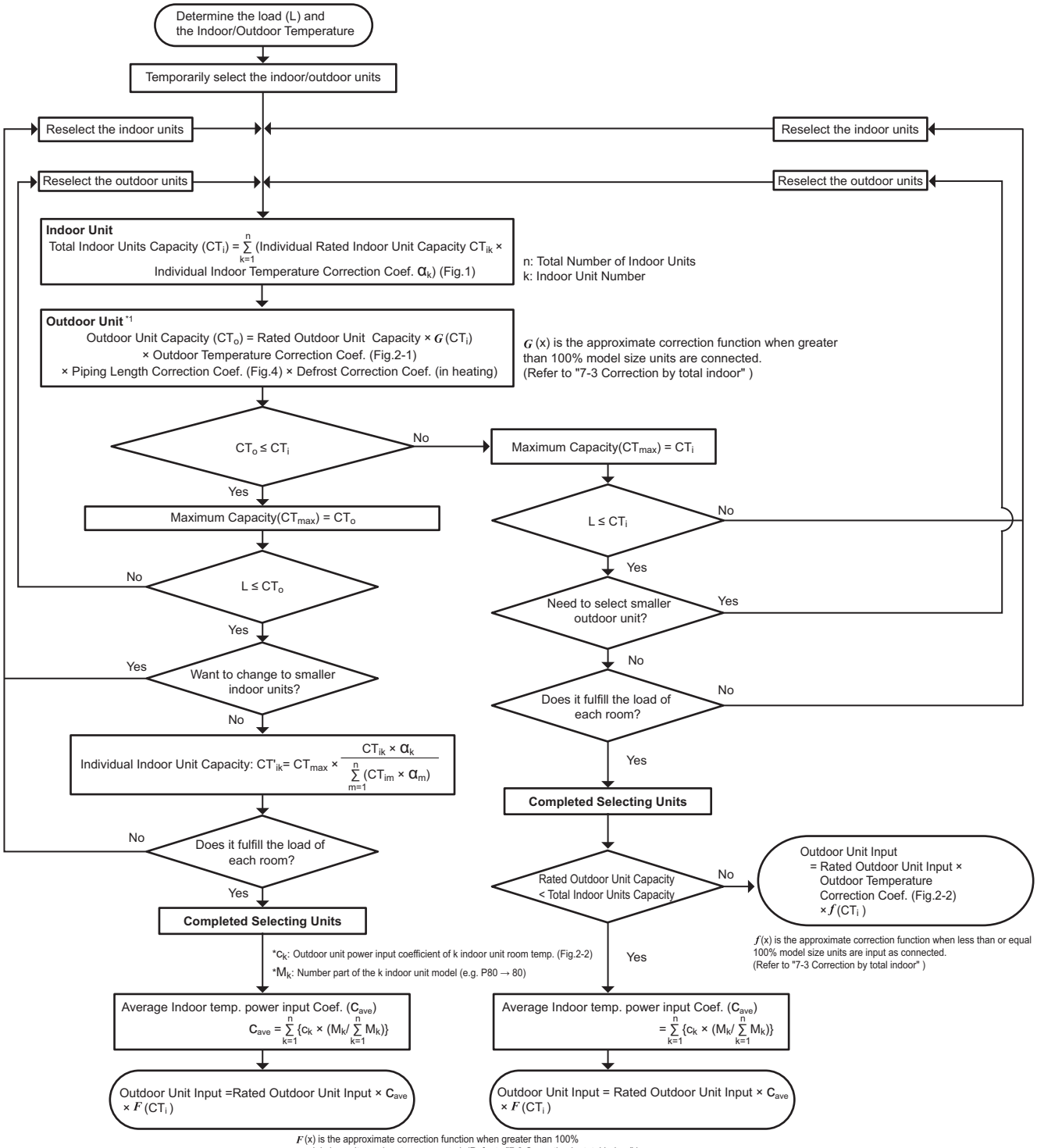
*1 When the indoor unit sizes from P100 to P140 or total capacity indoor units from P81 to P140 are connected to only 1 port on the BC controller in the R2 system, the cooling capacity of the outdoor unit should be multiplied by a correction factor of 0.97.

*2 This figure shows the characteristic of PUMY-SP112/125/140VKM2(-BS) and PUMY-SP112/125/140YKM2(-BS).

*3 This figure shows the characteristic of PUMY-SP112/125VKM2(-BS) and PUMY-SP112/125YKM2(-BS).

How to determine the capacity when greater than 100% indoor model size units are connected in total:

The purpose of this flow chart is to select the indoor and outdoor units. For other purposes, this flow chart is intended only for reference.



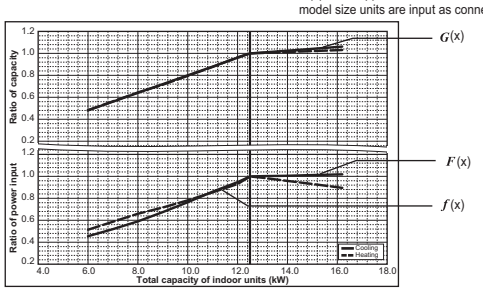


Fig.3 Correction by total indoor *2

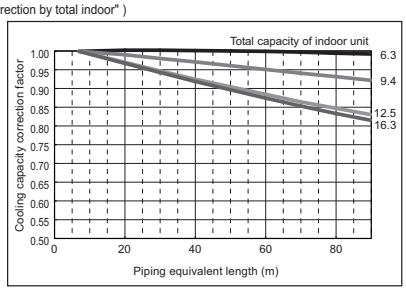


Fig.4 Correction of refrigerant piping length *2

*1 When the indoor unit sizes from P100 to P140 or total capacity indoor units from P81 to P140 are connected to only 1 port on the BC controller in the R2 system, the cooling capacity of the outdoor unit should be multiplied by a correction factor of 0.97.

*2 This figure shows the characteristic of PUMY-SP112VKM2(-BS) and PUMY-SP112YKM2(-BS).

<Cooling>

Design Condition	
Outdoor Design Dry Bulb Temperature	**44.7ºC**
Total Cooling Load	**8.5 kW**
Room1	
Indoor Design Dry Bulb Temperature	**27ºC**
Indoor Design Wet Bulb Temperature	**20ºC**
Cooling Load	**4.0 kW**
Room2	
Indoor Design Dry Bulb Temperature	**32ºC**
Indoor Design Wet Bulb Temperature	**22ºC**
Cooling Load	**4.5 kW**
<Other>	
Indoor/Outdoor Equivalent Piping Length	**60 m**

1. Cooling Calculation

(1) Temporary Selection of Indoor Units

Room1

PEFY-P40 **4.5 kW (Rated)**

Room2

PEFY-P50 **5.6 kW (Rated)**

(2) Total Indoor Units Capacity

P40 + P50 = P90

(3) Selection of Outdoor Unit

The SP112 outdoor unit is selected as total indoor units capacity is P90

PUMY-SP112 **12.5 kW**

(4) Total Indoor Units Capacity Correction Calculation

Room1

Indoor Design Wet Bulb Temperature Correction (20ºC) 1.03 (Refer to Figure 1)

Room2

Indoor Design Wet Bulb Temperature Correction (22ºC) 1.09 (Refer to Figure 1)

Total Indoor Units Capacity (CT_i)

CT_i = Σ (Indoor Unit Rating × Indoor Design Temperature Correction)

= 4.5 × 1.03 + 5.6 × 1.09

= 10.7 kW

(5) Outdoor Unit Correction Calculation

Outdoor Design Dry Bulb Temperature Correction (44.7ºC) 0.88 (Refer to Figure 2)

Piping Length Correction (60 m) 0.94 (Refer to Figure 3)

Total Outdoor Unit Capacity (CT_o)

CT_o = Outdoor Rating × Outdoor Design Temperature Correction × Piping Length Correction

= 12.5 × 0.88 × 0.94

= 10.3 kW

(6) Determination of Maximum System Capacity

Comparison of Capacity between Total Indoor Units Capacity (CT_i) and Total Outdoor Unit Capacity (CT_o)

CT_i = 10.7 > CT_o = 10.3, thus, select CT_o.

CT_{max} = CT_o = 10.3 kW

(7) Comparison with Essential Load

Against the essential load 8.5 kW, the maximum system capacity is 10.3 kW: Proper outdoor units have been selected.

(8) Calculation of Maximum Indoor Unit Capacity of Each Room

CT_{max} = CT_o, thus, calculate by the calculation below

Room1

Maximum Capacity × Room1 Capacity after the Temperature Correction/(Room1,2 Total Capacity after the Temperature Correction

= 10.3 × (4.5 × 1.03)/(4.5 × 1.03 + 5.6 × 0.94)

= 4.4 kW **OK: fulfills the load 4.0 kW**

Room2

Maximum Capacity × Room2 Capacity after the Temperature Correction/(Room1,2 Total Capacity after the Temperature Correction)

= 10.3 × (5.6 × 0.94)/(4.5 × 1.03 + 5.6 × 0.94)

= 5.9 kW **OK: fulfills the load 4.5 kW**

Note: If CT_{max} = CT_i, please refer to the <Heating> section to calculate the Maximum Indoor Unit Capacity of Each Room.

Go on to the heating trial calculation since the selected units fulfill the cooling loads of Room 1, 2.

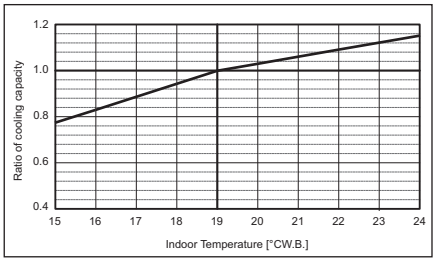


Figure 1 **Indoor unit temperature correction**
To be used to correct indoor unit only

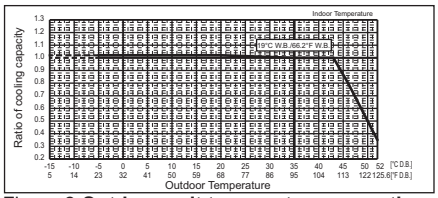


Figure 2 **Outdoor unit temperature correction**
To be used to correct outdoor unit only
* Values in the temperature correction diagram in the range below -5°C (23°F) are reference values and not guaranteed values. Do not use these reference values for selecting outdoor unit models.

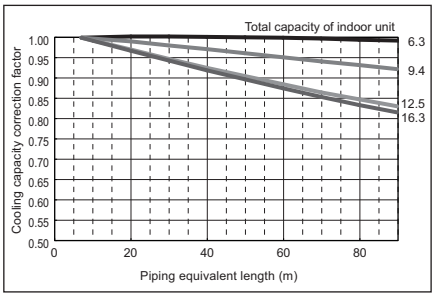


Figure 3 **Correction of refrigerant piping length**

<Heating>

Design Condition	
Outdoor Design Wet Bulb Temperature	**2ºC**
Total Heating Load	**10.3 kW**
Room1	
Indoor Design Dry Bulb Temperature	**21ºC**
Heating Load	**4.8 kW**
Room2	
Indoor Design Dry Bulb Temperature	**23ºC**
Heating Load	**5.5 kW**
<Other>	
Indoor/Outdoor Equivalent Piping Length	**90 m**

2. Heating Calculation

(1) Temporary Selection of Indoor Units

Room1

PEFY-P40 **5.0 kW (Rated)**

Room2

PEFY-P50 **6.3 kW (Rated)**

(2) Total Indoor Units Capacity

P40 + P50 = P90

(3) Selection of Outdoor Unit

The P112 outdoor unit is selected as total indoor units capacity is P90

PUMY-SP112 **14.0 kW**

(4) Total Indoor Units Capacity Correction Calculation

Room1

Indoor Design Dry Bulb Temperature Correction (21ºC) 0.96 (Refer to Figure 4)

Room2

Indoor Design Dry Bulb Temperature Correction (23ºC) 0.88 (Refer to Figure 4)

Total Indoor Units Capacity (CT_i)

$CT_i = \Sigma$ (Indoor Unit Rating × Indoor Design Temperature Correction)

= 5.0 × 0.96 + 6.3 × 0.88

= 10.3 kW

(5) Outdoor Unit Correction Calculation

Outdoor Design Wet Bulb Temperature Correction (2ºC) 1.0 (Refer to Figure 5)

Piping Length Correction (90 m) 0.95 (Refer to Figure 6)

Defrost Correction 0.89 (Refer to Table 1)

Total Outdoor Unit Capacity (CT_o)

CT_o = Outdoor Unit Rating × Outdoor Design Temperature Correction × Piping Length Correction × Defrost Correction

= 14.0 × 1.0 × 0.95 × 0.89

= 11.8 kW

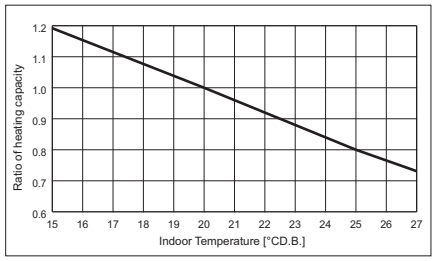


Figure 4 **Indoor unit temperature correction**
To be used to correct indoor unit only

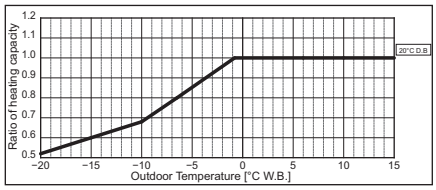


Figure 5 **Outdoor unit temperature correction**
To be used to correct outdoor unit only

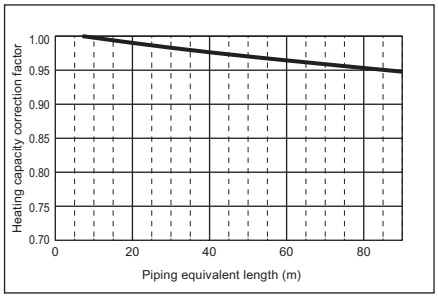


Figure 6 **Correction of refrigerant piping length**

(6) Determination of Maximum System Capacity

Comparison of Capacity between Total Indoor Units Capacity (CT_i) and Total Outdoor Unit Capacity (CT_o)

$CT_i = 10.3 < CT_o = 11.8$, thus, select CT_i.

$CT_{max} = CT_i = 10.3$ kW

(7) Comparison with Essential Load

Against the essential load 10.3 kW, the maximum system capacity is 10.3 kW: Proper indoor units have been selected.

(8) Calculation of Maximum Indoor Unit Capacity of Each Room

$CT_{max} = CT_i$, thus, calculate by the calculation below

Room1

Indoor Unit Rating × Indoor Design Temperature Correction

= 5.0 × 0.96

= 4.8 kW **OK: fulfills the load 4.8 kW**

Room2

Indoor Unit Rating × Indoor Design Temperature Correction

= 6.3× 0.88

= 5.5 kW **OK: fulfills the load 5.5 kW**

Table 1 Table of correction factor at frost and defrost

Outdoor inlet air temp. °C	6	4	2	0	−2	−4	−6	−8	−10	−15	−20
PUMY-SP112,125,140VKM2	1.0	0.98	0.89	0.88	0.89	0.90	0.95	0.95	0.95	0.95	0.95
PUMY-SP112,125,140YKM2	1.0	0.98	0.89	0.88	0.89	0.90	0.95	0.95	0.95	0.95	0.95

Note: If $CT_{max} = CT_o$, please refer to the <Cooling> section to calculate the Maximum Indoor Unit Capacity of Each Room.
Completed selecting units since the selected units fulfill the heating loads of Room 1, 2.

3. Power input of outdoor unit

<Cooling>

(1) Rated power input of outdoor unit **4.46 kW**

(2) Calculation of the average indoor temperature power input coefficient

Coefficient of the outdoor unit for indoor unit 1 (Outdoor temp. 44.7 °CD.B., Indoor temp. 20 °CW.B.)

1.15

Coefficient of the outdoor unit for indoor unit 2 (Outdoor temp. 44.7 °CD.B., Indoor temp. 22 °CW.B.)

1.13

Average indoor temp. power input coefficient (C_{ave}) = $\sum_{k=1}^{n} \{c_k \times (M_k / \sum_{k=1}^{n} M_k)\}$

n: Total number of the indoor units
k: Number of the indoor unit
c_k: Outdoor unit power input coefficient of k indoor unit room temp.
M_k: Number part of the k indoor unit model (e.g. P80 → 80)

= 1.15 × 40/(40 + 50) + 1.13 × 50/(40 + 50)
= 1.14

(3) No need to consider Coefficient of the partial load $f'(CT_i)$ **-**

(4) Outdoor power input (PI_o)

Maximum System Capacity (CT_{max}) = Total Outdoor unit Capacity (CT_o), so use the following formula
PI_o = Outdoor unit Cooling Rated Power Input × C_{ave}
= 4.46 × 1.14
= 5.08 kW

<Heating>

(1) Rated power input of outdoor unit **3.66 kW**

(2) Calculation of the average indoor temperature power input coefficient

Coefficient of the outdoor unit for indoor unit 1 (Outdoor temp. 2 °CW.B., Indoor temp. 21 °CD.B.)

1.12

Coefficient of the outdoor unit for indoor unit 2 (Outdoor temp. 2 °CW.B., Indoor temp. 23 °CD.B.)

1.0

Average indoor temp. power input coefficient (C_{ave}) = $\sum_{k=1}^{n} \{c_k \times (M_k / \sum_{k=1}^{n} M_k)\}$

n: Total number of the indoor units
k: Number of the indoor unit
c_k: Outdoor unit power input coefficient of k indoor unit room temp.
M_k: Number part of the k indoor unit model (e.g. P80 → 80)

= 1.12 × 40/(40 + 50) + 1.0 × 50/(40 + 50)
= 1.05

(3) Coefficient of the partial load f (CT_i) **0.89**

(4) Outdoor power input (PI_o)

Maximum System Capacity (CT_{max}) = Total Indoor unit Capacity (CT_i), so use the following formula
PI_o = Outdoor unit Heating Rated Power Input × C_{ave} × f (CT_i)
= 3.66 × 1.05 × 0.89
= 3.42 kW

7-2. Correction by temperature

CITY MULTI could have varied capacity at different designing temperature. Using the nominal cooling/heating capacity value and the ratio below, the capacity can be observed at various temperature.

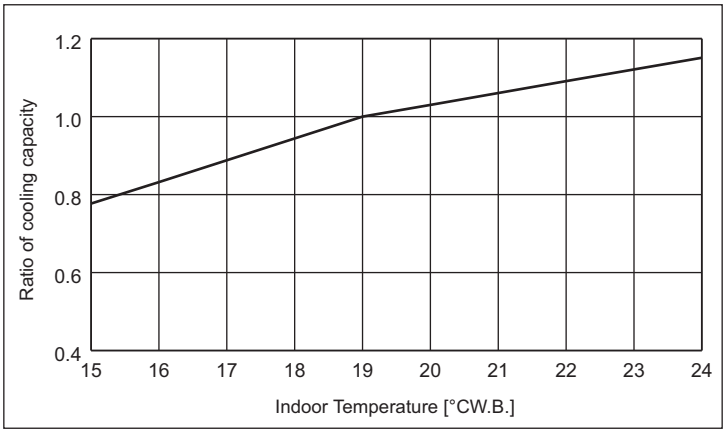
<Cooling>

PUMY-		SP112VKM2	SP125VKM2
Nominal Cooling Capacity	kW	12.5	14.0
	BTU/h	42,650	47,768
Input	kW	4.46	5.11

PUMY-		SP112YKM2	SP125YKM2
Nominal Cooling Capacity	kW	12.5	14.0
	BTU/h	42,650	47,768
Input	kW	4.46	5.11

Indoor unit temperature correction

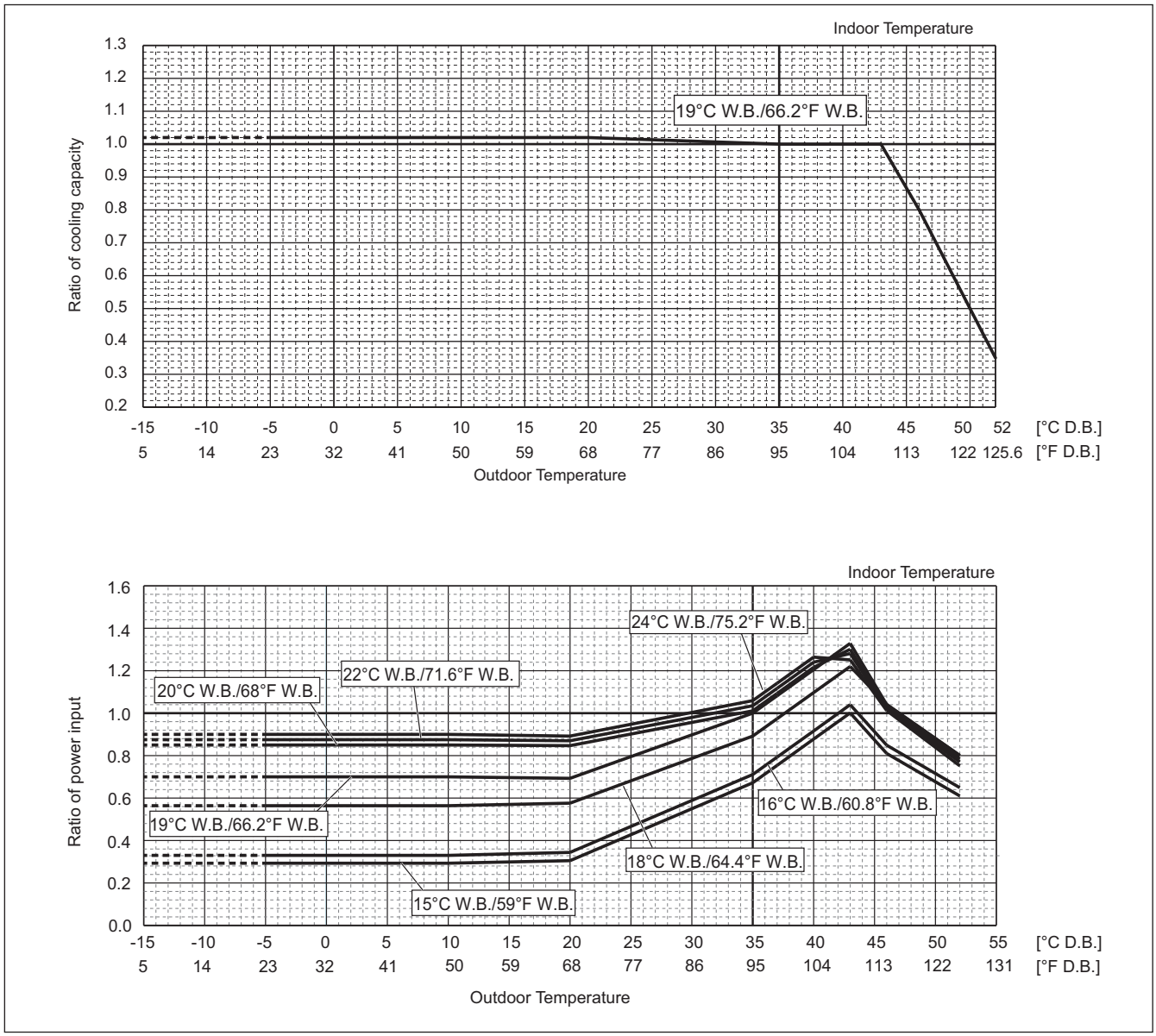
To be used to correct indoor unit capacity only



Outdoor unit temperature correction

To be used to correct outdoor unit only

Outdoor unit capacity is NOT affected by the indoor temperature.
Outdoor unit power input is affected by the indoor and outdoor temperatures. Please consult the sales office for details.



Values in the temperature correction diagram in the range below -5°C (23°F) are reference values and not guaranteed values. Do not use these reference values for selecting outdoor unit models.

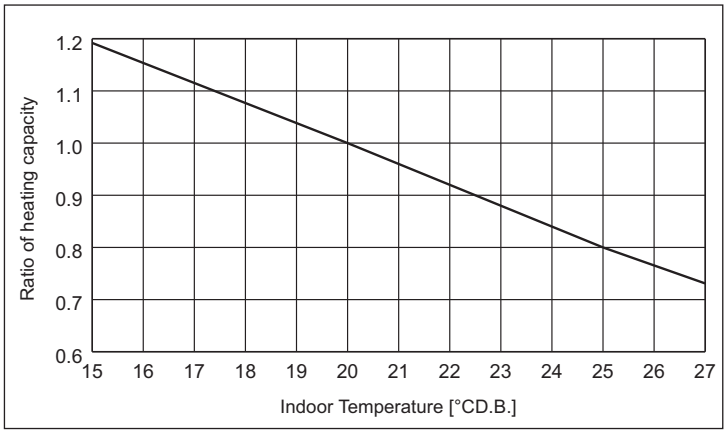
<Heating>

PUMY-		SP112VKM2	SP125VKM2
Nominal Heating Capacity	kW	14.0	16.0
	BTU/h	47,768	54,592
Input	kW	3.66	4.31

PUMY-		SP112YKM2	SP125YKM2
Nominal Heating Capacity	kW	14.0	16.0
	BTU/h	47,768	54,592
Input	kW	3.66	4.31

Indoor unit temperature correction

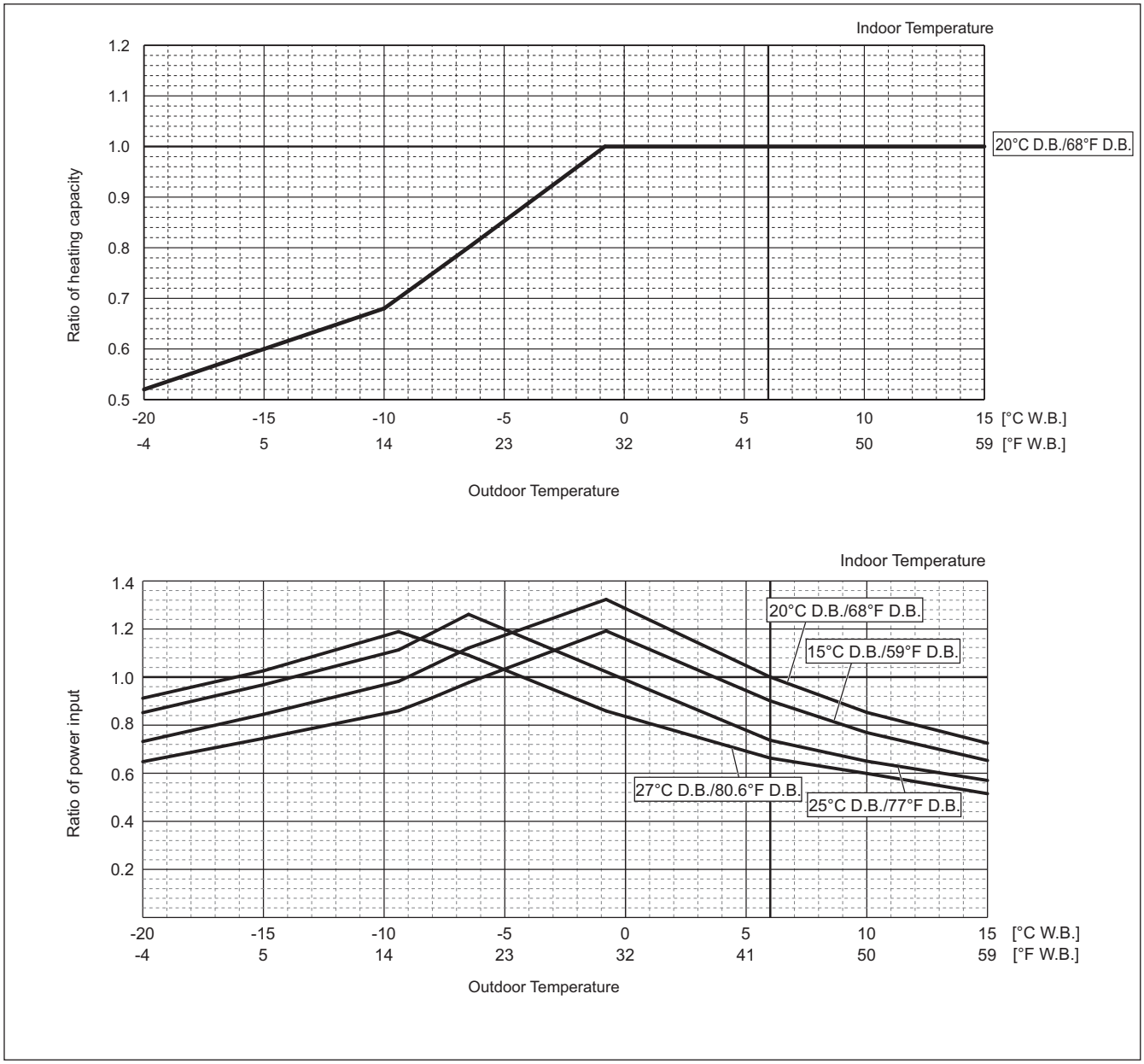
To be used to correct indoor unit capacity only



Outdoor unit temperature correction

To be used to correct outdoor unit only

Outdoor unit capacity is NOT affected by the indoor temperature.
Outdoor unit power input is affected by the indoor and outdoor temperatures. Please consult the sales office for details.



