CITY MULTI
SYSTEM DESIGN WY, WR2 SERIES

1-1. 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.

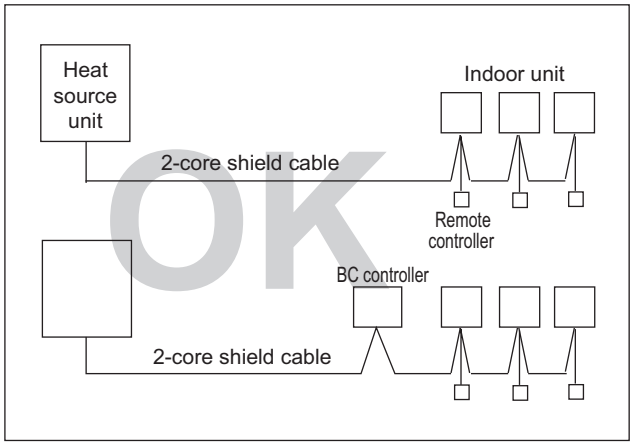
② Wiring for control (hereinafter referred to as transmission cable) shall be (50mm[1-5/8in] or more) apart from power source wiring so that it is not influenced by electric noise from power source wiring. (Do not insert transmission cable and power source wire in the same conduit.)

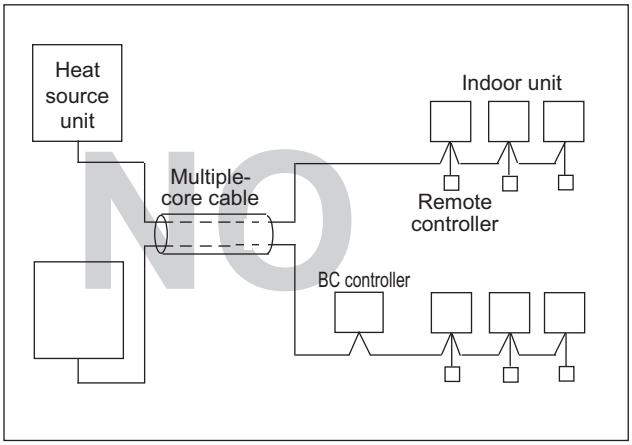
③ Be sure to provide designated grounding work to heat source unit.

④ Give some allowance to wiring for electrical part box of indoor and heat source unit, because the box is sometimes removed at the time of service work.

⑤ Never connect 100V, 208~230V, 460V power source to terminal block of transmission cable. If connected,electrical parts will be burnt out.

⑥ Use 2-core shield cable for transmission cable . If transmission cables of different systems are wired with the same multiplecore cable, the resultant poor transmitting and receiving will cause erroneous operations.





1-2. Power supply for Indoor unit and Heat source unit

1-2-1. Electrical characteristics of Indoor unit

Symbols: MCA : Min.Circuit Amps (=1.25xFLA) FLA : Full Load Amps
IFM :Indoor Fan Motor Output : Fan motor rated output