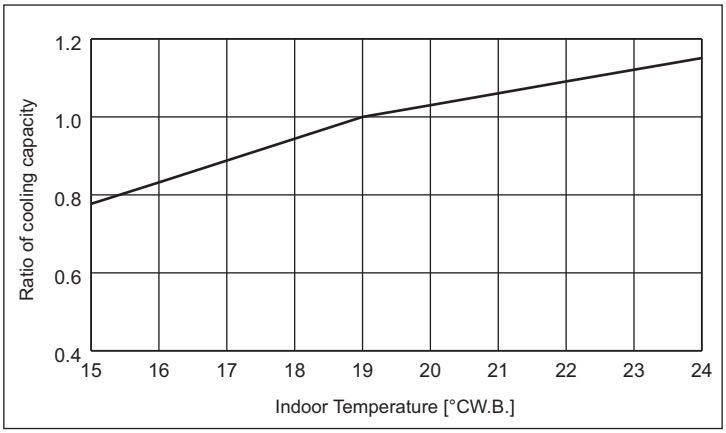
<Cooling>

PUMY-		SP140VKM2
Nominal Cooling Capacity	kW	15.5
	BTU/h	52,886
Input	kW	5.34

PUMY-		SP140YKM2
Nominal Cooling Capacity	kW	15.5
	BTU/h	52,886
Input	kW	5.34

Indoor unit temperature correction

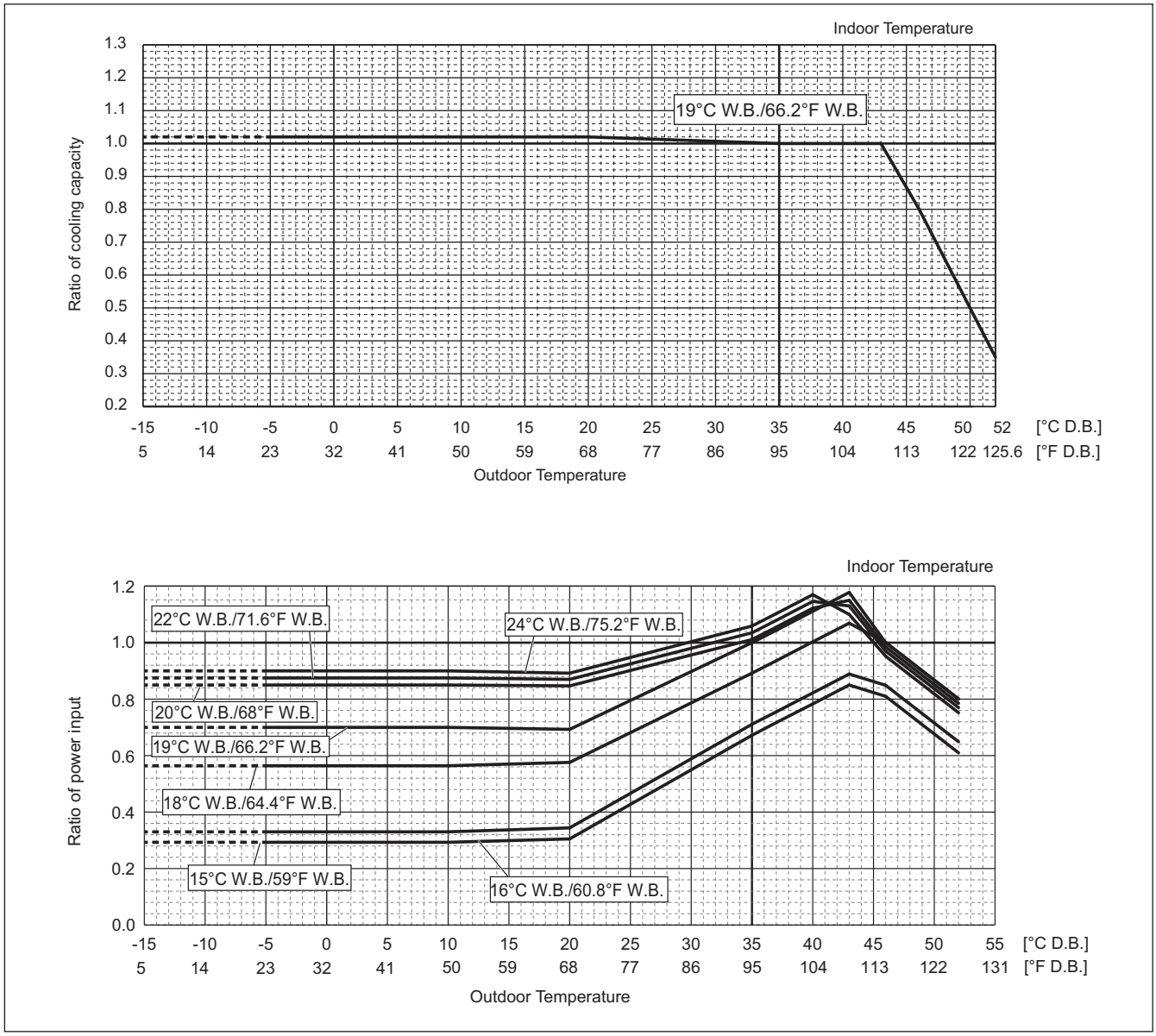
To be used to correct indoor unit capacity only



Outdoor unit temperature correction

To be used to correct outdoor unit only

Outdoor unit capacity is NOT affected by the indoor temperature.
Outdoor unit power input is affected by the indoor and outdoor temperatures. Please consult the sales office for details.



Values in the temperature correction diagram in the range below -5°C (23°F) are reference values and not guaranteed values. Do not use these reference values for selecting outdoor unit models.

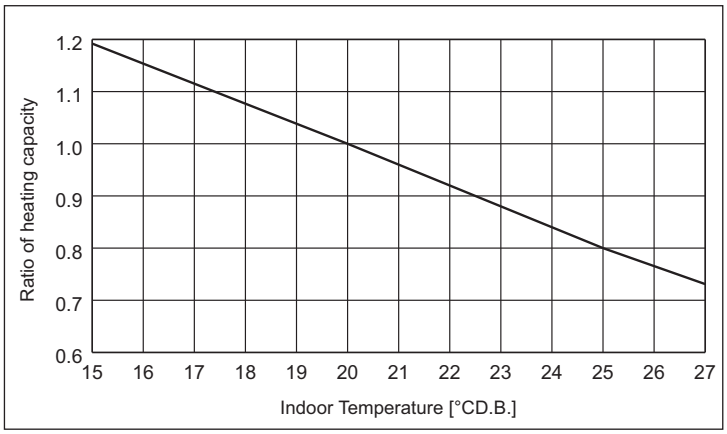
<Heating>

PUMY-		SP140VKM2
Nominal Heating Capacity	kW	16.5
	BTU/h	56,298
Input	kW	4.36

PUMY-		SP140YKM2
Nominal Heating Capacity	kW	16.5
	BTU/h	56,298
Input	kW	4.36

Indoor unit temperature correction

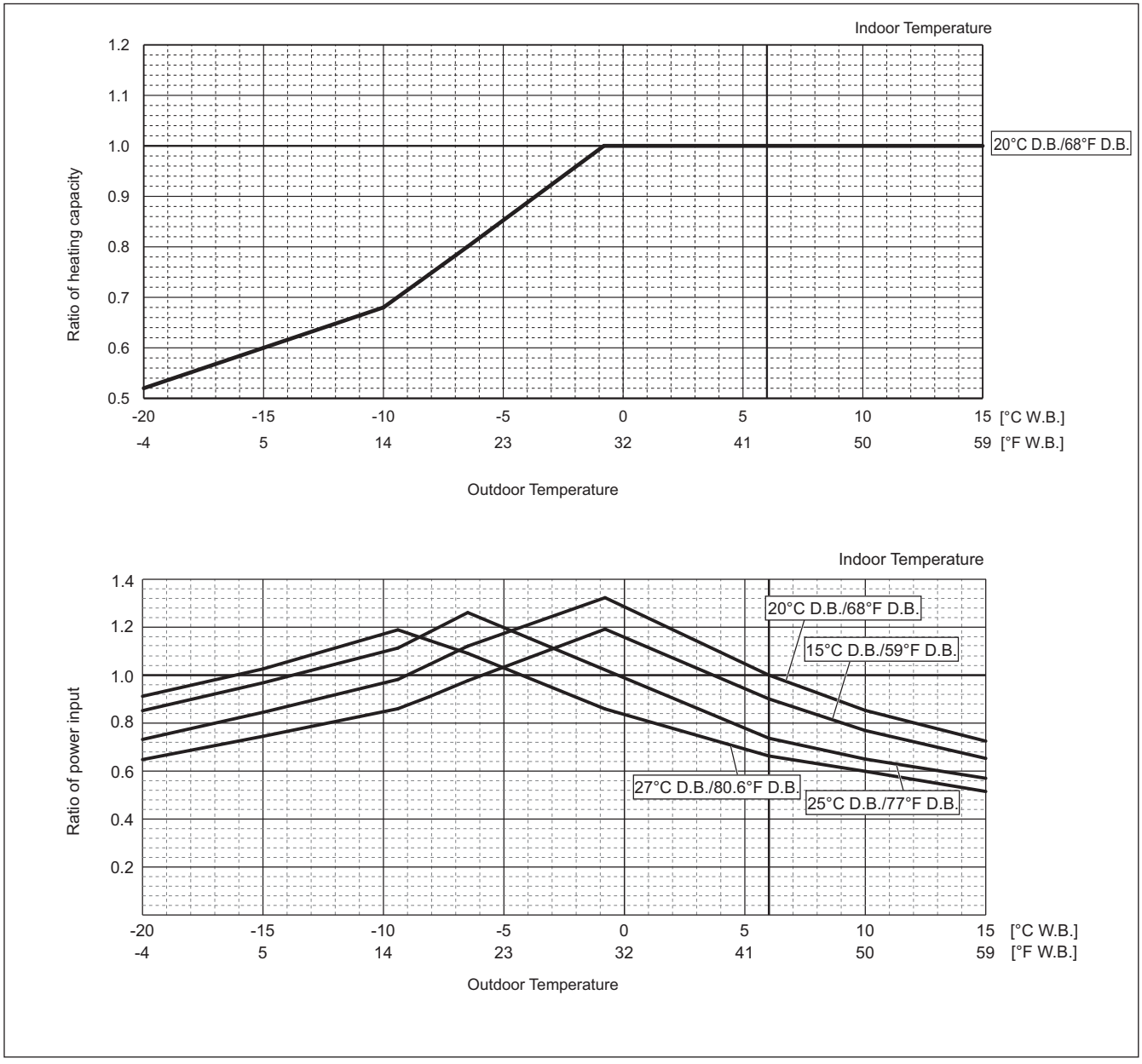
To be used to correct indoor unit capacity only



Outdoor unit temperature correction

To be used to correct outdoor unit only

Outdoor unit capacity is NOT affected by the indoor temperature.
Outdoor unit power input is affected by the indoor and outdoor temperatures. Please consult the sales office for details.



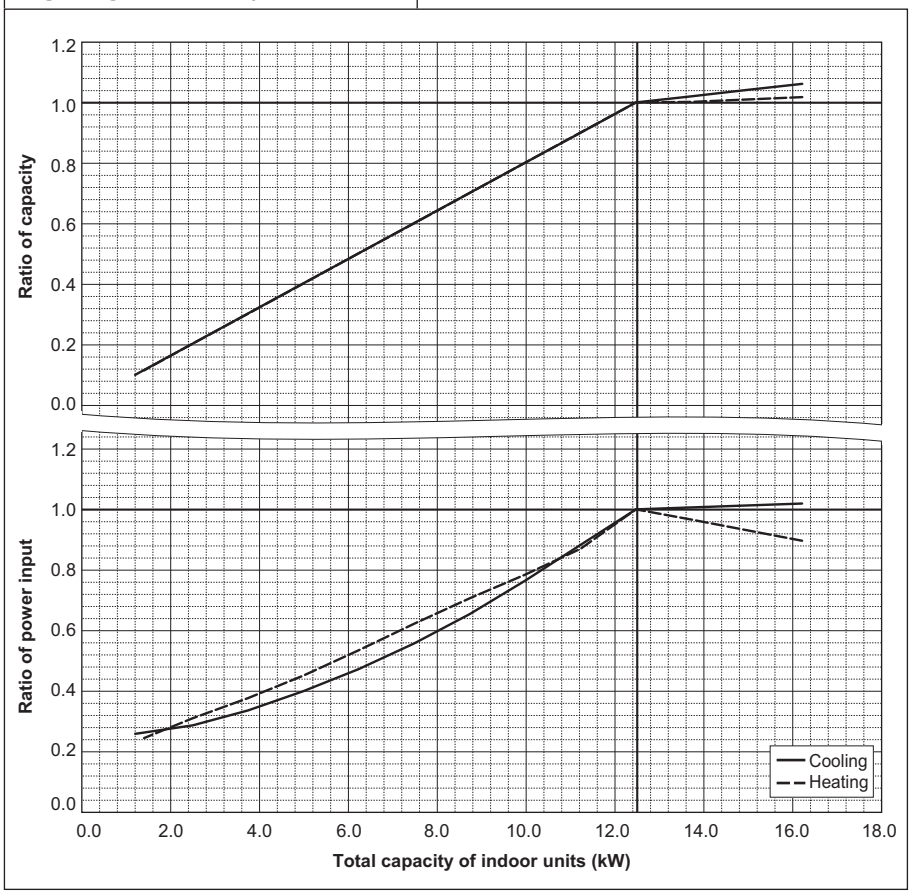
7-3. Correction by total indoor

CITY MULTI system has different capacities and inputs when many combinations of indoor units with different total capacities are connected. Using following tables, the maximum capacity can be found to ensure the system is installed with enough capacity for a particular application.

PUMY-SP112VKM2/YKM2		
Nominal Cooling Capacity	kW	12.5
	BTU/h	42,650
Input	kW	4.46

PUMY-SP112VKM2/YKM2		
Nominal Heating Capacity	kW	14.0
	BTU/h	47,768
Input	kW	3.66

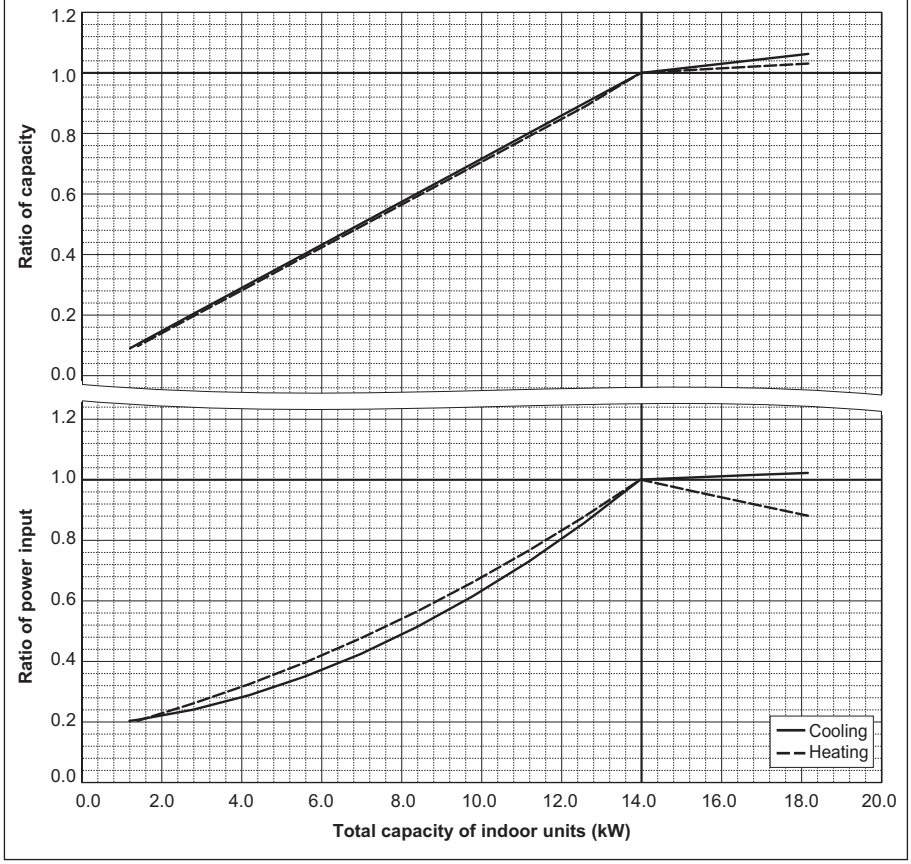
PUMY-SP112VKM2/YKM2



PUMY-SP125VKM2/YKM2		
Nominal Cooling Capacity	kW	14.0
	BTU/h	47,768
Input	kW	5.11

PUMY-SP125VKM2/YKM2		
Nominal Heating Capacity	kW	16.0
	BTU/h	54,592
Input	kW	4.31

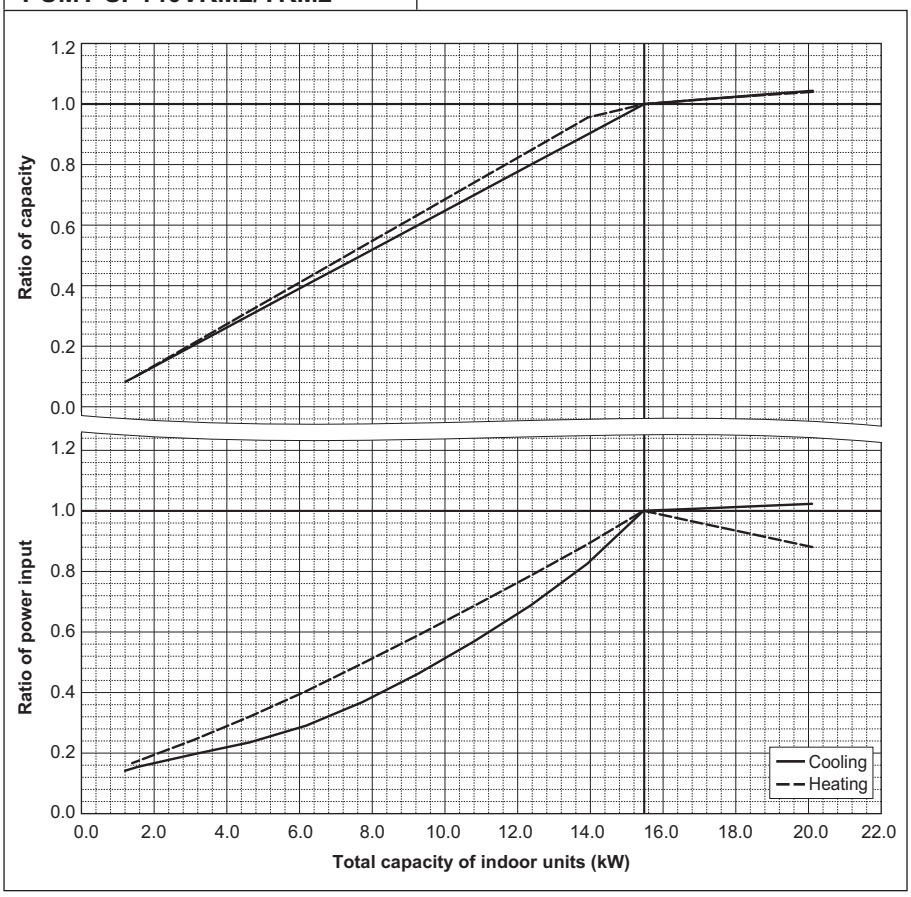
PUMY-SP125VKM2/YKM2



PUMY-SP140VKM2/YKM2		
Nominal Cooling Capacity	kW	15.5
	BTU/h	52,886
Input	kW	5.34

PUMY-SP140VKM2/YKM2		
Nominal Heating Capacity	kW	16.5
	BTU/h	56,298
Input	kW	4.36

PUMY-SP140VKM2/YKM2

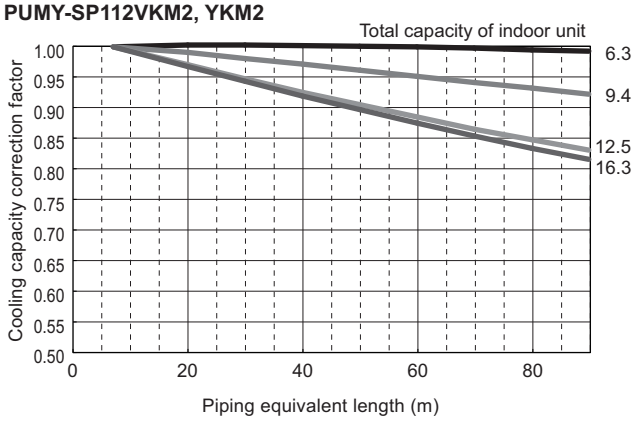


7-4. Correction by refrigerant piping length

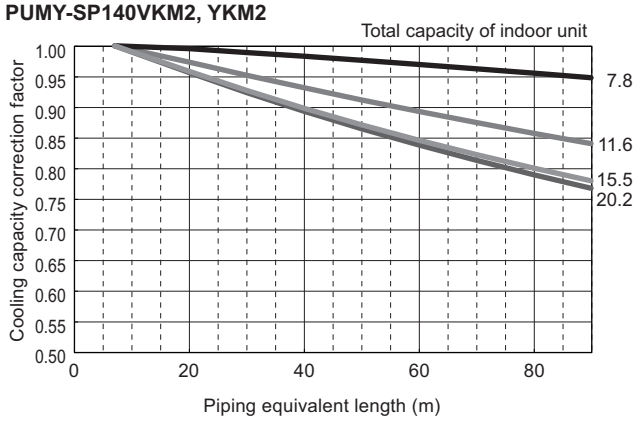
CITY MULTI systems can have extended piping lengths if certain limitations are followed, but cooling/heating capacity could be reduced. Using following correction factor by equivalent piping length shown at 7-4-1 and 7-4-2, capacity can be found.
7-4-3 shows how to obtain the equivalent piping length.

7-4-1. Cooling capacity correction

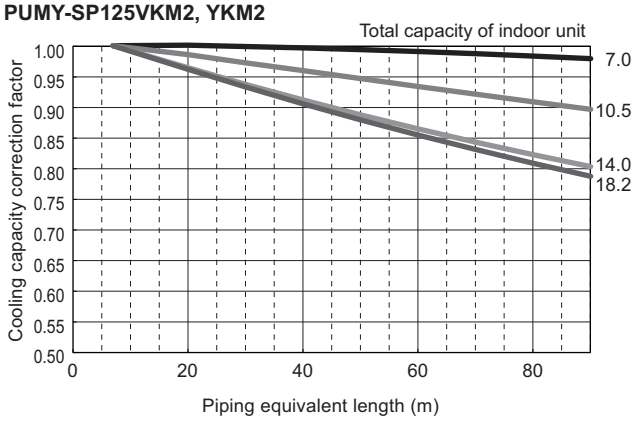
PUMY-SP112VKM2, YKM2



PUMY-SP140VKM2, YKM2

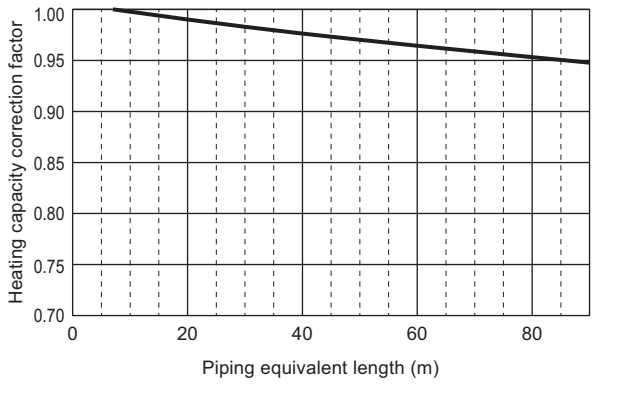


PUMY-SP125VKM2, YKM2



7-4-2. Heating capacity correction

PUMY-SP112, 125, 140VKM2, YKM2



7-4-3. How to obtain the equivalent piping length

Equivalent length = (Actual piping length to the farthest indoor unit) + (0.30 x number of bends on the piping) m

7-5. Correction at frost and defrost

Due to frost at the outdoor heat exchanger and the automatical defrosting operation, the heating capacity of the outdoor unit should be considered by multiplying the correction factor which shown in the table below.

Table of correction factor at frosting and defrosting

Outdoor inlet air temp. °CWB	6	4	2	0	-2	-4	-6	-8	-10	-15	-20
Outdoor inlet air temp. °FWB	43	39	36	32	28	25	21	18	14	-5	-4
PUMY-SP112,125,140VKM2,YKM2	1.0	0.98	0.89	0.88	0.89	0.90	0.95	0.95	0.95	0.95	0.95

Note

- The high humidity condition (e.g., a foggy atmosphere) which causes frost forming on the heat exchanger will worsen the heating performance of the unit.
- The snow blowing to the heat exchanger will worsen the heating performance of the unit. Install a snow hood as a preventive measure.

8-1. JOINT

CITY MULTI units can be easily connected by using Joint sets and Header sets provided by Mitsubishi Electric. One kind of Joint sets are available for use. Refer to section "Piping Design" or the Installation Manual that comes with the Joint set for how to install the Joint set.

CMY-Y62-G-E

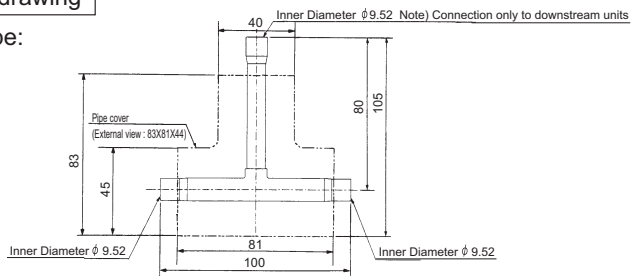
Unit: mm

1. Specification

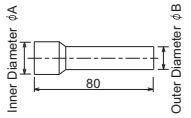
Items		Details
Main	Number of ports	2 ports
	Number of branch joints	One for each liquid and gas pipe
	Pipe material	Phosphorus deoxidized copper C1220T-OL (JIS H3300)
Accessory	Insulation material	Foamed polyethylene (one for each liquid and gas pipe)
	Reducer	10 reducers of 7 types (Refer to the external drawing for details.)

2. External drawing

For liquid pipe:

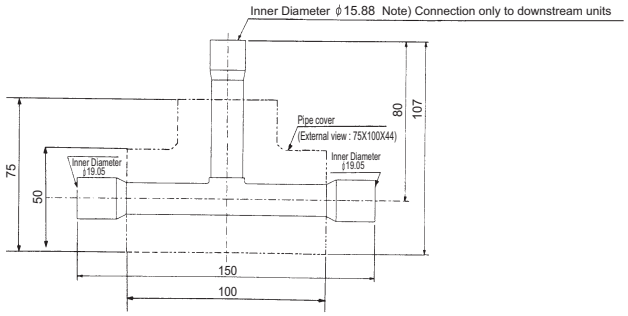


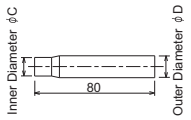
Reducer (Accessory):



A (Inner Diameter)	B (Outer Diameter)	Number of reducers
ϕ 12.7	ϕ 9.52	2
ϕ 19.05	ϕ 15.88	1
ϕ 22.2	ϕ 19.05	1

For gas pipe:





C (Inner Diameter)	D (Outer Diameter)	Number of reducers
ϕ 6.35	ϕ 9.52	2
ϕ 12.7	ϕ 15.88	1
ϕ 12.7	ϕ 19.05	1
ϕ 15.88	ϕ 19.05	2

8-2. HEADER

CITY MULTI units can be easily connected by using Joint sets and Header sets provided by Mitsubishi Electric. Two kinds of Header sets are available for use. Refer to section "Piping Design" or the Installation Manual that comes with the Header set for how to install the Header set.

CMY-Y64-G-E

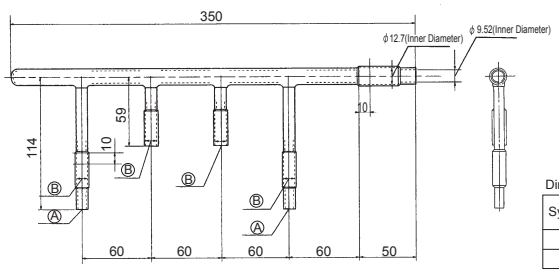
Unit: mm

1. Specification

Items		Details
Main	Number of ports	3 ~ 4 ports
	Number of branch joints	One for each liquid and gas pipe
	Pipe material	Phosphorus deoxidized copper C1220T-OL (JIS H3300)
Accessory	Insulation material	Foamed polyethylene
	Reducer	7 reducers of 5 types
	Cap	2 caps of 2 different types for each liquid and gas pipe 4 caps in total

2. External drawing

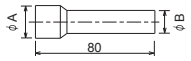
For liquid pipe:



Dimension table

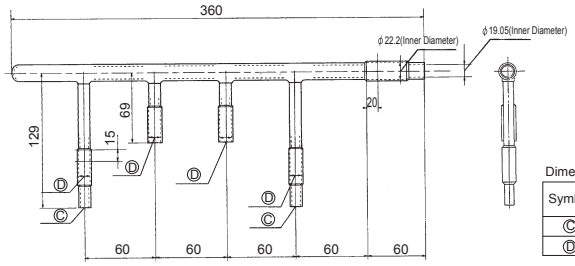
Symbol	Inner Diameter (mm)
Ⓐ	ϕ 6.35
Ⓑ	ϕ 9.52

Reducer (Accessory):



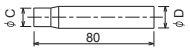
A (Inner Diameter)	B (Outer Diameter)	Number of reducers
ϕ 19.05	ϕ 15.88	1
ϕ 15.88	ϕ 12.7	2
ϕ 9.52	ϕ 6.35	2

For gas pipe:



Dimension table

Symbol	Inner Diameter (mm)
Ⓒ	ϕ 12.7
Ⓓ	ϕ 15.88



C (Inner Diameter)	D (Outer Diameter)	Number of reducers
ϕ 15.88	ϕ 19.05	1
ϕ 9.52	ϕ 12.7	1

CMY-Y68-G-E

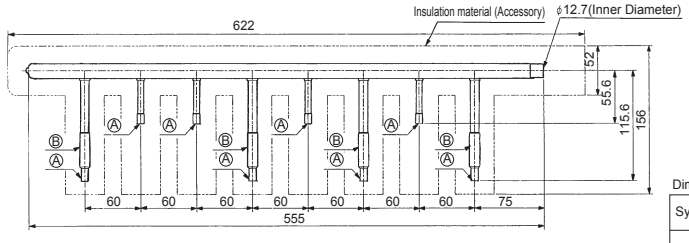
Unit: mm

1. Specification

Items		Details
Main	Number of ports	5 ~ 8 ports
	Number of branch joints	One for each liquid and gas pipe
	Pipe material	Phosphorus deoxidized copper C1220T-OL (JIS H3300)
Accessory	Insulation material	Foamed polyethylene
	Reducer	3 reducers of 3 types
	Cap	3 caps for each liquid and gas pipe 6 in total

2. External drawing

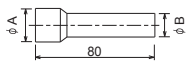
For liquid pipe:



Dimension table

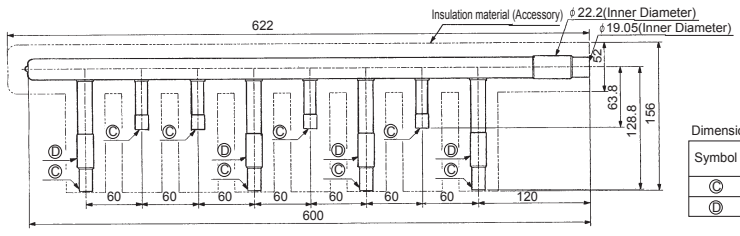
Symbol	Inner Diameter (mm)
Ⓐ	ϕ 6.35
Ⓑ	ϕ 9.52

Reducer (Accessory):



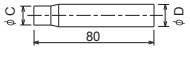
A (Inner Diameter)	B (Outer Diameter)	Number of reducers
ϕ 19.05	ϕ 15.88	1
ϕ 12.7	ϕ 9.52	1

For gas pipe:



Dimension table

Symbol	Inner Diameter (mm)
Ⓒ	ϕ 12.7
Ⓓ	ϕ 15.88



C (Inner Diameter)	D (Outer Diameter)	Number of reducers
ϕ 15.88	ϕ 19.05	1

8-3. BRANCH BOX

PUMY-SP112/125/140V(Y)KM2 units can be easily connected to M/S/P-Series indoor units by using Branch box provided by Mitsubishi Electric. Refer to section "Piping Design" or the Installation Manual that comes with the Branch box for how to install the Branch box.

(1) PAC-MK34/54BC

PAC-MK34BC

mm

1. Specification

Model Name				PAC-MK34BC
Connectable number of indoor units				Maximum 3
Power supply (from outdoor unit)				Single phase, 220/230/240V, 50Hz, Single phase, 220/230V, 60Hz
Input			kW	0.003
Running current			A	0.05 (Max. 6)
External finish				Galvanized sheets
Dimensions	Width		mm	450
	Depth		mm	280
	Height		mm	170
Weight			kg	6.7
Piping connection (Flare)	Branch (indoor side)	Liquid	mm	ø6.35 × 3 {A,B,C}
		Gas	mm	ø9.52 × 3 {A,B,C}
	Main (outdoor side)	Liquid	mm	ø9.52
		Gas	mm	ø15.88

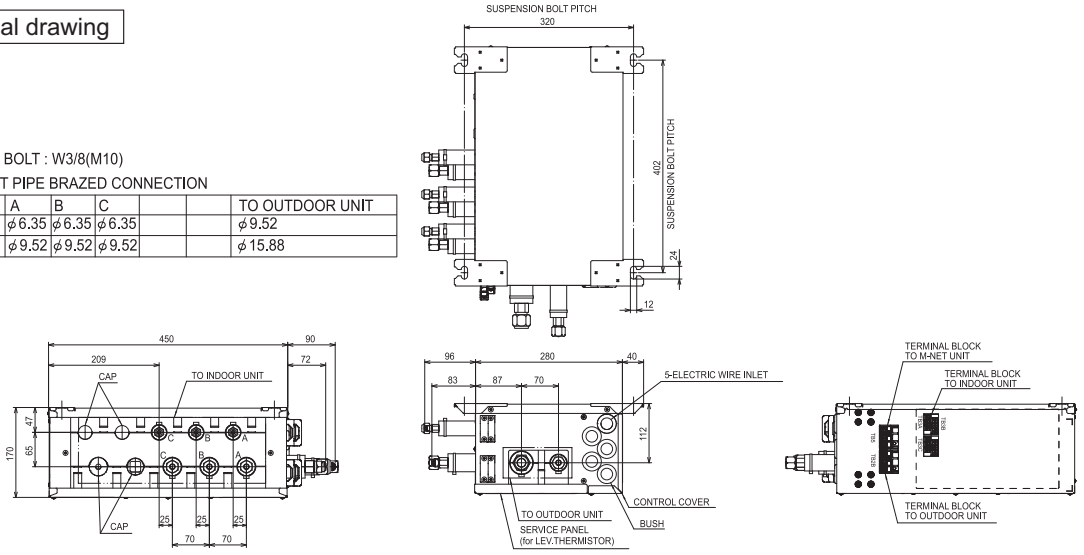
* The piping connection size differs according to the type and capacity of outdoor/indoor units.
Match the piping connection size of branch box with outdoor/indoor unit. If the piping connection size of branch box does not match the piping connection size of outdoor/indoor unit, use optional different-diameter (deformed) joints to the branch box side.
(Connect deformed joint directly to the branch box side.)

2. External drawing

SUSPENSION BOLT : W3/8(M10)

REFRIGERANT PIPE BRAZED CONNECTION

	A	B	C			TO OUTDOOR UNIT
LIQUID PIPE	ϕ6.35	ϕ6.35	ϕ6.35			ϕ9.52
GAS PIPE	ϕ9.52	ϕ9.52	ϕ9.52			ϕ15.88



PAC-MK54BC

mm

1. Specification

Model Name				PAC-MK54BC
Connectable number of indoor units				Maximum 5
Power supply (from outdoor unit)				Single phase, 220/230/240V, 50Hz, Single phase, 220/230V, 60Hz
Input			kW	0.003
Running current			A	0.05 (Max. 6)
External finish				Galvanized sheets
Dimensions	Width		mm	450
	Depth		mm	280
	Height		mm	170
Weight			kg	7.4
Piping connection (Flare)	Branch (indoor side)*	Liquid	mm	ø6.35 × 5 {A,B,C}
		Gas	mm	ø9.52 × 4 {A,B,C,D}, ø12.7 × 1 {E}
	Main (outdoor side)	Liquid	mm	ø9.52
		Gas	mm	ø15.88

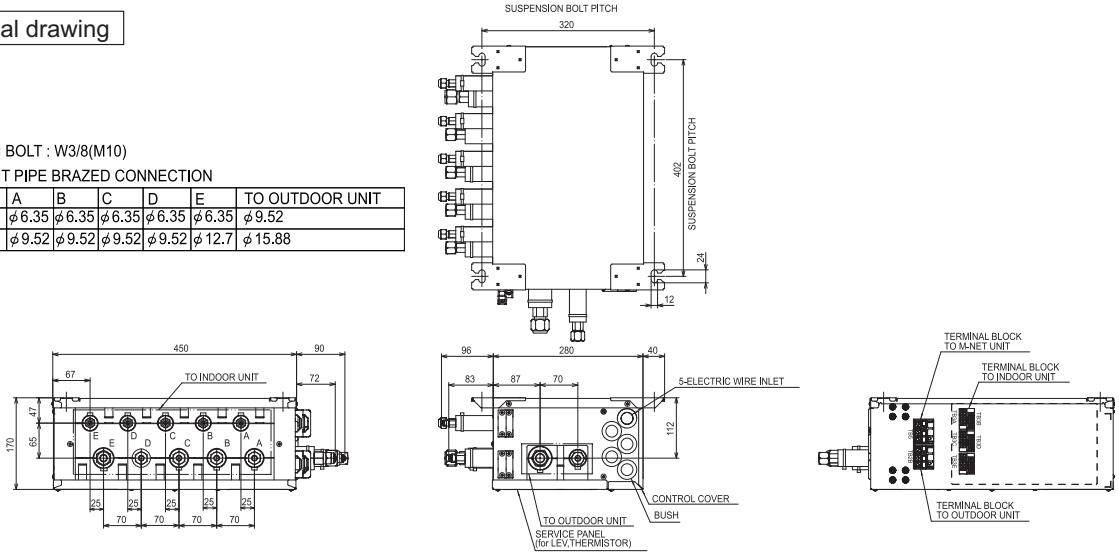
* The piping connection size differs according to the type and capacity of outdoor/indoor units.
Match the piping connection size of branch box with outdoor/indoor unit. If the piping connection size of branch box does not match the piping connection size of outdoor/indoor unit, use optional different-diameter (deformed) joints to the branch box side.
(Connect deformed joint directly to the branch box side.)

2. External drawing

SUSPENSION BOLT : W3/8(M10)

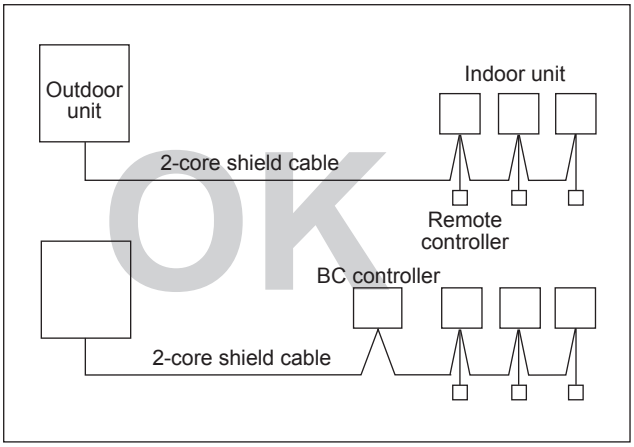
REFRIGERANT PIPE BRAZED CONNECTION

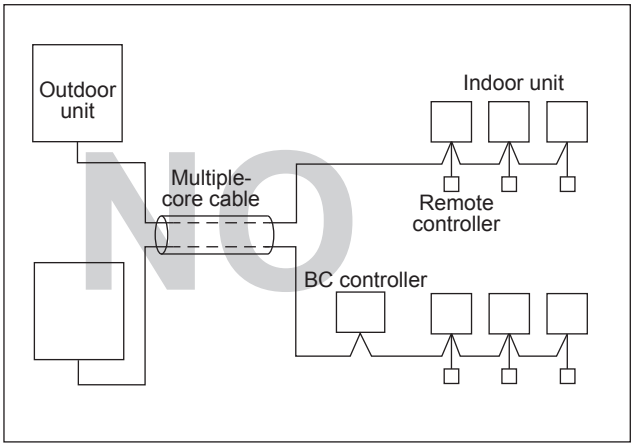
	A	B	C	D	E	TO OUTDOOR UNIT
LIQUID PIPE	ϕ6.35	ϕ6.35	ϕ6.35	ϕ6.35	ϕ6.35	ϕ9.52
GAS PIPE	ϕ9.52	ϕ9.52	ϕ9.52	ϕ9.52	ϕ12.7	ϕ15.88



9-1. General cautions

① Follow ordinance of your governmental organization for technical standard related to electrical equipment, wiring regulations, and guidance of each electric power company.
② Wiring for control (hereinafter referred to as transmission cable) shall be (50mm[1-5/8in.] or more) apart from power source wiring so that it is not influenced by electric noise from power source wiring. (Do not insert transmission cable and power source wire in the same conduit.)
③ Be sure to provide designated grounding work to outdoor unit.
④ Give some allowance to wiring for electrical part box of indoor and outdoor units, because the box is sometimes removed at the time of service work.
⑤ Never connect 380~415V(220~240V) power source to terminal block of transmission cable. If connected,electrical parts will be damaged.
⑥ Use 2-core shield cable for transmission cable. If transmission cables of different systems are wired with the same multiple-core cable, the resultant poor transmitting and receiving will cause erroneous operations.
⑦ When extending the transmission line, make sure to extend the shield cable as well.





9-2. Power supply for Outdoor unit

9-2-1. Electrical characteristics of Outdoor unit at cooling mode

Symbols: MCA (Max Circuit Amps =1.25 × Temperature correction × RLA)
RLA (Rated Load Amps), SC (Starting Current)

Model name	Units			Power supply	Compressor		FAN	RLA (A)
	Hz	Volts	Voltage range	MCA (A)	Output (kW)	SC (A)	Output (kW)	
PUMY-SP112VKM2	50	220 230 240	Max.: 264V Min.: 198V	30.5	3.9	14	0.20 × 1	20.69/19.79/18.97
PUMY-SP125VKM2				30.5	3.9	14	0.20 × 1	23.71/22.68/21.73
PUMY-SP140VKM2				30.5	4.2	14	0.20 × 1	24.77/23.70/22.71

Model name	Units			Power supply	Compressor		FAN	RLA (A)
	Hz	Volts	Voltage range	MCA (A)	Output (kW)	SC (A)	Output (kW)	
PUMY-SP112VKM2	60	220	Max.: 242V Min.: 198V	30.5	3.9	14	0.20 × 1	20.69
PUMY-SP125VKM2				30.5	3.9	14	0.20 × 1	23.71
PUMY-SP140VKM2				30.5	4.2	14	0.20 × 1	24.77

Model name	Units			Power supply	Compressor		FAN	RLA (A)
	Hz	Volts	Voltage range	MCA (A)	Output (kW)	SC (A)	Output (kW)	
PUMY-SP112YKM2	50	380 400 415	Max.: 456V Min.: 342V	13.0	3.9	7	0.20 × 1	7.14/6.78/6.54
PUMY-SP125YKM2				13.0	3.8	7	0.20 × 1	8.18/7.77/7.49
PUMY-SP140YKM2				13.0	4.1	7	0.20 × 1	8.55/8.12/7.83

Model name	Units			Power supply	Compressor		FAN	RLA (A)
	Hz	Volts	Voltage range	MCA (A)	Output (kW)	SC (A)	Output (kW)	
PUMY-SP112YKM2	60	380	Max.: 418V Min.: 342V	13.0	3.9	7	0.20 × 1	7.14
PUMY-SP125YKM2				13.0	3.8	7	0.20 × 1	8.18
PUMY-SP140YKM2				13.0	4.1	7	0.20 × 1	8.55

9-3. Power cable specifications

Thickness of wire for main power supply, capacities of the switch and system impedance

■ PUMY-SP-VKM2 / PUMY-SP-YKM2

<Outdoor unit> <When power is supplied to outdoor unit and branch box separately>

	Model	Minimum wire thickness (mm^2)			Ground-fault interrupter *1	Local switch (A)		Breaker for wiring (A) (Non-fuse breaker)	Max. Permissive System Impedance
		Main cable	Branch	Ground		Capacity	Fuse		
Outdoor unit	PUMY-SP112VKM2	6.0	-	6.0	32A 30mA 0.1sec. or less	32	32	32	-
	PUMY-SP125VKM2	6.0	-	6.0	32A 30mA 0.1sec. or less	32	32	32	-
	PUMY-SP140VKM2	6.0	-	6.0	32A 30mA 0.1sec. or less	32	32	32	-
	PUMY-SP112YKM2	1.5	-	1.5	16A 30mA 0.1sec. or less	16	16	16	-
	PUMY-SP125YKM2	1.5	-	1.5	16A 30mA 0.1sec. or less	16	16	16	-
	PUMY-SP140YKM2	1.5	-	1.5	16A 30mA 0.1sec. or less	16	16	16	-

<Outdoor unit> <When power is supplied to branch box from the outdoor unit>

	Model	Minimum wire thickness (mm^2)			Ground-fault interrupter *1	Local switch (A)		Breaker for wiring (A) (Non-fuse breaker)	Max. Permissive System Impedance
		Main cable	Branch	Ground		Capacity	Fuse		
Outdoor unit	PUMY-SP112VKM2	6.0	-	6.0	32A 30mA 0.1sec. or less	40	40	40	-
	PUMY-SP125VKM2	6.0	-	6.0	32A 30mA 0.1sec. or less	40	40	40	-
	PUMY-SP140VKM2	6.0	-	6.0	32A 30mA 0.1sec. or less	40	40	40	-
	PUMY-SP112YKM2	2.5	-	2.5	16A 30mA 0.1sec. or less	25	25	25	-
	PUMY-SP125YKM2	2.5	-	2.5	16A 30mA 0.1sec. or less	25	25	25	-
	PUMY-SP140YKM2	2.5	-	2.5	16A 30mA 0.1sec. or less	25	25	25	-

<Indoor units> <When power is supplied to indoor unit and outdoor unit separately>

	Model	Minimum wire thickness (mm^2)			Ground-fault interrupter *1	Local switch (A)		Breaker for wiring (A) (Non-fuse breaker)	Max. Permissive System Impedance
		Main cable	Branch	Ground		Capacity	Fuse		
Total operating current of the indoor unit	F0 = 16A or less *2	1.5	1.5	1.5	20A current sensitivity *3	16	16	40	-
	F0 = 25A or less *2	2.5	2.5	2.5	30A current sensitivity *3	25	25	40	-
	F0 = 32A or less *2	4.0	4.0	4.0	40A current sensitivity *3	32	32	40	-

*1 The Ground-fault interrupter should support Inverter circuit.
The Ground-fault interrupter should combine using of local switch or wiring breaker.

*2 Please take the larger of F1 or F2 as the value for F0.
F1 = Total operating maximum current of the indoor units × 1.2
F2 = {V1 × (Quantity of Type1)/C} + {V1 × (Quantity of Type2)/C} + {V1 × (Quantity of Type3)/C} + · · · · · + {V1 × (Quantity of Type17)/C}

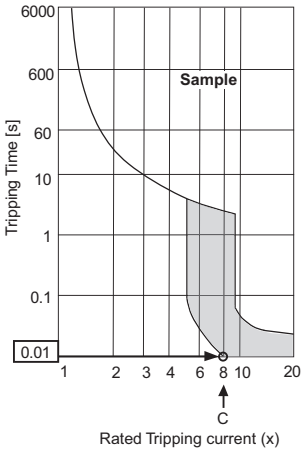
Connect to Branch box (PAC-MK·BC)

Indoor unit		V1	V2
Type1	PEAD-RP·JAQ(L).UK, PEAD-M·JA(L), PEAD-M·JA(L)2	26.9	2.4
Type2	SEZ-KD·VA, SEZ-M·DA(L), PCA-RP·KAQ, PCA-M·KA, SLZ-KF·VA, PLA-RP·EA(.UK), SEZ-M·DA(L)2, PCA-M·KA2, PLA-M·EA	19.8	
Type3	SLZ-M·FA, SLZ-M·FA, SLZ-M·FA2, PLA-M·EA2	17.1	
Type4	MLZ-KA·VA, MLZ-KP·VF	9.9	
Type5	MSZ-LN·VG, MSZ-LN·VG2, MSZ-AP·VF, MSZ-AP·VG(K), MFZ-KJ·VE, MLZ-KY·VG, MSZ-RW·VG, MFZ-KT·VG	7.4	
Type6	MSZ-FH·VE, MSZ-GF·VE, MSZ-SF·VE, MSZ-EF·VE, MSZ-SF·VA, MSZ-GE·VA, MSZ-EF·VG(K)	6.8	
Type7	Branch box (PAC-MK·BC(B))	5.1	3.0

Connect to Connection kit (PAC-LV11M)

Indoor unit		V1	V2
Type8	MSZ-LN·VG, MSZ-AP·VF, MSZ-AP·VG(K), MSZ-LN·VG2, MFZ-KT·VG	7.4	2.4
Type9	MSZ-SF·VA, MSZ-SF·VE, MSZ-EF·VE, MSZ-FH·VE, MSZ-GE·VA, MSZ-EF·VG(K)	6.8	
Type10	Connection kit (PAC-LV11M)	3.5	

Indoor unit		V1	V2
Type11	PEFY-P·VMA(L)-E	38.0	1.6
Type12	PMFY-P·VBM-E, PLFY-P·VBM-E, PLFY-P·VEM-E, PLFY-P·VFM-E, PEFY-P·VMS1(L)-E, PCFY-P·VKM-E, PKFY-P·VHM-E, PKFY-P·VKM-E, PFFY-P·VKM-E, PFFY-P·VLRMM-E, PFFY-P·VCM, PLFY-M·VEM	19.8	2.4
Type13	PEFY-M·VMA(L)-A, PEFY-M·VMA(L)-A1	18.6	
Type14	PLFY-M·VEM6	17.1	
Type15	PLFY-P·VCM-E	9.9	
Type16	PKFY-P·VBM-E	3.5	
Type17	PLFY-P·VLMD-E, PEFY-P·VMH-E, PEFY-P·VMR-E-L/R, PEFY-P·VMH(S)-E-F, PFFY-P·VLEM-E, PFFY-P·VLRM-E, GUF*4-RD(H)4	0	0



C: Multiple of tripping current at tripping time 0.01s
Please pick up "C" from the tripping characteristic of the breaker.

<Example of "F2" calculation>
Condition PLFY-VBM × 4 + PEFY-VMA × 1, C = 8 (refer to right sample chart)
F2 = 19.8 × 4/8 + 38 × 1/8
= 14.65
→16 A breaker (Tripping current = 8 × 16 A at 0.01s)

*3 Current sensitivity is calculated using the following formula.
G1 = (V2 × Quantity of Type1) + (V2 × Quantity of Type2) + (V2 × Quantity of Type3) + (V2 × Quantity of Type4) + · · · · · + (V2 × Quantity of Type17) + (V3 × Wire length [km])

G1	Current sensitivity
30 or less	30 mA 0.1sec or less
100 or less	100 mA 0.1sec or less

Wire thickness	V3
1.5 mm^2	48
2.5 mm^2	56
4.0 mm^2	66

1. Use dedicated power supplies for the outdoor unit and indoor unit.
2. Bear in mind ambient conditions (ambient temperature, direct sunlight, rain water, etc.) when proceeding with the wiring and connections.
3. The wire size is the minimum value for metal conduit wiring. If the voltage drops, use a wire that is one rank thicker in diameter. Make sure the power-supply voltage does not drop more than 10%. Make sure that the voltage imbalance between the phases is 2% or less.
4. Specific wiring requirements should adhere to the wiring regulations of the region.
5. Power supply cords of parts of appliances for outdoor use shall not be lighter than polychloroprene sheathed flexible cord (design 60245 IEC57). For example, use wiring such as YZW.
6. A switch with at least 3 mm contact separation in each pole shall be provided by the Air Conditioner installer.

⚠WARNING

- Be sure to use specified wires for connections and ensure no external force is imparted to terminal connections. If connections are not fixed firmly, heating or fire may result.
- Be sure to use the appropriate type of overcurrent protection switch. Note that generated overcurrent may include some amount of direct current.

⚠CAUTION

- The breakers for current leakage should support Inverter circuit. (e.g. Mitsubishi Electric's NV-S-Series or equivalent). If no earth leakage breaker is installed, it may cause an electric shock.
- Breakers for current leakage should combine using of switch.
- Do not use anything other than a breaker with the correct capacity. Using a breaker of too large capacity may cause malfunction or fire.
- If a large electric current flows due to malfunction or faulty wiring, earth-leakage breakers on the unit side and on the upstream side of the power supply system may both operate. Depending on the importance of the system, separate the power supply system or take protective coordination of breakers.

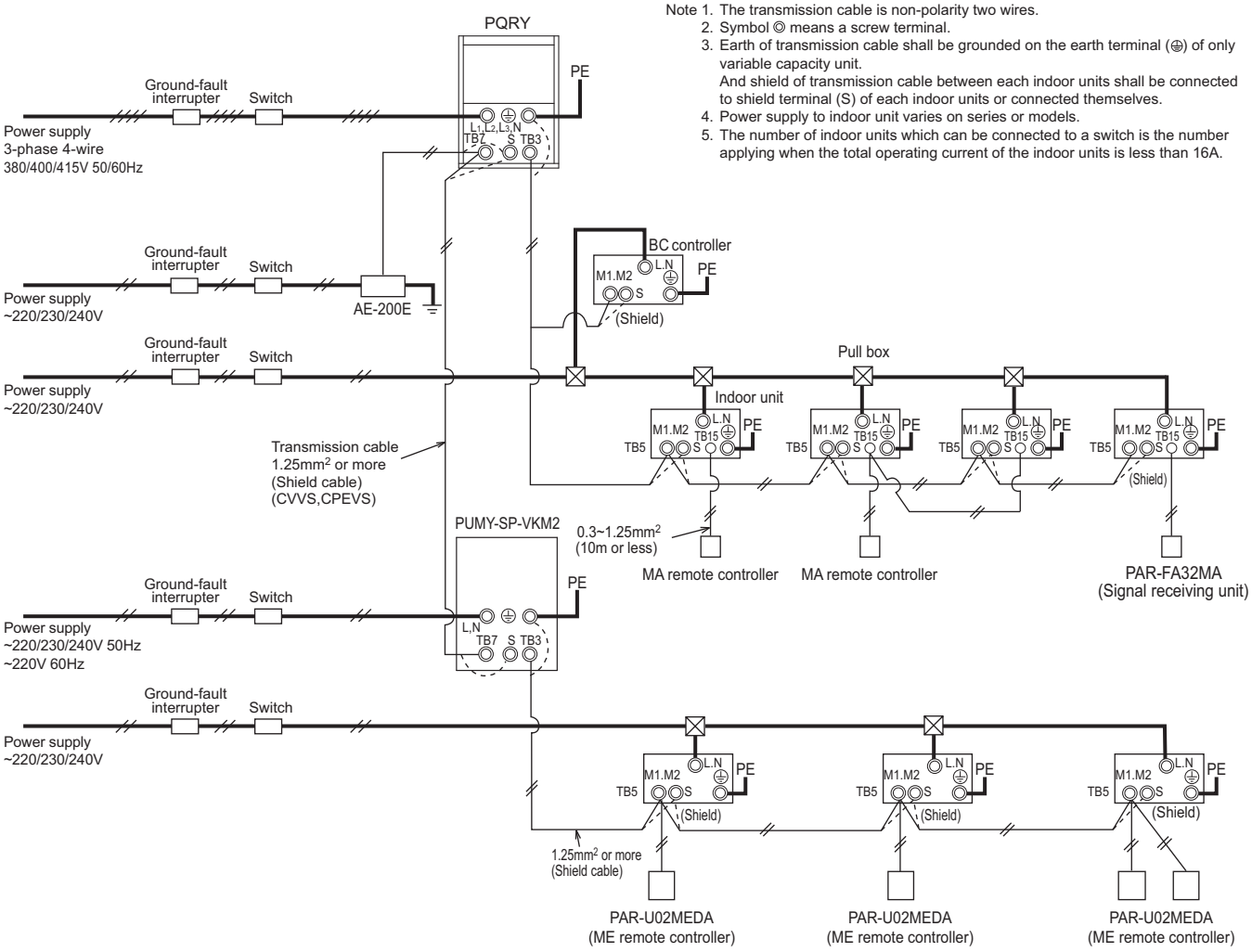
Note

- This device is intended for the connection to a power supply system with a maximum permissible system impedance shown in the above table at the interface point (power service box) of the user's supply.
- The user must ensure that this device is connected only to a power supply system which fulfils the requirement above.
  If necessary, the user can ask the public power supply company for the system impedance at the interface point.

9-4. Power supply examples

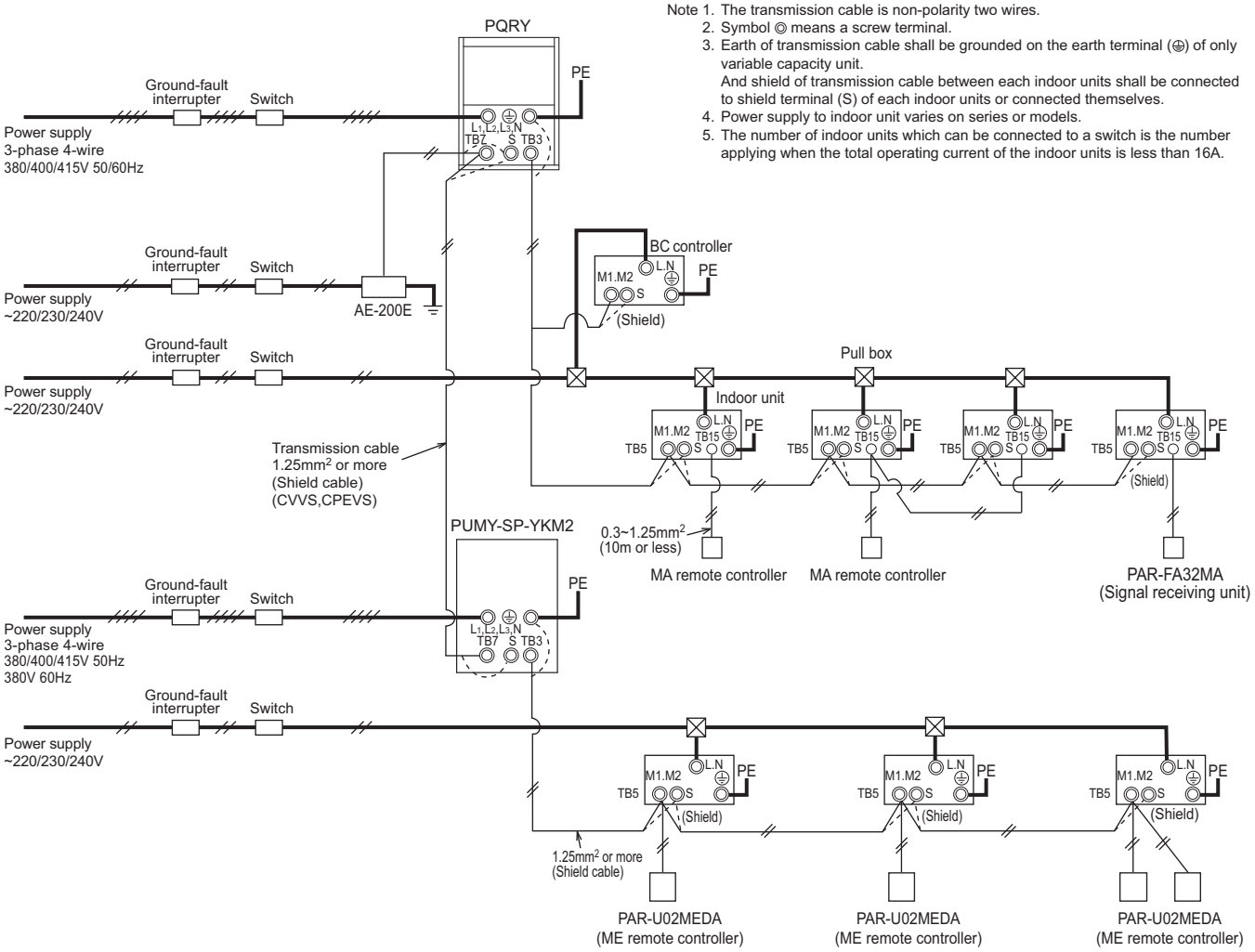
The local standards and/or regulations is applicable at a higher priority.

9-4-1. PUMY-SP112, 125, 140VKM2



The local standards and/or regulations is applicable at a higher priority.

9-4-2. PUMY-SP112, 125, 140YKM2

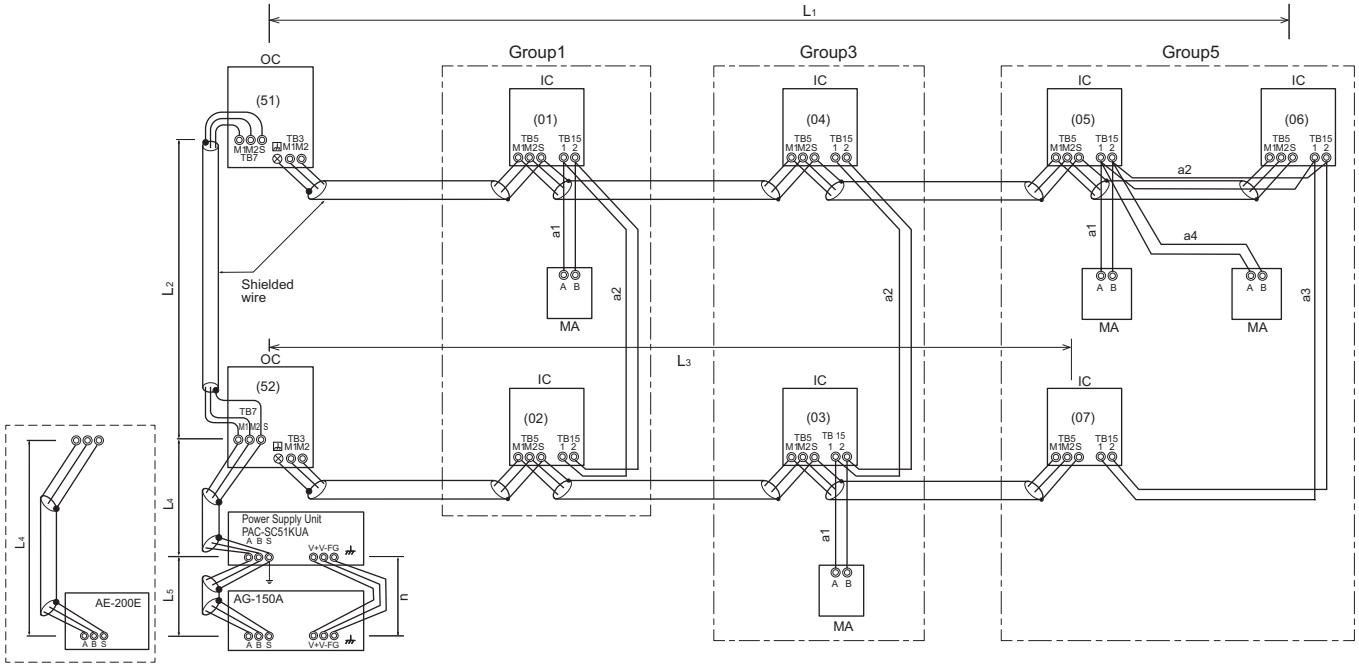


10-1. Transmission cable length limitation

10-1-1. Using MA Remote controller

Long transmission cable causes voltage down, therefore, the length limitation should be obeyed to secure proper transmission.

Max. length via Outdoor (M-NET cable)	L1+L2+L3, L1+L2+L4+L5, L3+L4+L5	<=500m[1640ft]	1.25mm^2 [AWG16] or thicker
Max. length to Outdoor (M-NET cable)	L1, L3, L2+L4, L5	<=200m[656ft]	1.25mm^2 [AWG16] or thicker
Max. length from MA to Indoor for each group	a1+a2, a1+a2+a3+a4	<=200m[656ft]	0.3-1.25mm^2 [AWG22-16]
24VDC to AG-150A	n	<=50m[164ft.]	0.75-2.0 mm^2 [AWG18-14]



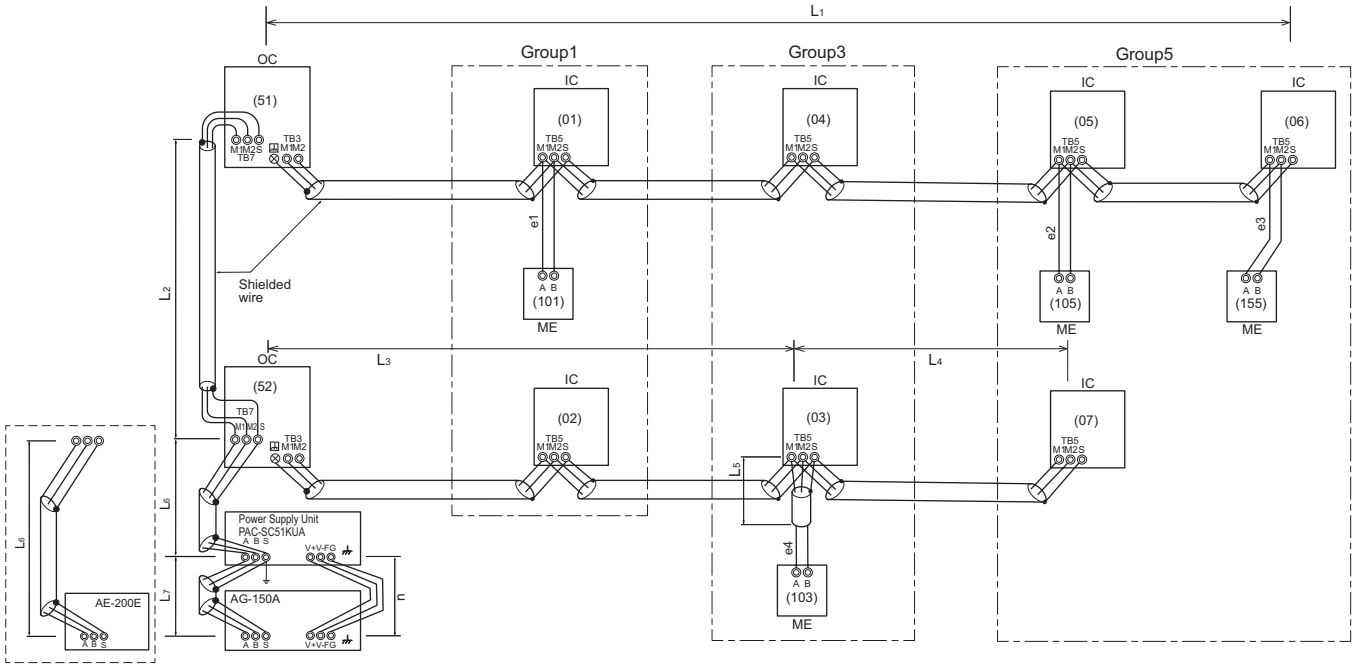
OC: Outdoor unit; IC: Indoor unit; MA: MA remote controller

10-1-2. Using ME Remote controller

Long transmission cable causes voltage down, therefore, the length limitation should be obeyed to secure proper transmission.

Max. length via Outdoor (M-NET cable)	L1+L2+L3+L4, L1+L2+L6+L7,L1+L2+L3+L5, L3+L4+L6+L7, L3+L5+L6+L7, L4+L5	<=500m[1640ft]	1.25mm^2 [AWG16] or thicker
Max. length to Outdoor (M-NET cable)	L1, L3+L4, L2+L6, L7, L3+L5	<=200m[656ft]	1.25mm^2 [AWG16] or thicker
Max. length from ME to Indoor	e1, e2, e3, e4	<=10m[32ft] *1	0.3-1.25mm^2 [AWG22-16] *1
24VDC to AG-150A	n	<=50m[164ft.]	0.75-2.0 mm^2 [AWG18-14]

*1. If the length from ME to Indoor exceed 10m, use 1.25 mm^2[AWG16] shielded cable, but the total length should be counted into Max. length via Outdoor.



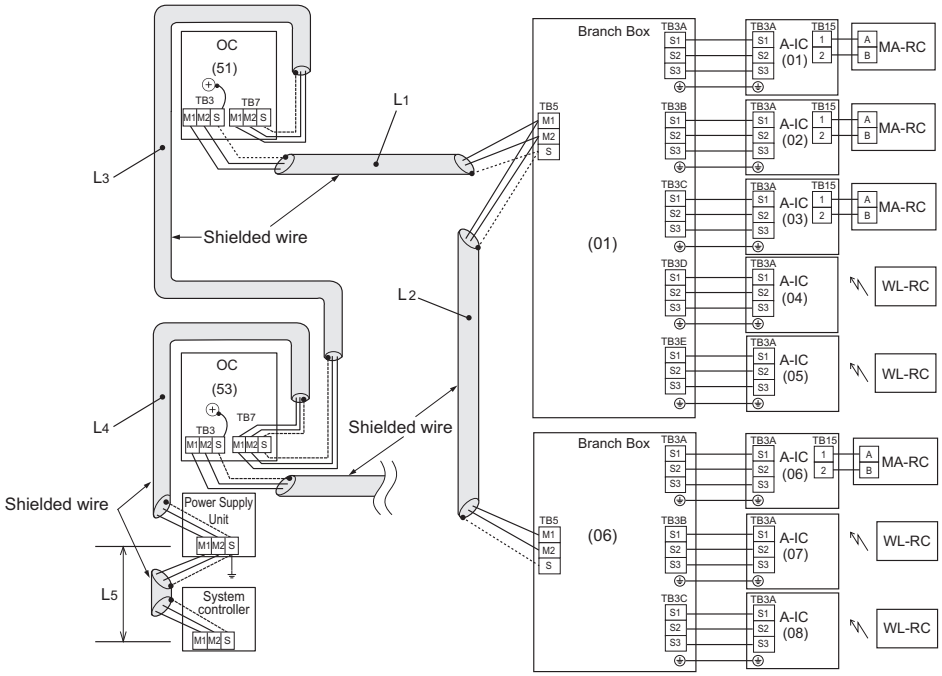
OC: Outdoor unit; IC: Indoor unit; ME: ME remote controller

10-1-3. Using a Branch Box

Long transmission cable causes voltage down, therefore, the length limitation should be obeyed to secure proper transmission.

Max length via outdoor units (M-NET cable):	$L_1 + L_2 + L_3 + L_4 + L_5$	<=500m[1640ft]	1.25mm^2 [AWG16] or thicker
Max transmission cable length (M-NET cable):	$L_1 + L_2$, $L_3 + L_4$, L_5	<=200m[656ft]	1.25mm^2 [AWG16] or thicker

<Example of Transmission Cable Wiring: When Using a Branch Box>



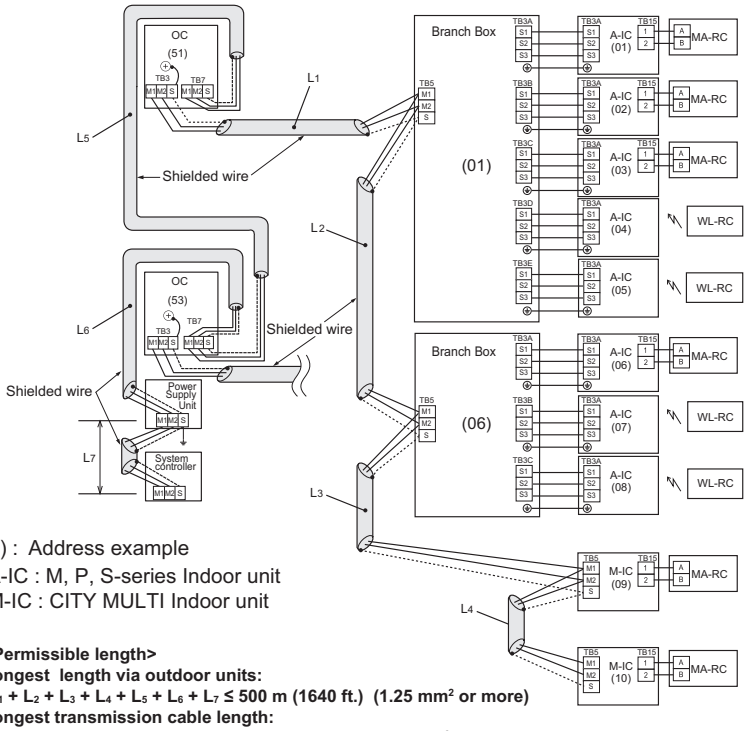
( ) : Address example
A-IC : M, P, S-series Indoor unit

10-1-4. Mixing system

Long transmission cable causes voltage down, therefore, the length limitation should be obeyed to secure proper transmission.

Max length via outdoor units:	$L_1 + L_2 + L_3 + L_4 + L_5 + L_6 + L_7$	<=500m[1640ft]	1.25mm^2 [AWG16] or thicker
Max transmission cable length:	$L_1 + L_2 + L_3 + L_4$, $L_5 + L_6$, L_7	<=200m[656ft]	1.25mm^2 [AWG16] or thicker

<Example of Transmission Cable Wiring: Mixing system>



( ) : Address example
A-IC : M, P, S-series Indoor unit
M-IC : CITY MULTI Indoor unit

<Permissible length>
Longest length via outdoor units:
$L_1 + L_2 + L_3 + L_4 + L_5 + L_6 + L_7 \leq 500$ m (1640 ft.) (1.25 mm^2 or more)
Longest transmission cable length:
$L_1 + L_2 + L_3 + L_4$, $L_5 + L_6$, $L_7 \leq 200$ m (656 ft.) (1.25 mm^2 or more)

10-2. Transmission cable specifications

	Transmission cables (Li)	MA Remote controller cables	ME Remote controller cables
Type of cable	Shielded cables (2-core) CVVS, CPEVS, and MVVS	VCTF, VCTFK, CVV, VVR, VVF, VCT	Shielded cables (2-core) CVVS, CPEVS, and MVVS
Cable size	Larger than 1.25 mm^2 [AWG16], or ø1.2 mm or above	0.3 to 1.25 mm^2 [AWG22 to 16] *1 *5	0.3 to 1.25 mm^2 [AWG22 to 16] *1 *6
Maximum overall line length	Refer to 10-1.	200 m [656 ft] *3 *4	10 m [32 ft] *2

*1 The use of cables that are smaller than 0.75 mm^2 (AWG18) is recommended for easy handling.
*2 The section of the cable that exceeds 10 m [32 ft] must be included in the maximum indoor-outdoor transmission line distance.
*3 Max. 70 m [229 ft] for PAR-CT01MA series
*4 Max. 150 m [492 ft] for PAR-FS01MA series
*5 To wire PAR-CT01MA series, PAR-FS01MA series, PAR-4"x"MA series, PAR-3"x"MA series ("x" represents 0 or later), or Simple MA remote controller, use a cable with a size of 0.3 mm^2 (AWG 22).
*6 When connected to the terminal block on the Simple remote controller, use a cable with a size of 0.75 to 1.25 mm^2 (AWG18 to 16).

CVVS, MVVS: PVC insulated PVC sheathed shielded control cable
CPEVS: PE insulated PVC sheathed shielded communication cable
CVV: PVC insulated PVC sheathed control cable

10-3. System configuration restrictions

10-3-1. Common restrictions for the CITY MULTI system

For each Outdoor/Heat source unit, the maximum connectable quantity of Indoor unit is specified at its Specifications table.

A) 1 Group of Indoor units can have 1-16 Indoor units;
*OA processing unit GUF-RD(H) is considered as Indoor unit.

B) Maximum 2 remote controllers for 1 group;
*MA/ME remote controllers cannot be present together in 1group.
*When a PAR-CT01MA or PAR-3X MA-Series (X indicates 1, 2…) is connected to a group, no other MA remote controllers can be connected to the same group.

C) 1 Lossnay unit can interlock maximum 16 Indoor units; 1 Indoor unit can interlock only 1 Lossnay unit.

D) Maximum 3 System controllers are connectable when connecting to TB3 of the Outdoor/Heat source unit.

E) A maximum of 6 system controller are connectable to TB3 and TB7 of Outdoor/Heat source unit.

F) 4 System controllers or more are connectable when connecting to TB7 of the Outdoor/Heat source unit, if the transmission power is supplied by the power supply unit PAC-SC51KUA.
*System controller connected as described in D) would have a risk that the failure of connected Outdoor/Heat source unit would stop power supply to the System controller.

10-3-2. Ensuring proper communication power and the number of connected units for M-NET

In order to ensure proper communication among Outdoor/Heat source unit, Indoor unit, LOSSNAY, OA processing unit GUF-RD(H), and Controllers, the transmission power situation for the M-NET should be observed. In some cases, Transmission booster should be used. Taking the power consumption of Indoor unit as 1, the equivalent power consumption or supply of others are listed at Table 1 and Table 2.
Both the transmission line for centralized controller and indoor-outdoor transmission line must meet the conditions listed below. (Both conditions a) and b) must be met.)

a) [Total equivalent power consumption] ≤ [The equivalent power supply]
b) [Total equivalent number of units (Table 1)] ≤ [40]

Table 1 The equivalent power consumption and the equivalent number of units

Category	Model	The equivalent power consumption	The equivalent number of units
CITY MULTI indoor unit OA unit CITY MULTI connection kit Air handling unit controller	Except for the models indicated by *2 PEFY-AF2500, 3000, 4000, 5000, 6000MH GUF-50, 100 PAC-LV11M-J PAC-AH125, 140, 250, 500M-J	1	1
CITY MULTI indoor unit *2	PDFY-P100VM-E-RE	2	2
BC controller	CMB	2	1
PWFY *1	P100VM-E-BU	6	1
	P200VM-E1-AU P200VM-E2-AU	5	1
	(E)P100VM-E1-AU (E)P100VM-E2-AU P140VM-E1-AU P140VM-E2-AU	1	1
PFAV	P250, 300, 500, 600VM-E(-F)	1	1
	P750, 900VM-E(-F)	2	2
PFV, PEV	P200, 250, 400, 500YM-A	1	1
MA remote controller/Lossnay	PAR-CT01MA PAR-21MA PAR-31MA PAR-32MA PAR-33MA PAC-YT52CRA PAR-FA32MA LGH PZ-60DR-E PZ-61DR-E PZ-43SMF-E	0	0
ME remote controller	PAR-U02MEDA	0.5	1
	PZ-52SF	0.25	1
System controller	AE-200E AE-50E EW-50E LM-AP	0	0
	AG-150A EB-50GU-J PAC-IF01AHC-J	0.5	1
	AT-50B	1.5	5
	PAC-YG60MCA PAC-YG66DCA PAC-YG63MCA	0.25	1
ON/OFF controller	PAC-YT40ANRA	1	1
MN converter	CMS-MNG-E	2	1
Outdoor/Heat source unit	TB7 power consumption	0	0
System control interface	MAC-333IF-E	0	0
A-M converter	PAC-SF83MA-E		

*1 PWFY cannot be connected to PUMY model.

Table 2 The equivalent power supply

Category	Model	The equivalent power supply		
Transmission Booster	PAC-SF46EPA	25 *1		
Power supply unit	PAC-SC51KUA	5		
Expansion controller	PAC-YG50ECA	6		
BM ADAPTER	BAC-HD150	6		
System controller	AE-200E/AE-50E	0.75		
	EW-50E	1.5		
	LM-AP	0		
Outdoor/Heat source unit		TB3 and TB7 total	TB7 only	TB3 only
	Outdoor unit except S-Series and TKA *2	32 *1	6	32 *1-equivalent power supplied to TB7
	S-Series outdoor unit	12 *1	0	12 *1
	TKA outdoor unit	32 *1	- *3	32 *1

*1 When one or more indoor units listed below is connected, subtract 3 from the equivalent power supply.

Table 3

Category	Model
Indoor unit	Sized P200/P250 PEFY-AF4000/5000/6000MH, PFFY-P400/500YM-E, PDFY-P100VM-E-RE
Air handling unit controller	PAC-AH250/500M-J
PFAV	PFAV-P500/600/750/900VM-E(-F)
PFV	PFV-P400/500YM-A
PEV	PEV-P400/500YM-A

*2 If PAC-SC51KUA is used to supply power at TB7 side, no power supply need from Outdoor/Heat source unit at TB7, Connector TB3 itself will therefore have 32.
*3 Do not supply power to TB7 from TKA outdoor units.
Use PAC-SC51KUA or PAC-SF46EPA when connecting an M-NET device to TB7.

With the equivalent power consumption values and the equivalent number of units in Table 1 and Table 2, PAC-SF46EPA can be designed into the air-conditioner system to ensure proper system communication according to (A), (B), (C).

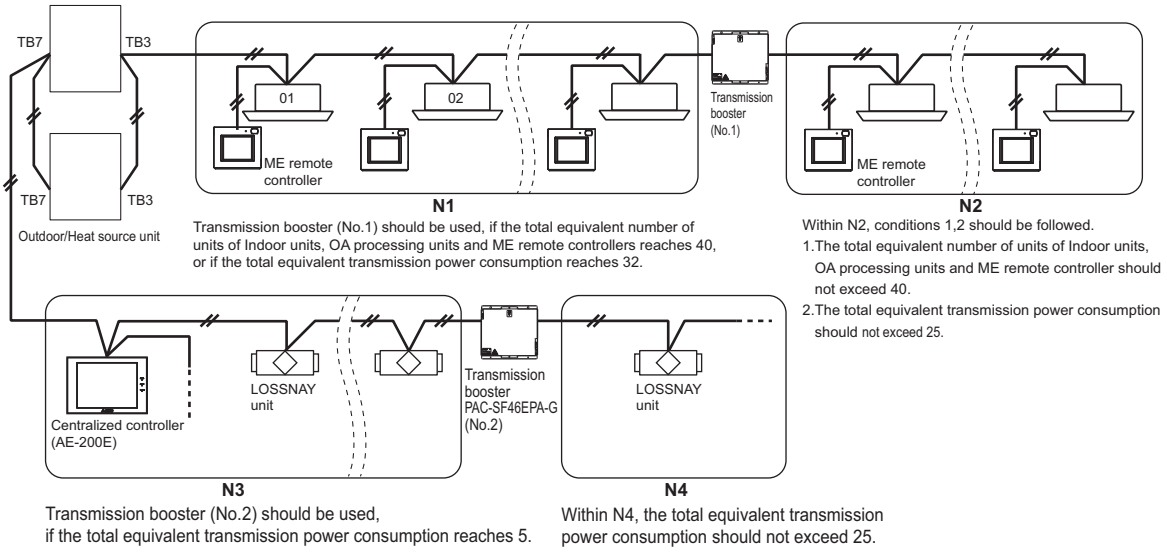
(A) Firstly, count from TB3 at TB3 side the total equivalent number of units of Indoor units, OA processing units, ME remote controller, and System controllers. If the total equivalent number of units reaches 40, a PAC-SF46EPA should be set.

(B) Secondly, count from TB7 side to TB3 side the total transmission power consumption. If the total equivalent power supply reaches 32, a PAC-SF46EPA should be set. Yet, if a PAC-SC51KUA or another controller with a built-in power supply, such as PAC-YG50ECA, is used to supply power at TB7 side, count from TB3 side only.

(C) Thirdly, count from TB7 at TB7 side the total transmission power consumption, If the total equivalent power supply for only TB7 reaches 6, a PAC-SF46EPA should be set. Also, count from TB7 at TB7 side the total equivalent number of units of System controllers, and so on. If the total equivalent number of units reaches 40, a PAC-SF46EPA should be set.

* The equivalent power supply of S-Series outdoor unit is 12.
* When one or more indoor units listed in Table 3 is connected, subtract 3 from the equivalent power supply.

■ System example



10-3-3. Ensuring proper power supply to System controller

The power to System controller (excluding AE-200E, AE-50E, EW-50E, BAC-HD150, LM-AP) is supplied via M-NET transmission line. M-NET transmission line at TB7 side is called Centralized control transmission line while one at TB3 side is called Indoor-Outdoor/Heat source transmission line. There are 3 ways to supply power to the System controller .

A) Connecting to TB3 of the Outdoor/Heat source unit and receiving power from the Outdoor/Heat source unit.

B) Connecting to TB7 of the Outdoor/Heat source unit and receiving power from the Outdoor/Heat source unit.
(Not applicable to the PUMY model)

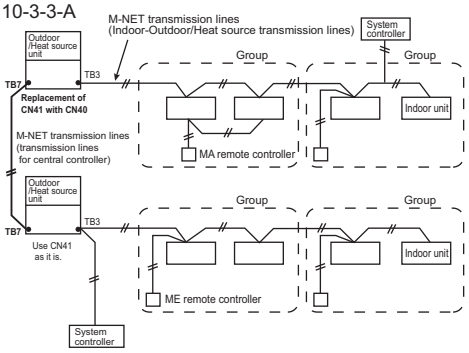
C) Connecting to TB7 of the Outdoor/Heat source unit but receiving power from power supply unit PAC-SC51KUA.

* System controllers (AE-200E, AE-50E, EW-50E, BAC-HD150, LM-AP) have a built-in function to supply power to the M-NET transmission lines, so no power needs to be supplied to the M-NET transmission lines from the Outdoor/Heat source units or from PAC-SC51KUA.

10-3-3-A. When connecting to TB3 of the Outdoor/Heat source unit and receiving power from the Outdoor/Heat source unit.

Maximum 3 System controllers can be connected to TB3.
If there is more than 1 Outdoor/Heat source unit, it is necessary to replace power supply switch connector CN41 with CN40 on one Outdoor/Heat source unit.

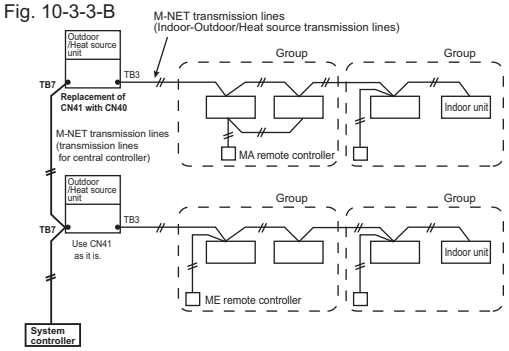
Fig. 10-3-3-A



10-3-3-B. When connecting to TB7 of the Outdoor/Heat source unit and receiving power from the Outdoor/Heat source unit. (Not applicable to the PUMY model)

A maximum of 6 system controller are connectable to TB3 and TB7 of Outdoor/Heat source unit. (Not applicable to the PUMY model)
It is necessary to replace power supply switch connector CN41 with CN40 on one Outdoor/Heat source unit.

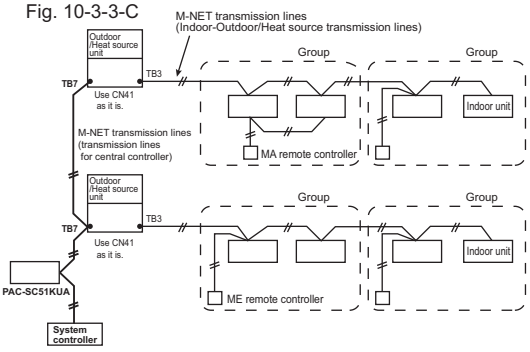
Fig. 10-3-3-B



10-3-3-C. When connecting to TB7 of the Outdoor/Heat source unit but receiving power from PAC-SC51KUA.

When using PAC-SC51KUA to supply transmission power, the power supply connector CN41 on the Outdoor/Heat source units should be kept as it is. It is also a factory setting.
1 PAC-SC51KUA supports maximum 1 AG-150A or
1 EB-50GU-J unit due to the limited power 24VDC at its TB3.
However, 1 PAC-SC51KUA supplies transmission power at its TB2 equal to 5 Indoor units, which is referable at Table 2.
If System controller, ON/OFF controller connected to TB7 consume transmission power more than 5 (Indoor units), Transmission booster PAC-SF46EPA-G is needed. PAC-SF46EPA-G supplies transmission power equal to 25 Indoor units.

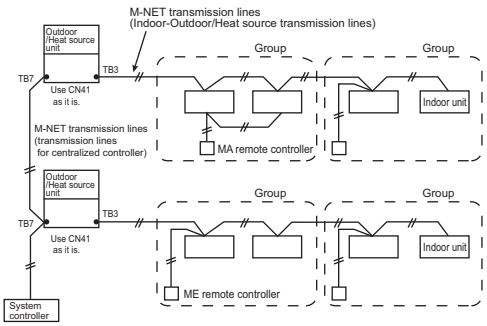
Fig. 10-3-3-C



⚠ CAUTION

■How to connect system controllers (AE-200E, AE-50E, EW-50E, BAC-HD150, LM-AP) to a given system
System controllers (AE-200E, AE-50E, EW-50E, BAC-HD150, LM-AP) have a built-in function to supply power to the M-NET transmission lines, so no power needs to be supplied to the M-NET transmission lines from the Outdoor/Heat source units or from PAC-SC51KUA.
Leave the power supply connector on the Outdoor/Heat source unit connected to CN41 as it is.
Refer to 10-3-2 for information about the power-supply capacity of each system controller (EW-50E, BAC-HD150, LM-AP) to the low-level system controllers.

Fig. 10-3-3-D



10-3-4. Power supply to LM-AP

1-phase 220-240VAC power supply is needed.
The power supply unit PAC-SC51KUA is not necessary when connecting only the LM-AP. Yet, make sure to change the power supply changeover connector CN41 to CN40 on the LM-AP.

10-3-5. Power supply to expansion controller

1-phase 100-240VAC power supply is needed.
The power supply unit PAC-SC51KUA is not necessary.
The expansion controller supplies power through TB3, which equals 6 indoor units. (refer to Table 2)

10-3-6. Power supply to BM ADAPTER

1-phase 100-240VAC power supply is needed.
The power supply unit PAC-SC51KUA is not necessary when only BM ADAPTER is connected.
Yet, make sure to move the power jumper from CN41 to CN40 on the BM ADAPTER.

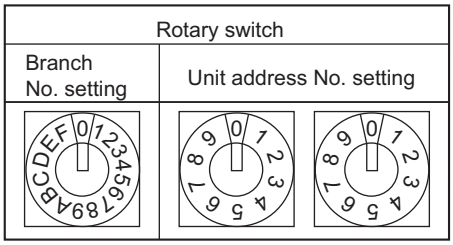
10-3-7. Power supply to AE-200E/AE-50E/EW-50E

1-phase 100-240VAC power supply is needed.
The power supply unit PAC-SC51KUA is not necessary when connecting only the AE-200E/AE-50E/EW-50E.

10-4. Address setting

10-4-1. Switch operation

In order to constitute CITY MULTI in a complete system, switch operation for setting the unit address No. and connection No. is required.



① Address No. of outdoor unit, indoor unit and remote controller.
The address No. is set at the address setting board.
In the case of R2 system, it is necessary to set the same No. at the branch No. switch of indoor unit as that of the BC controller connected. (When connecting two or more branches, use the lowest branch No.)

② Caution for switch operations

- Be sure to shut off power source before switch setting. If operated with power source on, switch can not operate properly.
- No units with identical unit address shall exist in one whole air conditioner system. If set erroneously, the system can not operate.

③ MA remote controller

- When connecting only one remote controller to one group, it is always the main remote controller.
  When connecting two remote controllers to one group, set one remote controller as the main remote controller and the other as the sub remote controller.
- The factory setting is "Main".

PAR-4"x"MAA ("x" represents 0 or later), PAR-CT01MA, PAR-FS01MA
The MA remote controller does not have the switches listed above.
Refer to the installation manual for the function setting.

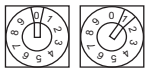
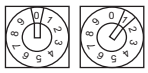
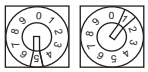
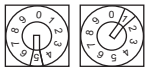
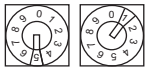
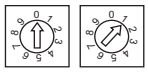
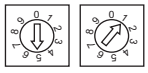
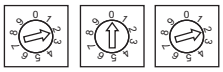
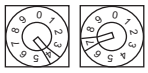
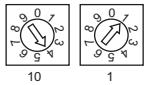
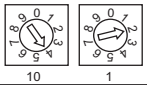
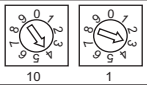
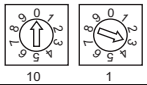
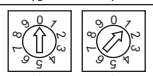
PAC-YT52CRA

Setting the dip switches

There are switches on the back of the top case. Remote controller Main/Sub and other function settings are performed using these switches. Ordinarily, only change the Main/Sub setting of SW1.
(The factory settings are ON for SW1, 2, and 3 and OFF for SW4.)

SW No.	SW contents Main	ON	OFF	Comment
1	Remote controller Main/Sub setting	Main	Sub	Set one of the two remote controllers at one group to "ON".
2	Temperature display units setting	Celsius	Fahrenheit	When the temperature is displayed in [Fahrenheit], set to "OFF".
3	Cooling/heating display in AUTO mode	Yes	No	When you do not want to display "Cooling" and "Heating" in the AUTO mode, set to "OFF".
4	Indoor temperature display	Yes	No	When you want to display the indoor temperature, set to "ON".

10-4-2. Rule of setting address

Unit		Address setting	Example	Note
Indoor unit		01 ~ 50	 10 1	Use the most recent address within the same group of indoor units. Make the indoor units address connected to the BC controller (Sub) larger than the indoor units address connected to the BC controller (Main). If applicable, set the sub BC controllers in an PURY/PQRY system in the following order: (1) Indoor unit to be connected to the BC controller (Main) (2) Indoor unit to be connected to the BC controller (No.1 Sub) (3) Indoor unit to be connected to the BC controller (No.2 Sub) Set the address so that (1)<(2)<(3)
Branch Box		01 ~ 50	 10 1	Use a number within the range 01~ 50, but it should not make the highest address of connected A-IC exceed 50. • Specify whether indoor units are connected to each port (A, B, C, D, and E). SW1 | 1 | 2 | 3 | 4 | 5 | (6) Port | A | B | C | D | E | not use indoor units are connected ON indoor units are not connected OFF
Outdoor unit		51 ~ 99, 100	 10 1	The smallest address of indoor unit in same refrigerant system + 50 * The address automatically becomes "100" if it is set as "01~ 50"
BC controller (Main)		52 ~ 99, 100	 10 1	The address of outdoor unit + 1 * Please reset another address between 51 and 99 when two addresses overlap. * The address automatically becomes "100" if it is set as "01~ 50"
BC controller (Sub)		53 ~ 99, 100	 10 1	Lowest address within the indoor units connected to the BC controller (Sub) plus 50.
Local remote controller	ME Remote controller (Main)	101 ~ 150	1 Fixed  10 1	The smallest address of indoor unit in the group + 100 * The place of "100" is fixed to "1"
Local remote controller	ME Remote controller (Sub)	151 ~ 199, 200	1 Fixed  10 1	The address of main remote controller + 50 * The address automatically becomes "200" if it is set as "00"
System controller	ON/OFF remote controller	201 ~ 250	 100 10 1	The smallest group No. to be managed + 200 * The smallest group No. to be managed is changeable.
System controller	AE-200E/AE-50E AG-150A EB-50GU-J EW-50E AT-50B	000, 201 ~ 250	0 0 0 100 10 1	* AT-50B cannot be set to "000".
System controller	PAC-YG50ECA	000, 201 ~ 250	0 0 0 100 10 1	* Settings are made on the initial screen of AG-150A.
System controller	BAC-HD150	000, 201 ~ 250	0 0 0 100 10 1	* Settings are made with setting tool of BM ADAPTER.
System controller	LMAP04-E	201 ~ 250	2 Fixed  10 1	
PI, AI, DIDO	PAC-YG60MCA	01 ~ 50	 10 1	
PI, AI, DIDO	PAC-YG63MCA	01 ~ 50	 10 1	
PI, AI, DIDO	PAC-YG66DCA	01 ~ 50	 10 1	
Lossnay, OA processing unit		01 ~ 50	 10 1	After setting the addresses of all the indoor units, assign an arbitrary address.
PAC-IF01AHC		201 ~ 250	2 Fixed  10 1	

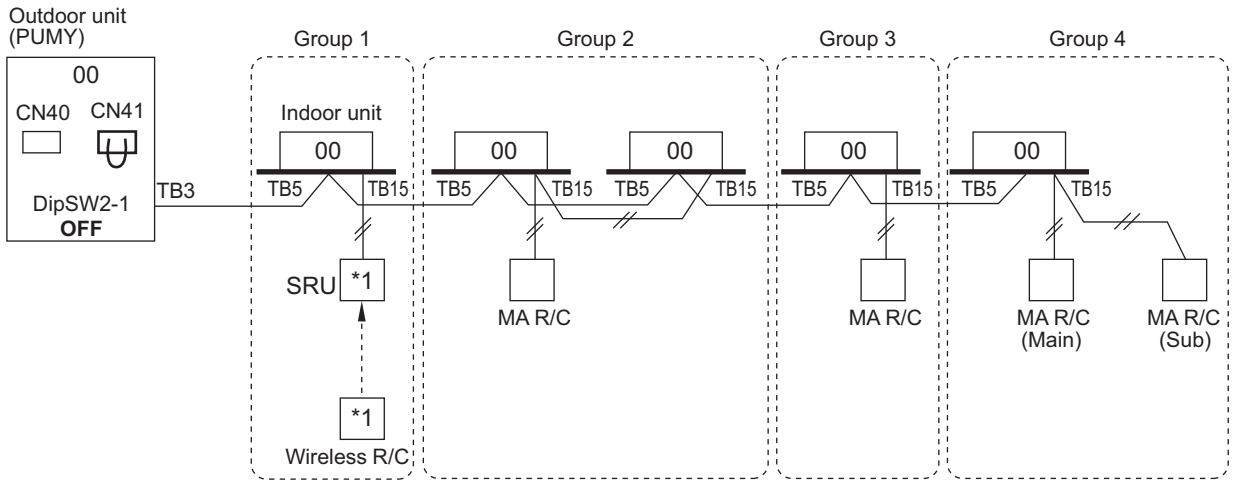
10-4-3. System example

Factory setting

Original switch setting of the outdoors, indoors, controllers, LM-AP and BM ADAPTER at shipment is as follows.

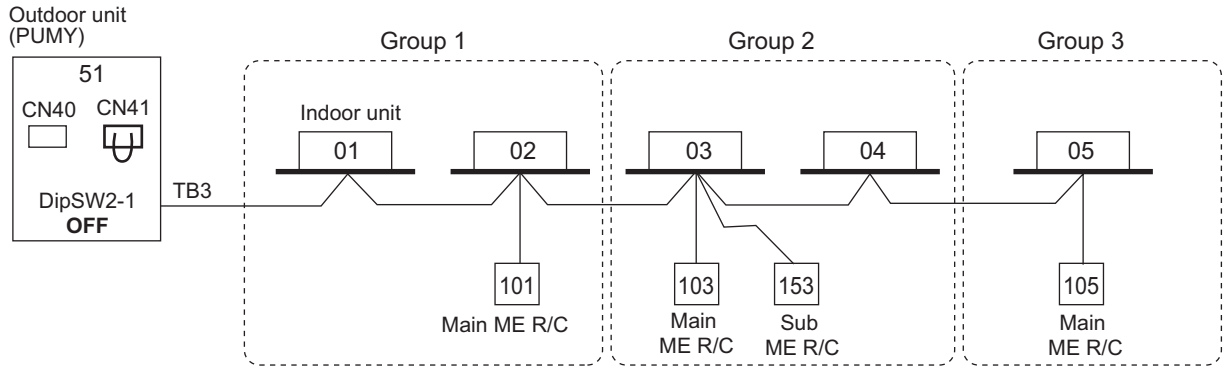
- Outdoor unit : Address: 00, CN41: ON (Jumper), DipSW2-1: OFF
- Indoor unit : Address: 00
- ME Remote controller : Address: 101
- LM-AP : Address: 247, CN41: ON (Jumper), DipSW1-2: OFF
- BM ADAPTER : Address: 000, CN41: ON (Jumper)
- AE-200E/AE-50E/EW-50E : Address: 000, CN21: ON (Jumper)

10-4-3-1. Basic (No address setting)

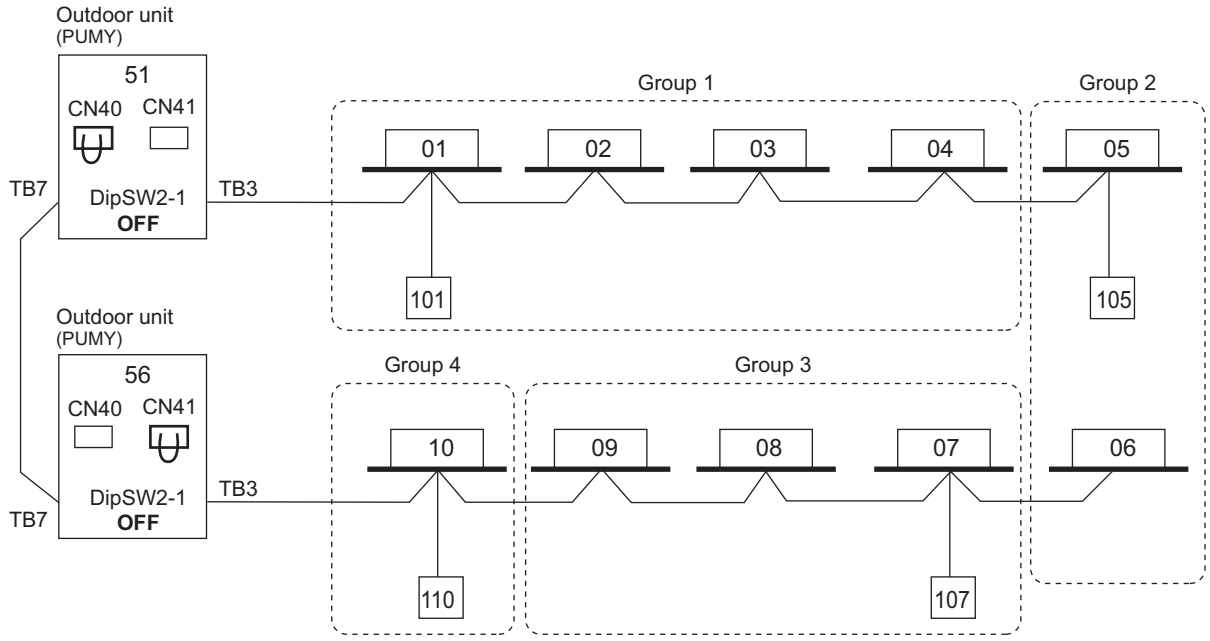


*1 For wireless R/C and Signal receiver unit(SBU), channel 1, 2 and 3 are selectable and should be set same channel.

10-4-3-2. Basic, Sub/main ME remote controller

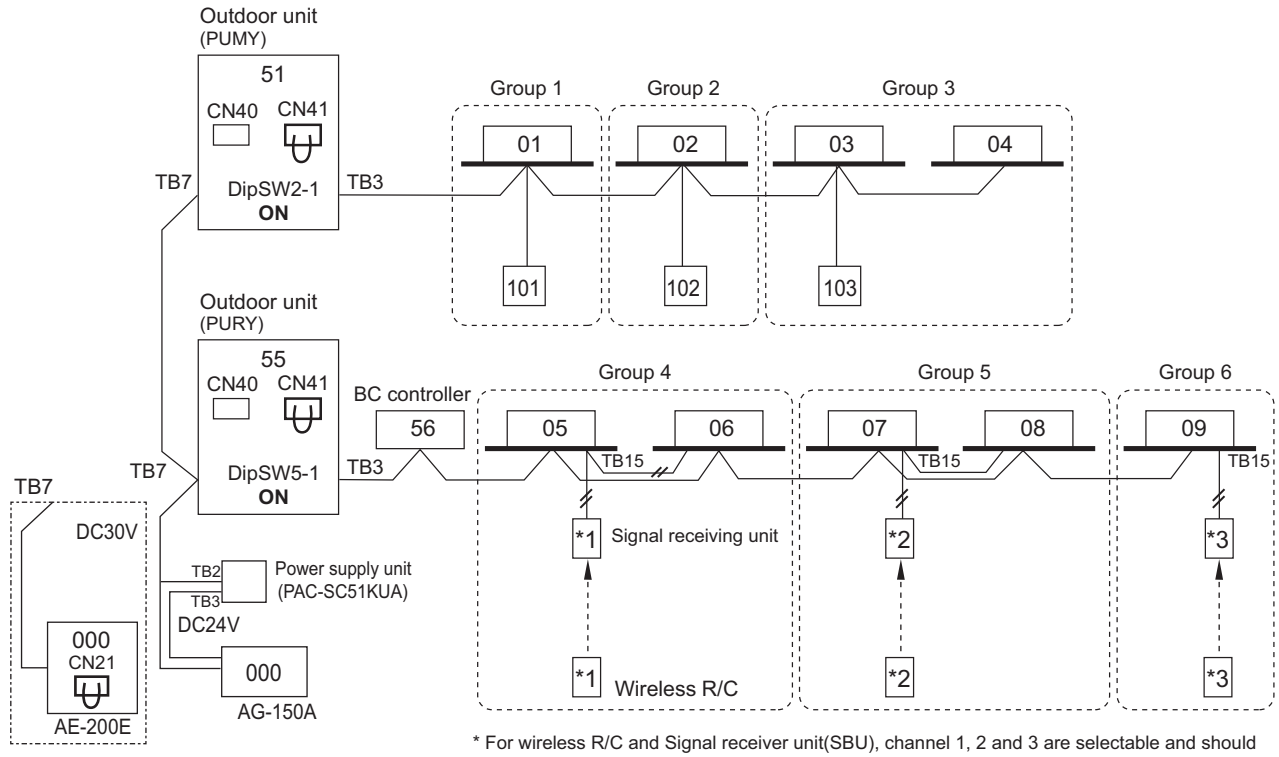


10-4-3-3. Grouping in different refrigerant system



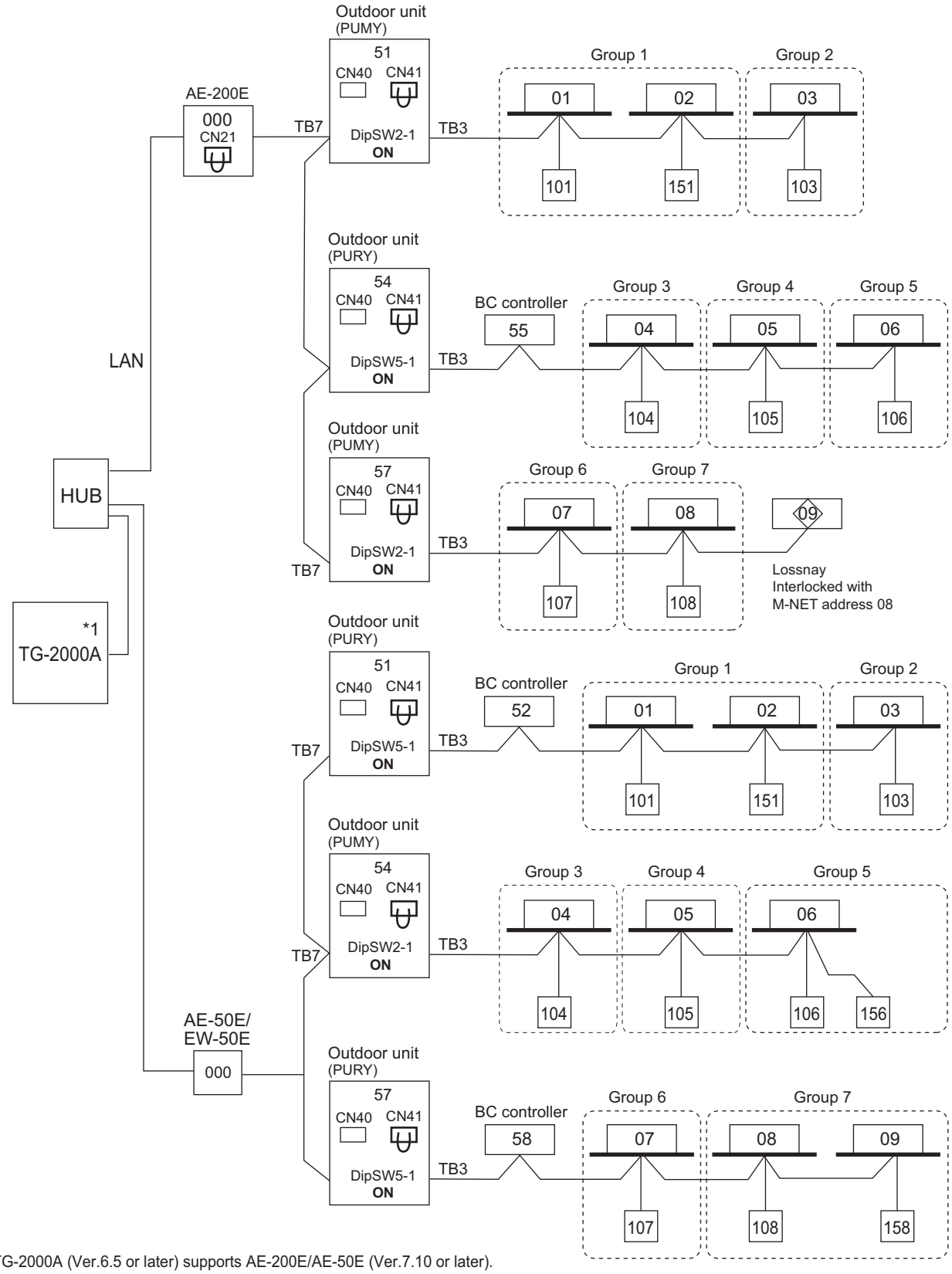
NOTE
- It is necessary to change the connecter to CN40 on the outdoor unit (Heat source unit) control board (only one outdoor unit (Heat source unit)) when the group is set between other refrigerant systems.
- It is necessary to set on the remote controller by manual when group sets on the different refrigerant system. Please refer to remote controller installation manual.

10-4-3-4. 2 Outdoor unit, AG-150A, AE-200E, MA



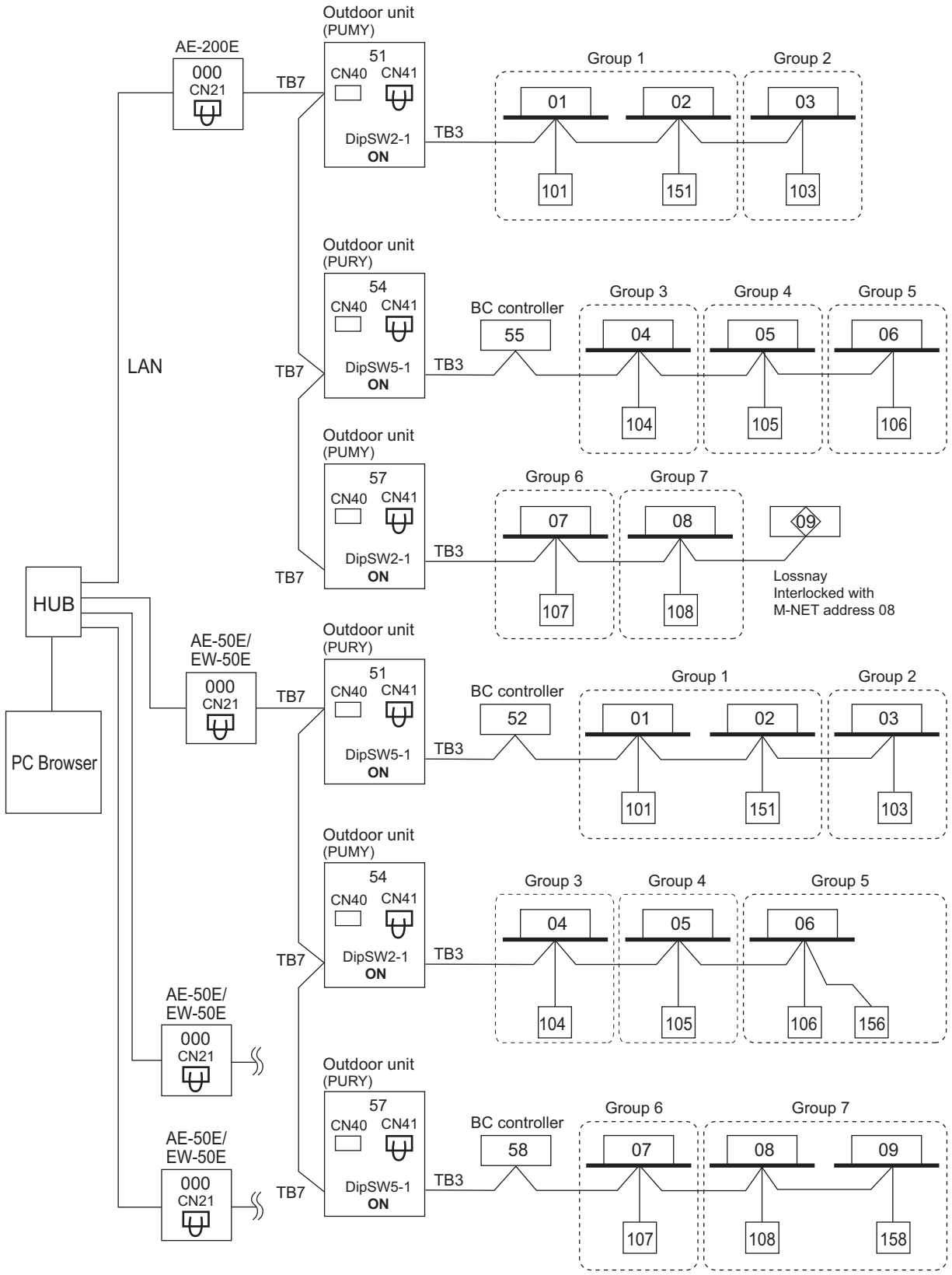
* For wireless R/C and Signal receiver unit(SBU), channel 1, 2 and 3 are selectable and should be set same channel.

10-4-3-5. TG-2000A(*1)+AE-200E/AE-50E/EW-50E
AE-200E can control max. 50 indoor units;
TG-2000A can control max. 40 of AE-200E/AE-50E/EW-50E;*2
TG-2000A can control max. 2000 indoor units.

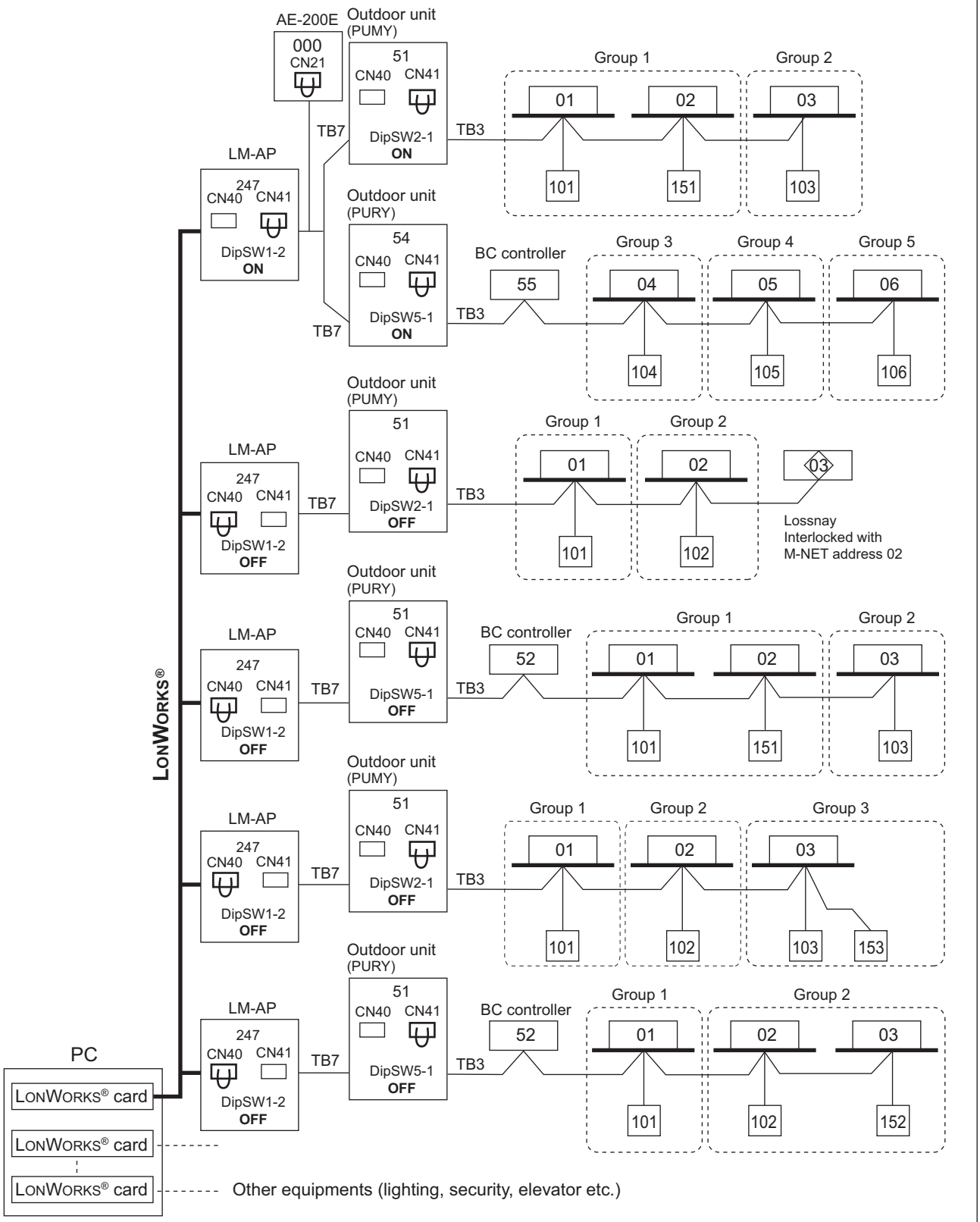


*1 TG-2000A (Ver.6.5 or later) supports AE-200E/AE-50E (Ver.7.10 or later).
TG-2000A (Ver.6.60 or later) supports EW-50E.
*2 When AE-200E connected with AE-50E/EW-50E is connected, the number of AE-50E/EW-50E will be the maximum controllable number.
TG-2000A can control up to 40 AE-200E/AE-50E/EW-50E or AE-200E without AE-50E/EW-50E connection.

10-4-3-6. AE-200E + AE-50E/EW-50E
AE-200E can control max. 200 indoor units/via AE-50E/EW-50E.



10-4-3-7. LM-AP

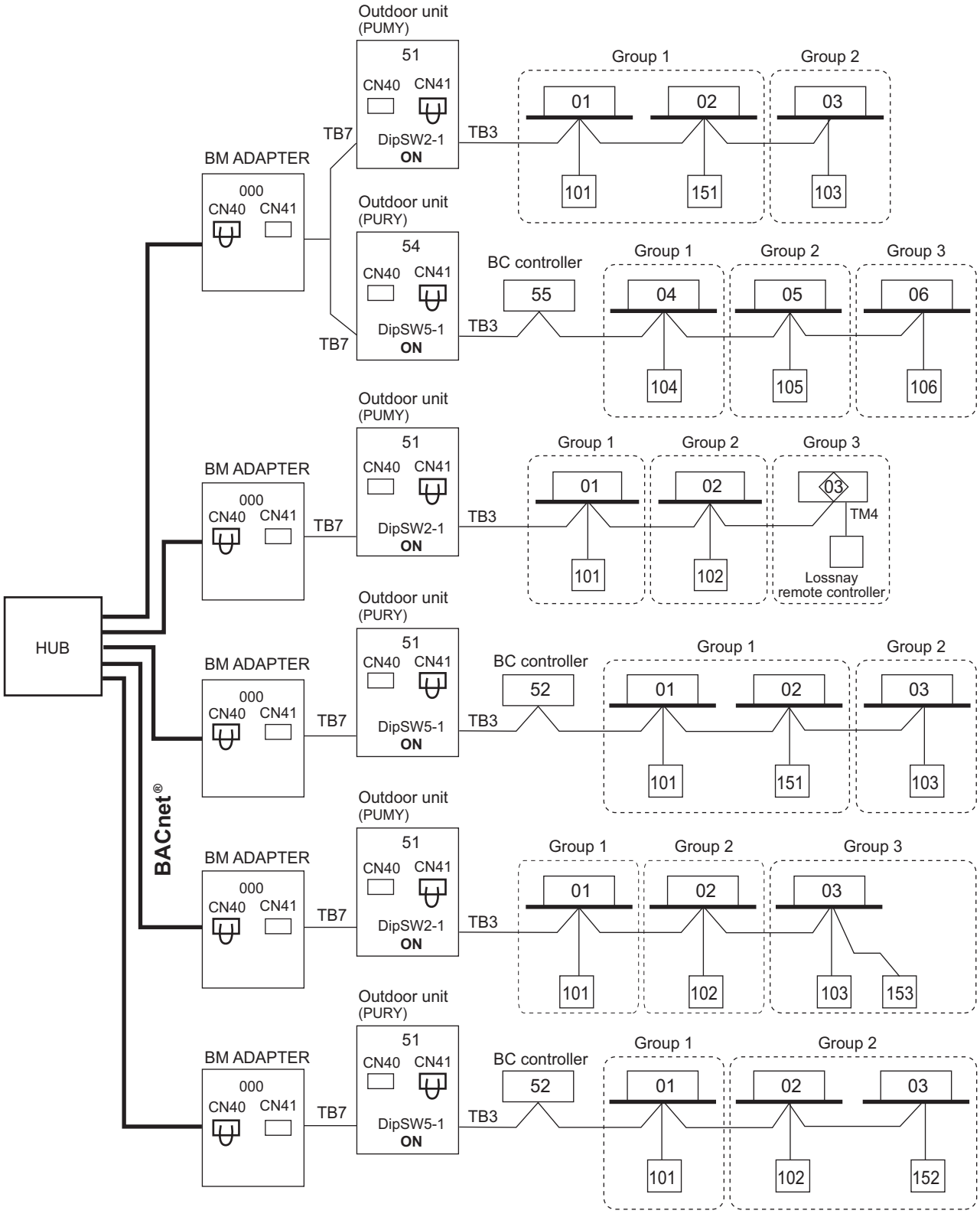


NOTE

- LM-AP can control 50 indoor units.
- It is necessary to turn on the DipSW1-2 on the LM-AP control board and the DipSW2-1 on the outdoor unit (heat source unit) control board with centralized controller (Power supply unit).
- It is necessary to change the connector to CN40 on the LM-AP control board without centralized controllers (Power supply unit).

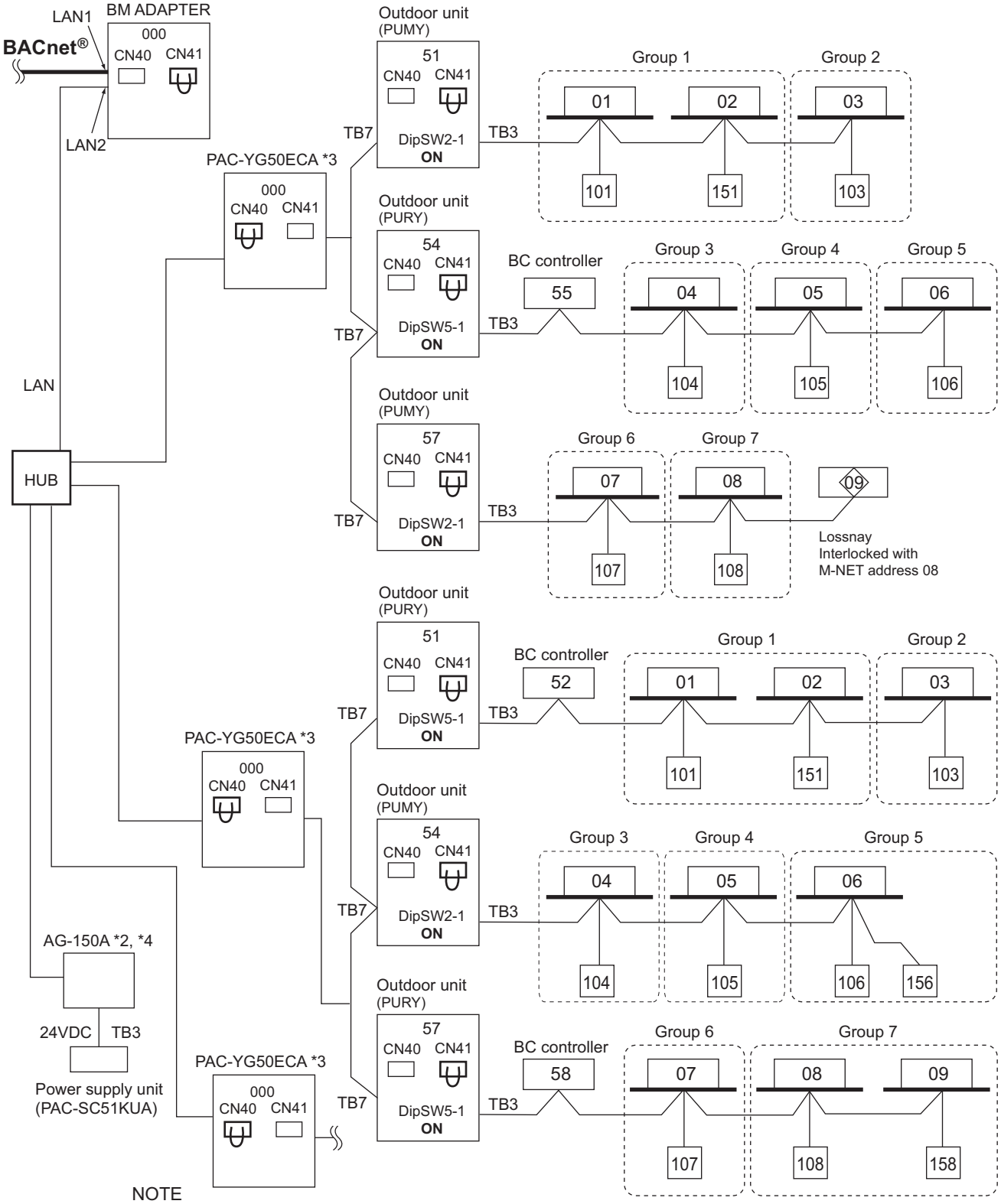
10-4-3-8. BM ADAPTER

BM ADAPTER can transmit for max. 50 indoor units;
Change Jumper from CN41 to CN40 to activate power supply to BM ADAPTER itself for those BM ADAPTER connected without the power supply unit.



10-4-3-9. BM ADAPTER+PAC-YG50ECA (Expansion controller)

BM ADAPTER(*1) can transmit for max. 150 indoor units/via expansion controllers (PAC-YG50ECA).
When the dual-set-point function is used, no expansion controllers can be connected, and only up to 50 units can be controlled from each BAC-HD150.



NOTE

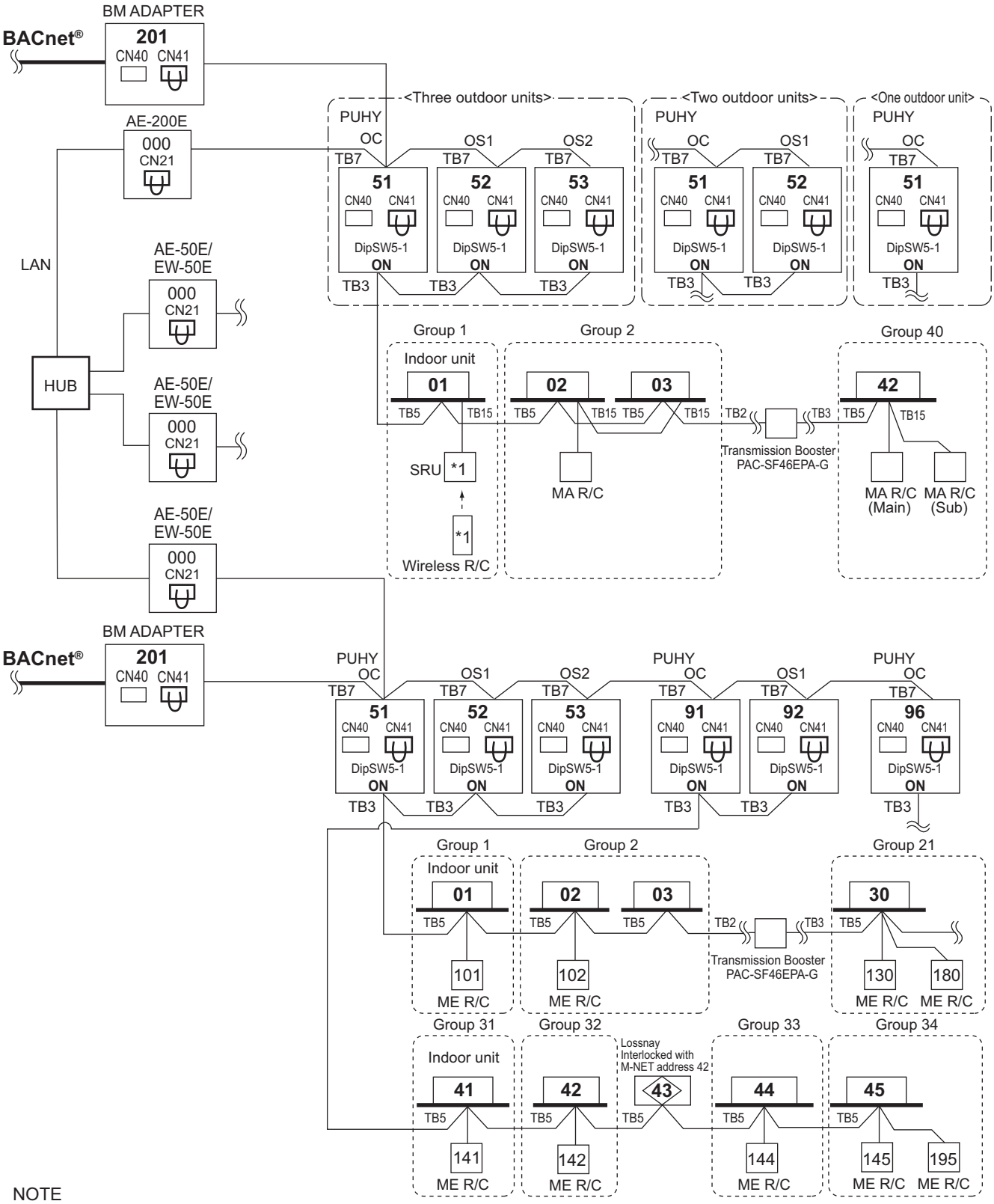
•It is not necessary to connect the M-NET transmission line to the TB3 on BM ADAPTER. Leave the power jumper of BM ADAPTER connected to CN41.

*1 BM ADAPTER (Ver.2.00 or later) supports the expansion controller.
*2 AG-150A (Ver.2.30 or later) supports the BM ADAPTER.
*3 PAC-YG50ECA (Ver.1.30 or later) supports the BM ADAPTER.
*4 Consult your dealer for restrictions when connecting both AG-150A and BM ADAPTER to PAC-YG50ECA.

10-4-3-10. BM ADAPTER+AE-200E/AE-50E/EW-50E

BM ADAPTER can transmit for max. 50 indoor units.

One BM ADAPTER is required for one AE-200E/AE-50E/EW-50E.



NOTE

•It is not necessary to connect the M-NET transmission line to the TB3 on BM ADAPTER. Leave the power jumper of BM ADAPTER connected to CN41.

*1 For Wireless R/C and Signal receiver unit (SRU), channel 1, 2 and 3 are selectable and should be set to same channel.

*2 Consult your dealer for restrictions when connecting both AE-200E/AE-50E/EW-50E and BM ADAPTER.

*3 When a PAR-CT01MA or PAR-4X MA-Series (X indicates 1, 2…) is connected to a group, no other MA remote controllers can be connected to the same group.

*4 In a system that uses AE-200E and/or AE-50E/EW-50E, each BM-ADAPTER must be connected to the M-NET line.

11-1. R410A Piping material

Refrigerant pipe for CITY MULTI shall be made of phosphorus deoxidized copper, and has two types.
A. Type-O: Soft copper pipe (annealed copper pipe), can be easily bent with human's hand.
B. Type-1/2H pipe: Hard copper pipe (Straight pipe), being stronger than Type-O pipe of the same radical thickness.

The maximum operation pressure of R410A air conditioner is 4.30 MPa [623psi]. The refrigerant piping should ensure the safety under the maximum operation pressure. MITSUBISHI ELECTRIC recommends pipe size as Table1, or You shall follow the local industrial standard. Pipes of radical thickness 0.7mm or less shall not be used.

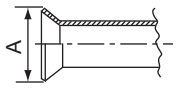
Table 1. Copper pipe size and radial thickness for R410A CITY MULTI.

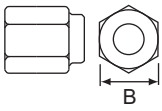
Size (mm)	Size (in.)	Radial thickness (mm)	Radial thickness (mil)	Pipe type
ø6.35	ø1/4"	0.8	[32]	Type-O
ø9.52	ø3/8"	0.8	[32]	Type-O
ø12.7	ø1/2"	0.8	[32]	Type-O
ø15.88	ø5/8"	1.0	[40]	Type-O
ø19.05	ø3/4"	1.2	[48]	Type-O
ø19.05	ø3/4"	1.0	[40]	Type-1/2H or H
ø22.2	ø7/8"	1.0	[40]	Type-1/2H or H
ø25.4	ø1"	1.0	[40]	Type-1/2H or H
ø28.58	ø1-1/8"	1.0	[40]	Type-1/2H or H
ø31.75	ø1-1/4"	1.1	[44]	Type-1/2H or H
ø34.93	ø1-3/8"	1.2	[48]	Type-1/2H or H
ø41.28	ø1-5/8"	1.4	[56]	Type-1/2H or H

* For pipe sized ø19.05 (3/4") for R410A air conditioner, choice of pipe type is up to you.
* The figures in the radial thickness column are based on the Japanese standards and provided only as a reference. Use pipes that meet the local standards.

Flare

Due to the relative higher operation pressure of R410A compared to R22, the flare connection should follow dimensions mentioned below so as to achieve enough the air-tightness.

Flare pipe	Pipe size	A (For R410A) (mm[in.])
	ø6.35 [1/4"]	9.1
	ø9.52 [3/8"]	13.2
	ø12.70 [1/2"]	16.6
	ø15.88 [5/8"]	19.7
	ø19.05 [3/4"]	24.0

Flare nut	Pipe size	B (For R410A) (mm[in.])
	ø6.35 [1/4"]	17.0
	ø9.52 [3/8"]	22.0
	ø12.70 [1/2"]	26.0
	ø15.88 [5/8"]	29.0
	ø19.05 [3/4"]	36.0

11-2. Piping Design

11-2-1. Use of the existing refrigerant piping

⚠ WARNING

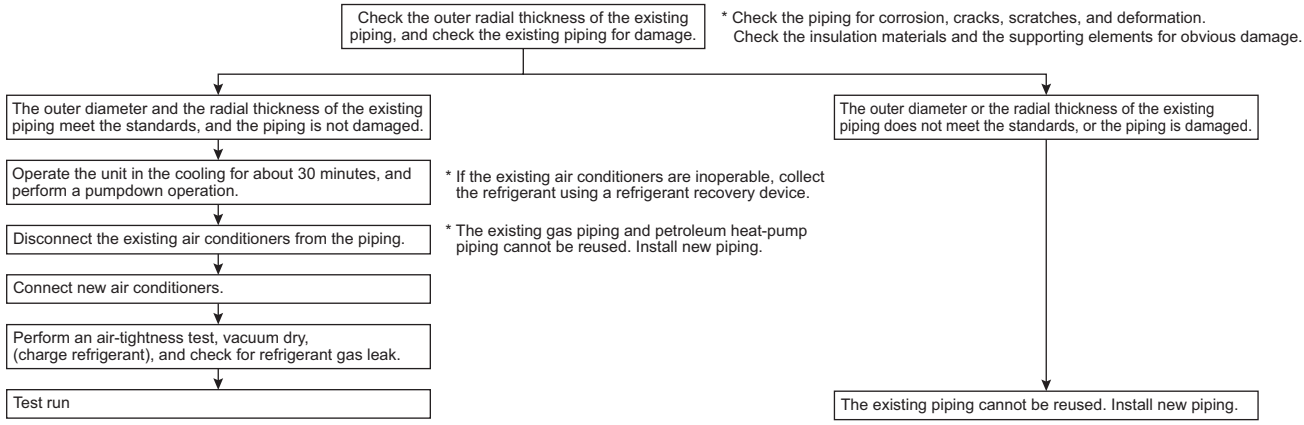
Before operating the compressor, make sure the refrigerant pipes are properly installed.

• Operating the compressor without the refrigerant pipes properly being connected and with the stop (ball) valve open, the compressor may suck in air, raising the pressure inside the refrigerant cycle abnormally high and resulting in pipe bursting and personal injury.

• Adequately insulate the liquid and gas refrigerant pipes to keep condensation from dripping.
• Provide additional insulation on the refrigerant pipes as necessary to keep condensation from forming on the insulation surface.
(Insulating material···Heat-resistance temperature: 120°C; Thickness: 15 mm or greater)
* Installation of the unit in high-temperature high-humidity conditions, such as in the ceiling of the top floor, may require additional insulation.
• Insulate refrigerant pipes with heat-resistant polyethylene foam and without leaving any gap between indoor unit and insulating material or between insulating materials. (Exposed pipes may cause condensation and pose burn hazard.)
• Keep the piping length within the limits, and charge the required amount of refrigerant (R410A).
* Before charging refrigerant, evacuate the extended piping and the indoor units, and charge refrigerant through the stop valve (applicable when the unit is stopped). When charging refrigerant through the check valve on the suction side, use a safety charger to prevent liquid refrigerant from being inhaled (applicable when the unit is operated).
* When charging refrigerant, record the amount of refrigerant charged in the relevant section of the maintenance manual (attached to the product).

• Determine the reusability of the existing piping, using the flowchart below.
• If the diameter of the existing piping differs from the standard diameter, check the reusability of the piping and restrictive conditions for reuse.

Cautionary notes on reusing the existing piping



Connecting non-standard diameter pipes

• The following restrictions apply when using pipes with a diameter different from the standard recommended size.

Usability of pipes with non-standard diameters

• Main pipe size

	Outside diameter(mm)	Radial thickness	SP112	SP125	SP140
Gas pipe	ø12.7	t 0.8	NA	NA	NA
	ø15.88	t 1.0	A	A	A
	ø19.05	t 1.0	C	C	C
	ø22.2	t 1.0	NA	NA	NA
	ø28.58 or greater	t 1.0 or greater	NA	NA	NA
Liquid pipe	ø9.52	t 0.8	A	A	A
	ø12.7	t 0.8	D	D	D
	ø15.88	t 1.0	D	D	D
	ø19.05 or greater	t 1.0 or greater	NA	NA	NA

A: Standard piping
B: Usable (with no loss of performance)
C: Usable (with loss of performance), Set the SW6-1 from OFF to ON.
D: Usable (Restrictions on refrigerant charge apply.)
NA: Unusable

• Size of the piping after branching and up to indoor units

	Outside diameter(mm)	Radial thickness	P10	P15	P20	P25	P32	P40	P50	P63	P71	P80	P100	P125	P140
Gas pipe	ø12.7	t 0.8	A	A	A	A	A	A	A	C	C	C	C	C	C
	ø15.88	t 1.0	NA	NA	NA	NA	NA	B	B	A	A	A	A	A	A
	ø19.05	t 1.0	NA	NA	NA	NA	NA	NA	NA	NA	B	B	B	B	B
	ø22.2	t 1.0	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
	ø25.4	t 1.0	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
	ø28.58	t 1.0	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Liquid pipe	ø6.35	t 0.8	A	A	A	A	A	A	A	15 m or less	NA	NA	NA	NA	NA
	ø9.52	t 0.8	D	D	D	D	D	D	D	A	A	A	A	A	A
	ø12.7	t 1.0	NA	NA	NA	NA	NA	NA	NA	D	D	D	D	D	D
	ø15.88	t 1.0	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
	ø19.05	t 1.0	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA

Pipe diameter and radial thickness Note: For pipes with a diameter of ø22.2 and up, use 1/2-H or H-material.

Outside diameter (mm)	ø6.35	ø9.52	ø12.7	ø15.88	ø19.05	ø22.2	ø25.4	ø28.58
Radial thickness (mm)	0.8	0.8	0.8	1.0	1.0	1.0	1.0	1.0

Restrictions on extending piping/Amount of refrigerant to be charged (REPLACE units)

When reusing the existing piping, calculate the amount of refrigerant to be charged using the formula below. The existing piping is usable if the result of the calculation below is less than 10 kg. If the calculation result is at or above 10 kg, use new piping. When reusing the existing piping, charge the amount of refrigerant required for the piping and for the indoor units.

• Calculating the amount of refrigerant to be charged based on pipe size and length

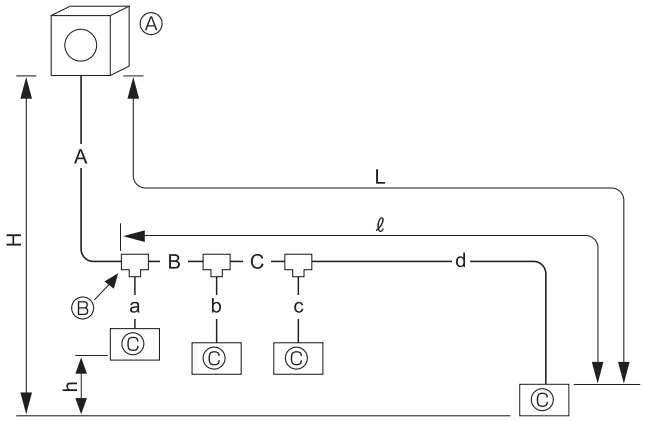
Total length of ø15.88 liquid pipes × 0.20	+	Total length of ø12.7 liquid pipes × 0.092	+	Total length of ø9.52 liquid pipes × 0.05	+	Total length of ø6.35 liquid pipes × 0.019	=	Amount of additional refrigerant to be charged (REPLACE units)
(m) × 0.20 (kg/m)		(m) × 0.092 (kg/m)		(m) × 0.05 (kg/m)		(m) × 0.019 (kg/m)		(kg)

• Calculating the amount of refrigerant to be charged based on indoor unit capacity

Total capacity index of the connected indoor units	Amount of refrigerant to be charged
~ 8.0kW	1.5kg
8.1kW ~ 16.0kW	2.5kg
16.1kW ~	3.0kg

11-2-2. PUMY-SP112, 125, 140VKM2/YKM2 Piping

Line-Branch Method
Connection Examples
(Connecting to 4 Indoor Units)



Ⓐ Outdoor Unit
Ⓑ First Branch
Ⓒ Indoor unit

Permissible Length	Total Piping Length	A+B+C+a+b+c+d ≦ 120 m
	Farthest Piping Length (L)	A+B+C+d ≦ 70 m
	Farthest Piping Length After First Branch (ℓ)	B+C+d ≦ 50 m
Permissible High/ Low Difference	High/Low Difference in Indoor/Outdoor Section (H)	50 meters or less (If the outdoor unit is lower, 30 meters or less)
	High/Low Difference in Indoor/Indoor Section (h)	15 meters or less

■ **Selecting the Refrigerant Branch Kit**

Use an optional branch piping kit (CMY-Y62-G-E).

■ **Select Each Section of Refrigerant Piping**

(1) Section From Outdoor Unit to First Branch (A)
(2) Sections From Branch to Indoor Unit (a,b,c,d)
(3) Section From Branch to Branch (B,C)

Each Section of Piping

Select the size from the table to the right.

(1) Refrigerant Piping Diameter In Section From Outdoor Unit to First Branch (Outdoor Unit Piping Diameter)

Model	Piping Diameter (mm)	
PUMY-SP112 PUMY-SP125 PUMY-SP140	Liquid Line	ϕ9.52
	Gas Line	ϕ15.88

(2) Refrigerant Piping Diameter In Section From Branch to Indoor Unit (Indoor Unit Piping Diameter)

Model number	Piping Diameter (mm)		
50 or lower	Liquid Line	ℓ ≦ 30 m	ϕ6.35
		ℓ > 30 m	ϕ9.52
	Gas Line		ϕ12.7
63 to 140	Liquid Line		ϕ9.52
	Gas Line		ϕ15.88

(3) Refrigerant Piping Diameter In Section From Branch to Branch

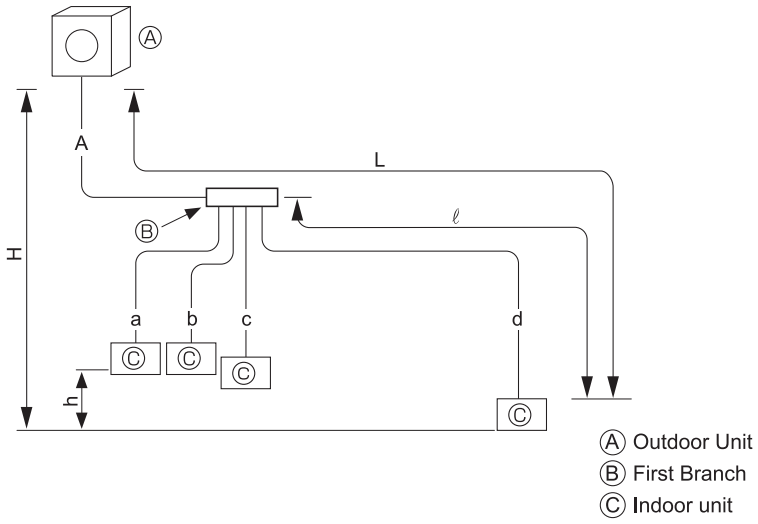
Liquid Line (mm)	Gas Line (mm)
ϕ9.52	ϕ15.88

Note:
When connecting the CONNECTION KIT (PAC-LV11M-J) and an M-series indoor unit, refer to the installation manual for the CONNECTION KIT when selecting the pipe size and piping length.

■ **Additional refrigerant charge**

Refer to “11-3. Refrigerant charging calculation”.

Header-Branch Method
Connection Examples
(Connecting to 4 Indoor Units)



Permissible Length	Total Piping Length	A+a+b+c+d ≦ 120 m
	Farthest Piping Length (L)	A+d ≦ 70 m
	Farthest Piping Length After First Branch (ℓ)	d is 50 meters or less
Permissible High/Low Difference	High/Low Difference in Indoor/Outdoor Section (H)	50 meters or less (If the outdoor unit is lower, 30 meters or less)
	High/Low Difference in Indoor/Indoor Section (h)	15 meters or less

■ **Selecting the Refrigerant Branch Kit**

Please select branching kit, which is sold separately, from the table below.
(The kit comprises sets for use with liquid pipes and for use with gas pipes.)

Branch header (4 branches)	Branch header (8 branches)
CMY-Y64-G-E	CMY-Y68-G-E

■ **Select Each Section of Refrigerant Piping**

(1) Section From Outdoor Unit to First Branch (A)
(2) Sections From Branch to Indoor Unit (a,b,c,d)
} Each Section of Piping

Select the size from the table to the right.

(1) Refrigerant Piping Diameter In Section From Outdoor Unit to First Branch (Outdoor Unit Piping Diameter)

Model	Piping Diameter (mm)	
PUMY-SP112 PUMY-SP125 PUMY-SP140	Liquid Line	ϕ9.52
	Gas Line	ϕ15.88

(2) Refrigerant Piping Diameter In Section From Branch to Indoor Unit (Indoor Unit Piping Diameter)

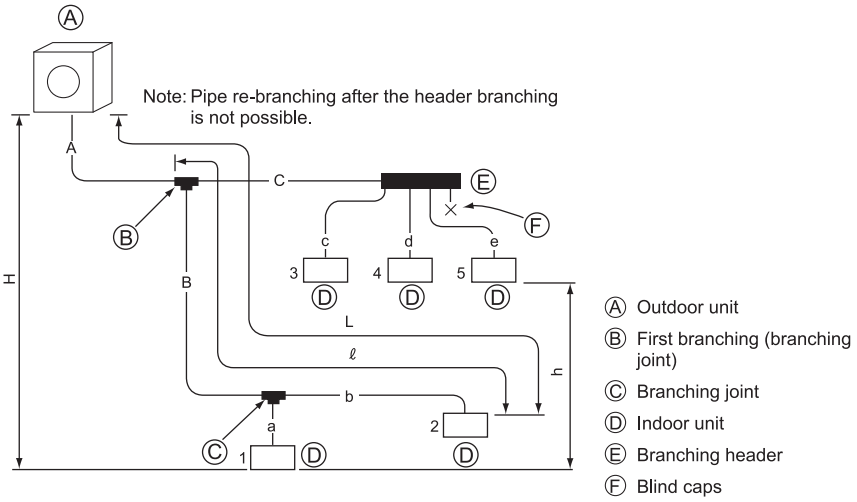
Model number	Piping Diameter (mm)		
50 or lower	Liquid Line	ℓ ≦ 30 m	ϕ6.35
		ℓ > 30 m	ϕ9.52
	Gas Line	ϕ12.7	
63 to 140	Liquid Line	ϕ9.52	
	Gas Line	ϕ15.88	

Note:
When connecting the CONNECTION KIT (PAC-LV11M-J) and an M-series indoor unit, refer to the installation manual for the CONNECTION KIT when selecting the pipe size and piping length.

■ **Additional refrigerant charge**

Refer to “11-3. Refrigerant charging calculation”.

Method of Combined Branching of Lines and Headers
Connection Examples
(Connecting to 5 Indoor Units)



Permissible Length	Total Piping Length	A+B+C+a+b+c+d+e is 120 meters or less
	Farthest Piping Length (L)	A+B+b is 70 meters or less
	Farthest Piping Length After First Branch (ℓ)	B+b is 50 meters or less
Permissible High/Low Difference	High/Low Difference in Indoor/Outdoor Section (H)	50 meters or less (If the outdoor unit is lower, 30 meters or less)
	High/Low Difference in Indoor/Indoor Section (h)	15 meters or less

■ **Selecting the Refrigerant Branch Kit**

Please select branching kit, which is sold separately, from the table below.
(The kit comprises sets for use with liquid pipes and for use with gas pipes.)

Branch Joint	Branch Header (4 branches)	Branch Header (8 branches)
CMY-Y62-G-E	CMY-Y64-G-E	CMY-Y68-G-E

■ **Select Each Section of Refrigerant Piping**

(1) Section From Outdoor Unit to First Branch (A)
(2) Sections From Branch to Indoor Unit (a,b,c,d,e)
(3) Section From Branch to Branch (B,C)
→ Each Section of Piping

Select the size from the table to the right.

(1) Refrigerant Piping Diameter In Section From Outdoor Unit to First Branch (Outdoor Unit Piping Diameter)

Model	Piping Diameter (mm)	
PUMY-SP112 PUMY-SP125 PUMY-SP140	Liquid Line	ϕ9.52
	Gas Line	ϕ15.88

(2) Refrigerant Piping Diameter In Section From Branch to Indoor Unit (Indoor Unit Piping Diameter)

Model number	Piping Diameter (mm)	
50 or lower	Liquid Line	ℓ ≦ 30 m: ϕ6.35
		ℓ > 30 m: ϕ9.52
	Gas Line	ϕ12.7
63 to 140	Liquid Line	ϕ9.52
	Gas Line	ϕ15.88

(3) Refrigerant Piping Diameter In Section From Branch to Branch

Liquid Line (mm)	Gas Line (mm)
ϕ9.52	ϕ15.88

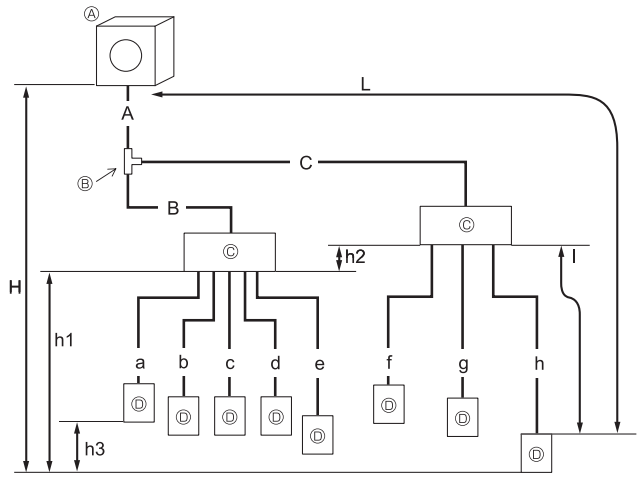
Note:
When connecting the CONNECTION KIT (PAC-LV11M-J) and an M-series indoor unit, refer to the installation manual for the CONNECTION KIT when selecting the pipe size and piping length.

■ **Additional refrigerant charge**

Refer to “11-3. Refrigerant charging calculation”.

11-2-3. PUMY-SP112, 125, 140VKM2/YKM2 (WHEN USING BRANCH BOX)

Branch box Method
Connection Examples
(Connecting to 8 Indoor Units)



Permissible length (One-way)	Total piping length	A + B + C + a + b + c + d + e + f + g + h ≦ 120 m
	Farthest piping length (L)	A + C + h ≦ 80 m (A + C ≦ 55 m, h ≦ 25 m)
	Piping length between outdoor unit and branch boxes	A + B + C ≦55 m
	Farthest piping length after branch box (1)	l ≦ 25m
	Total piping length between branch boxes and indoor units	a + b + c + d + e + f + g + h ≦ 95 m
Permissible height difference (One-way)	In indoor/outdoor section (H)*	H ≦ 50 m (In case of that outdoor unit is set higher than indoor unit)
		H ≦ 30 m (In case of that outdoor unit is set lower than indoor unit)
	In branch box/indoor unit section (h1)	h1 + h2 ≦15 m
	In each branch unit (h2)	h2 ≦ 15 m
	In each indoor unit (h3)	h3 ≦ 12 m
Number of bends		≦ 15

*Branch box should be placed within the level between the outdoor unit and indoor units.

■ **Select Each Section of Refrigerant Piping**

(1) Section From Outdoor Unit to Branch box (A, B, C)
(2) Sections From Branch box to Indoor Unit (a to h)
} Each Section of Piping

Select the size from the table to the right.

(1) Refrigerant Piping Diameter In Section From Outdoor Unit to Branch box (Outdoor Unit Piping Diameter)

Model	Piping Diameter (mm)	
PUMY-SP112 PUMY-SP125 PUMY-SP140	Liquid Line	ϕ9.52
	Gas Line	ϕ15.88

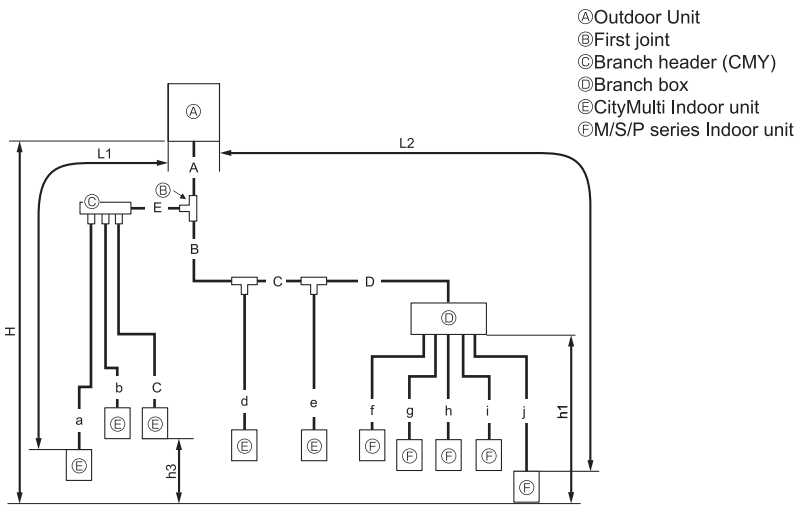
(2) Refrigerant Piping Diameter In Section From Branch box to Indoor Unit (Indoor Unit Piping Diameter)

Indoor unit series	kW type	A Liquid pipe	B Gas pipe
M series or S series	15 to 42	ϕ6.35	ϕ9.52
	50	ϕ6.35	ϕ12.7
	60	ϕ6.35	ϕ15.88
	71,80	ϕ9.52	ϕ15.88
P series	35,50	ϕ6.35	ϕ12.7
	60 to 100	ϕ9.52	ϕ15.88

■ **Additional refrigerant charge**

Refer to “11-3. Refrigerant charging calculation”.

Mixed Method
Connection Examples
(Connecting to 1 Branch box)



Permissible length (One-way)	Total piping length	A+B+C+D+E+a+b+c+d+e+f+g+h+i+j ≦120 m
	Farthest piping length (L1)	A+E+a or A+B+C+e ≦ 70 m
	Farthest piping length. Via Branch box (L2)	A+B+C+D+j ≦ 80 m
	Piping length between outdoor unit and branch box	A+B+C+D ≦ 55 m
	Farthest piping length from the first joint	B+C+D or B+C+e≦ 50 m
	Farthest piping length after branch box	j ≦ 25 m
	Total piping length between branch boxes and indoor units	f+g+h+i+j ≦ 95 m
Permissible height difference (One-way)	In indoor/outdoor section (H)*	H ≦ 50 m (In case of outdoor unit is set higher than indoor unit)
		H ≦ 30 m (In case of outdoor unit is set lower than indoor unit)
	In branch box/indoor unit section (h1)	h1 ≦ 15 m
	In each indoor unit (h3)	h3 ≦ 12 m
Number of bends		≦ 15

*Branch box should be placed within the level between the outdoor unit and indoor units.

■ **Selecting the Refrigerant Branch Kit**

Please select branching kit, which is sold separately, from the table below.
(The kit comprises sets for use with liquid pipes and for use with gas pipes.)

Branch header (4 branches)	Branch header (8 branches)
CMY-Y64-G-E	CMY-Y68-G-E

■ **Select Each Section of Refrigerant Piping**

(1) Section From Outdoor Unit to Branch box or Branch header (A to E)
(2) Sections From Branch box or Branch header to Indoor Unit (a to j)
} Each Section of Piping

Select the size from the table to the right.

(1) Refrigerant Piping Diameter In Section From Outdoor Unit to Branch box or Branch header (Out-door Unit Piping Diameter)

Model	Piping Diameter (mm)	
PUMY-SP112 PUMY-SP125 PUMY-SP140	Liquid Line	ϕ9.52
	Gas Line	ϕ15.88

(2) Refrigerant Piping Diameter In Section From Branch box or Branch header to Indoor Unit (Indoor Unit Piping Diameter)

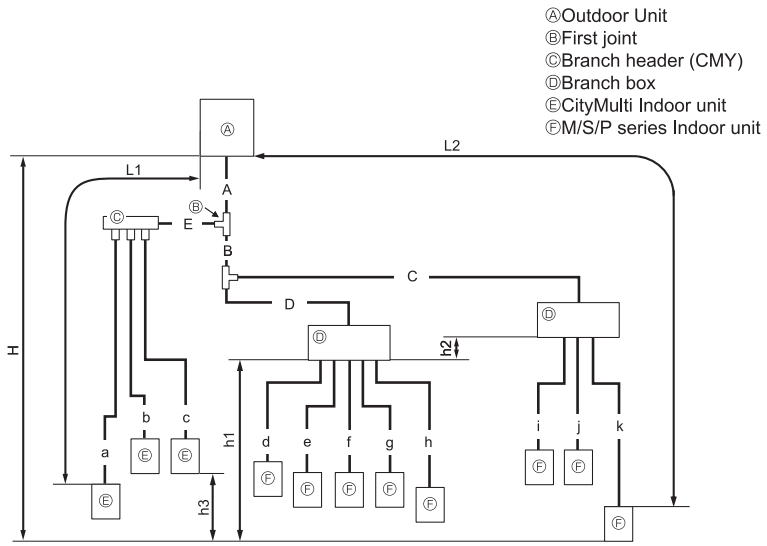
Indoor unit series	kW type	A Liquid pipe		B Gas pipe
CityMulti	10 to 50	ℓ ≦ 30 m	ϕ6.35	ϕ12.7
		ℓ > 30 m	ϕ9.52	
	63 to 140	ϕ9.52		ϕ15.88
M series or S series	22 to 42	ϕ6.35		ϕ9.52
	50	ϕ6.35		ϕ12.7
	60	ϕ6.35		ϕ15.88
	71,80	ϕ9.52		ϕ15.88
P series	35,50	ϕ6.35		ϕ12.7
	60 to 100	ϕ9.52		ϕ15.88

Note:
When connecting the CONNECTION KIT (PAC-LV11M-J) and an M-series indoor unit, refer to the installation manual for the CONNECTION KIT when selecting the pipe size and piping length.

■ **Additional refrigerant charge**

Refer to “11-3. Refrigerant charging calculation”.

Mixed Method
Connection Examples
(Connecting to 2 Branch boxes)



Permissible length (One-way)	Total piping length	A+B+C+D+E+a+b+c+d+e+f+g+h+i+j+k ≦120 m
	Farthest piping length (L1)	A+E+a ≦ 70 m
	Farthest piping length. Via Branch box (L2)	A+B+C+k ≦ 80 m
	Piping length between outdoor unit and branch boxes	A+B+C+D ≦ 55 m
	Farthest piping length from the first joint	B+C or E+a ≦ 50 m
	Farthest piping length after branch box	k ≦ 25m
	Farthest branch box form outdoor unit	A+B+C ≦ 55m
	Total piping length between branch boxes and indoor units	d+e+f+g+h+i+j+k ≦ 95 m
Permissible height difference (One-way)	In indoor/outdoor section (H)*	H ≦50 m (In case of outdoor unit is set higher than indoor unit)
		H ≦30 m (In case of outdoor unit is set lower than indoor unit)
	In branch box/indoor unit section (h1)	h1+h2 ≦ 15 m
	In each branch unit (h2)	h2 ≦ 15 m
	In each indoor unit (h3)	h3 ≦ 12 m
Number of bends		≦ 15

*Branch box should be placed within the level between the outdoor unit and indoor units.

■ **Selecting the Refrigerant Branch Kit**

Please select branching kit, which is sold separately, from the table below.
(The kit comprises sets for use with liquid pipes and for use with gas pipes.)

Branch header (4 branches)	Branch header (8 branches)
CMY-Y64-G-E	CMY-Y68-G-E

■ **Select Each Section of Refrigerant Piping**

(1) Section From Outdoor Unit to Branch box or Branch header (A to E)
(2) Sections From Branch box or Branch header to Indoor Unit (a to k)
} Each Section of Piping

Select the size from the table to the right.

(1) Refrigerant Piping Diameter In Section From Outdoor Unit to Branch box or Branch header (Out-door Unit Piping Diameter)

Model	Piping Diameter (mm)	
PUMY-SP112 PUMY-SP125 PUMY-SP140	Liquid Line	ϕ9.52
	Gas Line	ϕ15.88

(2) Refrigerant Piping Diameter In Section From Branch box or Branch header to Indoor Unit (Indoor Unit Piping Diameter)

Indoor unit series	kW type	A Liquid pipe	B Gas pipe
CityMulti	10 to 50	ℓ ≦ 30 m ϕ6.35 ℓ > 30 m ϕ9.52	ϕ12.7
	63 to 140	ϕ9.52	ϕ15.88
M series or S series	22 to 42	ϕ6.35	ϕ9.52
	50	ϕ6.35	ϕ12.7
	60	ϕ6.35	ϕ15.88
	71,80	ϕ9.52	ϕ15.88
P series	35,50	ϕ6.35	ϕ12.7
	60 to 100	ϕ9.52	ϕ15.88

Note:
When connecting the CONNECTION KIT (PAC-LV11M-J) and an M-series indoor unit, refer to the installation manual for the CONNECTION KIT when selecting the pipe size and piping length.

■ **Additional refrigerant charge**

Refer to “11-3. Refrigerant charging calculation”.

11-3. Refrigerant charging calculation

Additional refrigerant charge

Refrigerant for the extended piping is not included in the outdoor unit when the unit is shipped from the factory. Therefore, charge each refrigerant piping system with additional refrigerant at the installation site. In addition, in order to carry out service, enter the size and length of each liquid pipe and additional refrigerant charge amounts in the spaces provided on the “Refrigerant amount” plate on the outdoor unit.

Calculation of additional refrigerant charge

- Calculate the additional charge using the liquid pipe size and length of the extended piping and total capacity of connected indoor units.
- Calculate the additional refrigerant charge using the procedure below, and charge with the additional refrigerant.
- For amounts less than 0.1 kg, round up the calculated additional refrigerant charge.
  (For example, if the calculated charge is 6.01 kg, round up the charge to 6.1 kg.)

<Additional Charge>

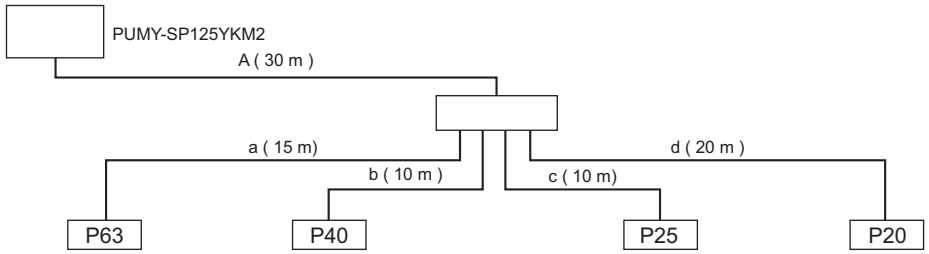
Calculation of refrigerant charge

Pipe size Liquid pipe ø6.35		Pipe size Liquid pipe ø9.52		Total capacity of connected indoor units	Amount for the indoor units
(m) x 19.0 (g/m)	+	(m) x 50.0 (g/m)	+	~ 8.0kW	1.5kg
				8.1 ~ 16.0kW	2.5kg
				16.1kW ~	3.0kg

Included refrigerant amount when shipped from the factory

Included refrigerant amount
3.5kg

Example:



<Example>
Outdoor model: SP125

Indoor 1: P63 (7.1kW)	A: ø9.52 30 m	a: ø9.52	15 m
2: P40 (4.5kW)		b: ø6.35	10 m
3: P25 (2.8kW)		c: ø6.35	10 m
4: P20 (2.2kW)		d: ø6.35	20 m

<Calculation example>
Additional refrigerant charge

$$40 \times \frac{19.0}{1000} + 45 \times \frac{50.0}{1000} + 3.0 = 6.1\text{kg (rounded up)}$$

The total length of each liquid line is as follows:
ø9.52: A + a = 30 + 15 = 45 m
ø6.35: b + c + d = 10 + 10 + 20 = 40 m
The total capacity of connected indoor unit is as follows:
7.1 + 4.5 + 2.8 + 2.2 = 16.6

■Maximum refrigerant charge

There is a limit to the amount of refrigerant that can be charged into a unit.
Regardless of the amount yielded by the formula above, observe the maximum refrigerant charge in the table below.

Maximum refrigerant charge	Factory charge	kg	3.5
	Charged on site	kg	9.0
	Total for system	kg	12.5

12-1. Requirement on installation site

12-1-1. General caution

A. Avoid locations exposed to direct sunlight or other sources of heat.
B. Select a location from which noise emitted by the unit will not inconvenience the neighbors.
C. Select a location permitting easy wiring and pipe access to the power source and indoor unit.
D. Avoid locations where combustible gases may leak, be produced, flow, or accumulate.
E. Note that water may drain from the unit during operation.
F. Select a level location that can bear the weight and vibration of the unit.
G. Avoid locations where the unit can be covered by snow. In areas where heavy snow fall is anticipated, special precautions such as raising the installation location or installing a hood on the air intake must be taken to prevent the snow from blocking the air intake or blowing directly against it. This can reduce the airflow and a malfunction may result.
H. Avoid locations exposed to oil, steam, or sulfuric gas.
I. Use the transportation handles of the outdoor unit to transport the unit. If the unit is carried from the bottom, hands or fingers may be pinched.

12-1-2. Installation at windy location.

When installing the outdoor unit on a rooftop or other location unprotected from the wind, situate the air outlet of the unit so that it is not directly exposed to strong winds.Strong wind entering the air outlet may impede the normal airflow and a malfunction may result.
The following shows two examples of precautions against strong winds.
① Install an optional air guide if the unit is installed in a location where strong winds from a typhoon, etc. may directly enter the air outlet. (Fig. 12-1-2a)
Ⓐ Air guide
② Position the unit so that the air outlet blows perpendicularly to the seasonal wind direction, if possible. (Fig. 12-1-2b)
Ⓑ Wind direction

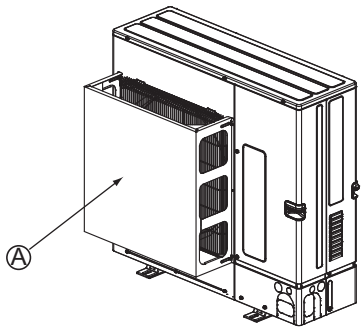


Fig. 12-1-2a

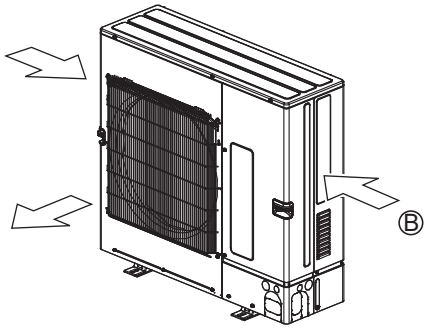


Fig. 12-1-2b

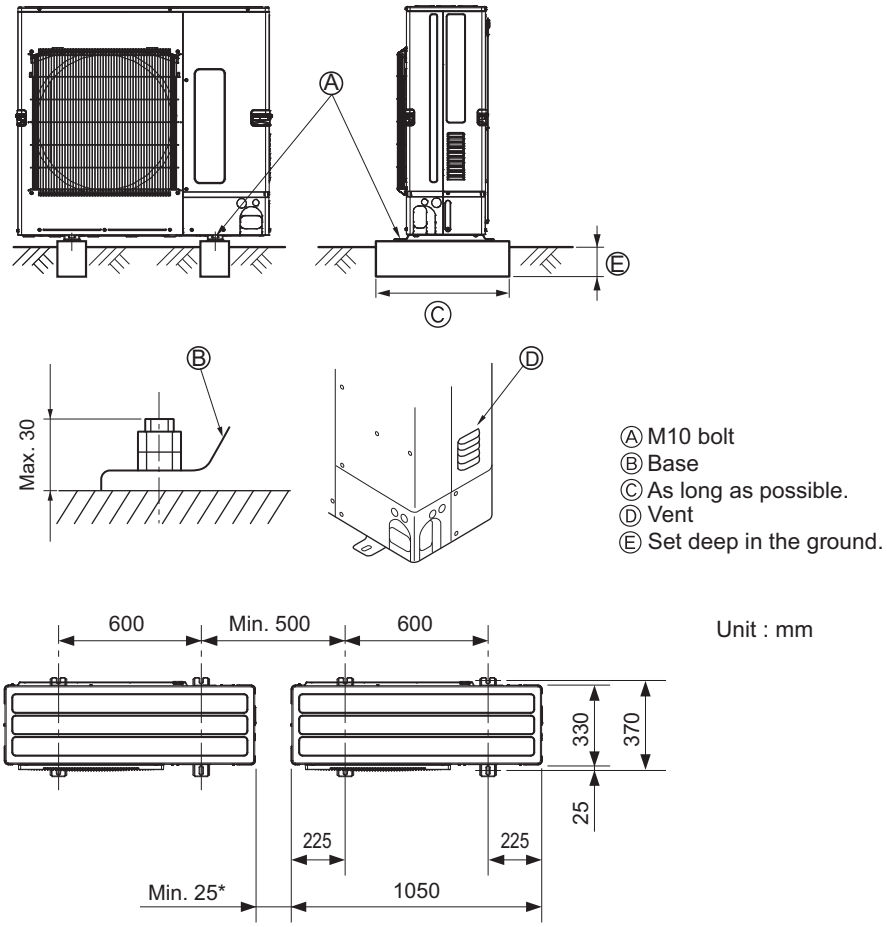
12-1-3. Foundation

A. Be sure to install the unit in a sturdy, level surface to prevent rattling noises during operation. (see Fig. 12-1-3)
B. Foundation specifications are as follows.

Thickness of concrete	Weight-bearing capacity	Foundation bolt	Bolt length
120 mm	320 kg	M10	70 mm

C. Make sure that the length of the foundation bolt is within 30 mm of the bottom surface of the base.
D. Secure the base of the unit firmly with four-M10 foundation bolts in sturdy locations.

⚠ Warning:
A. The foundation base should be strong enough to support the outdoor unit, otherwise, it may fall down and cause damage or injures.
B. The unit must be installed according to the instructions in order to minimize the risk of damage from earthquakes, typhoons, or strong winds.



Ⓐ M10 bolt
Ⓑ Base
Ⓒ As long as possible.
Ⓓ Vent
Ⓔ Set deep in the ground.

Unit : mm

* When installing a single outdoor unit, the clearance is 15 mm or more.

Fig. 12-1-3

12-2. Spacing

12-2-1. PUMY-SP112, 125, 140VKM2/YKM2

(mm)

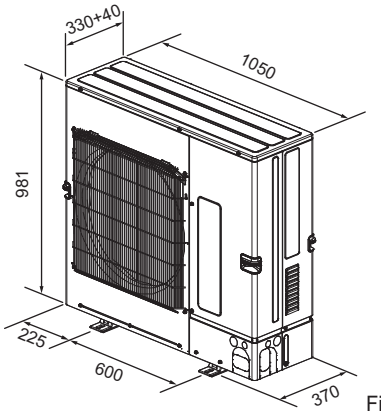


Fig. 12-2-1

12-2-1-1. Spacing individual PUMY-SP-VKM2/YKM2

Follow Fig. 12-2-2~7 to space individual PUMY-SP-VKM2/YKM2 at the installation site.

mm[in.]

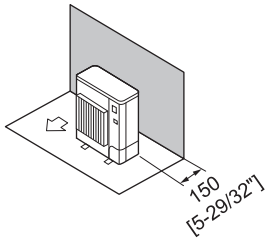


Fig. 12-2-2
Obstacles at rear only

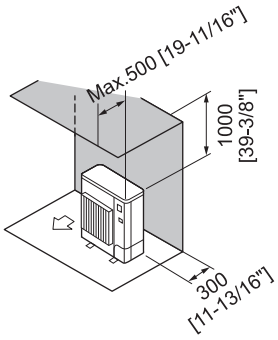


Fig. 12-2-3
Obstacles at rear and above only

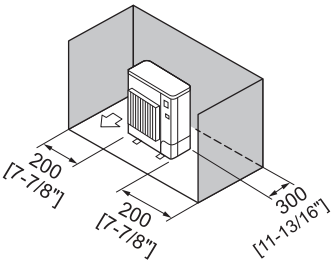
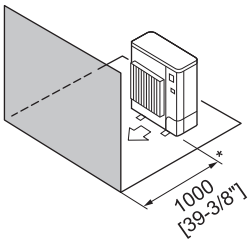
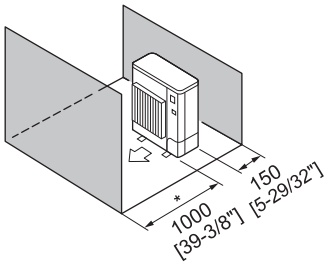


Fig. 12-2-4
Obstacles at rear and sides only



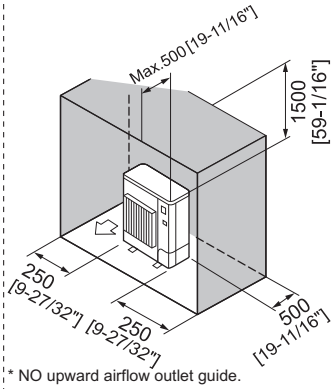
* Using an optional air outlet guide, the clearance >= 500 mm [19-11/16"].

Fig. 12-2-5
Obstacles at front only



* Using an optional air outlet guide, the clearance >= 500 mm [19-11/16"].

Fig. 12-2-6
Obstacles at front and rear only



* NO upward airflow outlet guide.

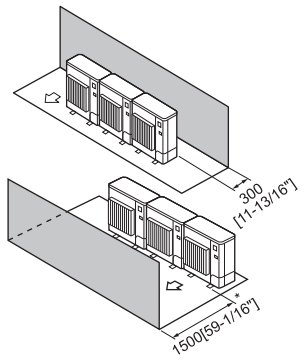
Fig. 12-2-7
Obstacles at rear, sides and above only

12-2-1-2. Spacing grouped PUMY-SP-VKM2/YKM2

Follow Fig. 12-2-8~13 to space grouped PUMY-SP-VKM2/YKM2 at the installation site.

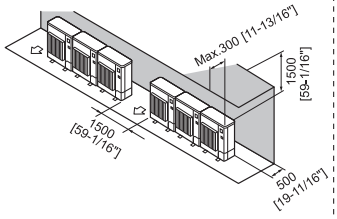
Leave 25 mm space or more between PUMY-SP-VKM2/YKM2 units.

mm[in.]



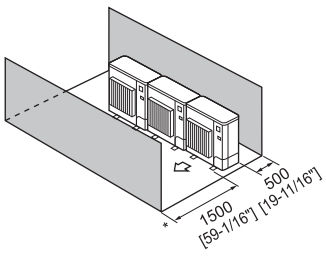
* When using an optional air outlet guide, the clearance is 1000 mm [39-3/8"] or more.

Fig. 12-2-8
Obstacles at rear or front only



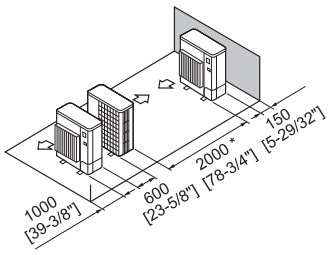
* In case of side-by-side installation, <=3 units;
* Do not install the optional air outlet guides for upward airflow.

Fig. 12-2-9
Obstacles at rear and above only



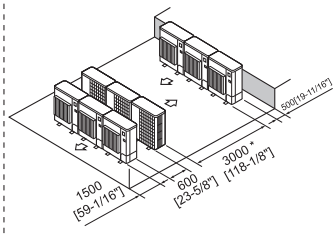
* Using an optional air outlet guide, the clearance >= 1000 mm [39-3/8"].

Fig. 12-2-10
Obstacles at front and rear only



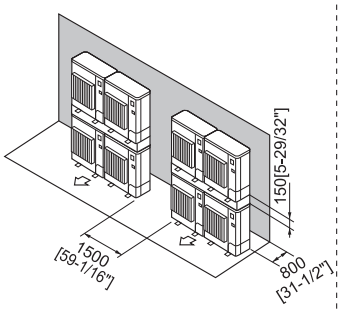
* Using an optional air outlet guide, the clearance >= 1000 mm [39-3/8"].

Fig. 12-2-11
Parallel individuals arrangement



* Using an optional air outlet guide for upward airflow, the clearance >= 1500 mm [59-1/16"].

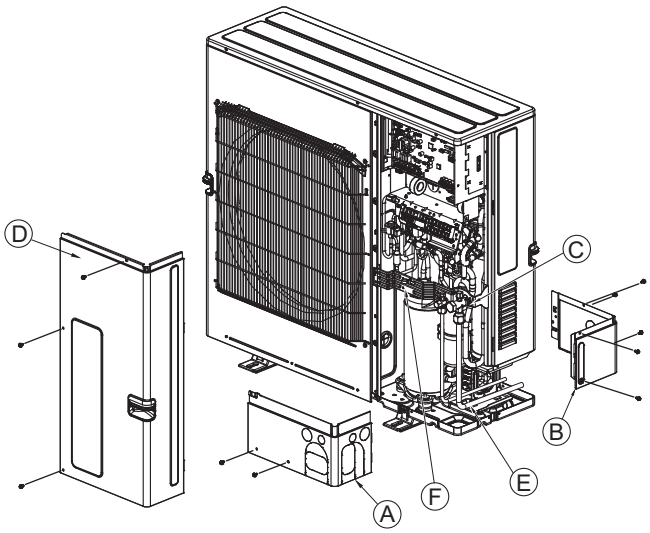
Fig. 12-2-12
Parallel groups arrangement



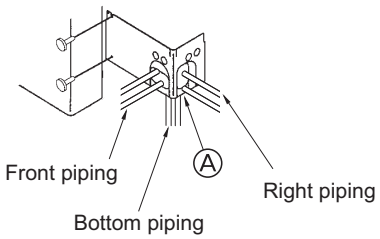
* Stacked layer <= 2 units;
* Side-by-side stacked groups <= 2 groups;

Fig. 12-2-13
Stacked groups arrangement

12-3. Piping direction



Ⓐ Front piping cover
Ⓑ Piping cover
Ⓒ Stop valve
Ⓓ Service panel
Ⓔ Bend radius: 100mm-150mm
Ⓕ Strap



⚠Warning

■ Do not use refrigerant other than the type indicated in the manuals provided with the unit and on the nameplate.
- Doing so may cause the unit or pipes to burst, or result in explosion or fire during use, repair, or at the time of disposal of the unit.
- It may also be in violation of applicable laws.
- MITSUBISHI ELECTRIC CORPORATION cannot be held responsible for malfunctions or accidents resulting from the use of the wrong type of refrigerant.

■ Our air conditioning equipment and heat pumps contain a fluorinated greenhouse gas, R410A.

MITSUBISHI ELECTRIC CORPORATION

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