Model	Indoor Unit				IFM	
	Hz	Volts	Voltage range	MCA(A)	Output(kW)	FLA(A)
PLFY-P06NLMU-E	60Hz	208 / 230V	188 to 253V	0.43 / 0.47	0.015 / 0.015	0.34 / 0.37
PLFY-P08NLMU-E				0.43 / 0.47	0.015 / 0.015	0.34 / 0.37
PLFY-P12NLMU-E				0.43 / 0.47	0.015 / 0.015	0.34 / 0.37
PLFY-P15NLMU-E				0.48 / 0.53	0.015 / 0.015	0.38 / 0.42
PLFY-P18NLMU-E				0.49 / 0.54	0.020 / 0.020	0.39 / 0.43
PLFY-P08NCMU-E			198 to 253V	0.29 / 0.29	0.015 / 0.015	0.23 / 0.23
PLFY-P12NCMU-E				0.35 / 0.35	0.020 / 0.020	0.28 / 0.28
PLFY-P15NCMU-E				0.35 / 0.35	0.020 / 0.020	0.28 / 0.28
PLFY-P12NBMU-E				0.64 / 0.64	0.050 / 0.050	0.51 / 0.51
PLFY-P15NBMU-E				0.64 / 0.64	0.050 / 0.050	0.51 / 0.51
PLFY-P18NBMU-E				0.64 / 0.64	0.050 / 0.050	0.51 / 0.51
PLFY-P24NBMU-E				0.64 / 0.64	0.050 / 0.050	0.51 / 0.51
PLFY-P30NBMU-E				0.64 / 0.64	0.050 / 0.050	0.51 / 0.51
PLFY-P36NBMU-E				1.25 / 1.25	0.120 / 0.120	1.00 / 1.00
PMFY-P06NBMU-E	60Hz	208 / 230V	188 to 253V	0.25 / 0.25	0.028 / 0.028	0.20 / 0.20
PMFY-P08NBMU-E				0.25 / 0.25	0.028 / 0.028	0.20 / 0.20
PMFY-P12NBMU-E				0.26 / 0.26	0.028 / 0.028	0.21 / 0.21
PMFY-P15NBMU-E				0.33 / 0.33	0.028 / 0.028	0.26 / 0.26
PDFY-P06NMU-E	60Hz	208 / 230V	188 to 253V	0.77 / 0.85	0.075 / 0.075	0.61 / 0.68
PDFY-P08NMU-E				0.77 / 0.85	0.075 / 0.075	0.61 / 0.68
PDFY-P12NMU-E				0.77 / 0.85	0.075 / 0.075	0.61 / 0.68
PDFY-P15NMU-E				0.97 / 1.07	0.085 / 0.085	0.77 / 0.85
PDFY-P18NMU-E				0.97 / 1.07	0.085 / 0.085	0.77 / 0.85
PDFY-P24NMU-E				1.09 / 1.20	0.095 / 0.095	0.87 / 0.96
PDFY-P27NMU-E				1.18 / 1.30	0.095 / 0.095	0.94 / 1.04
PDFY-P30NMU-E				1.34 / 1.49	0.095 / 0.095	1.07 / 1.19
PDFY-P36NMU-E				1.85 / 2.05	0.140 / 0.140	1.48 / 1.64
PDFY-P48NMU-E				2.49 / 2.77	0.190 / 0.190	1.99 / 2.21
PEFY-P06NMSU-E	60Hz	208 / 230V	188 to 253V	0.47 / 0.50	0.023 / 0.023	0.32 / 0.31
PEFY-P08NMSU-E				0.47 / 0.50	0.023 / 0.023	0.41 / 0.39
PEFY-P12NMSU-E				0.68 / 0.74	0.032 / 0.032	0.46 / 0.43
PEFY-P15NMSU-E				1.20 / 1.33	0.130 / 0.130	0.47 / 0.45
PEFY-P18NMSU-E				1.20 / 1.33	0.130 / 0.130	0.64 / 0.60
PEFY-P24NMSU-E				1.57 / 1.73	0.180 / 0.180	0.88 / 0.83
PEFY-P27NMHU-E				1.72 / 1.89	0.220 / 0.220	1.37 / 1.51
PEFY-P30NMHU-E				2.08 / 2.29	0.230 / 0.230	1.66 / 1.83
PEFY-P36NMHU-E				4.23 / 4.67	0.400 / 0.400	3.38 / 3.73
PEFY-P48NMHU-E				4.23 / 4.67	0.400 / 0.400	3.38 / 3.73
PEFY-P54NMHU-E				4.29 / 4.73	0.400 / 0.400	3.43 / 3.78
PEFY-P72NMHU-E				5.60 / 6.18	0.650 / 0.650	4.48 / 4.94
PEFY-P96NMHU-E				7.12 / 7.85	0.850 / 0.850	5.69 / 6.28
PEFY-P30NMHU-E-F	60Hz	208 / 230V	188 to 253V	1.14 / 1.14	0.090 / 0.090	0.91 / 0.91
PEFY-P54NMHU-E-F				1.85 / 1.85	0.130 / 0.130	1.48 / 1.48
PEFY-P72NMHU-E-F				2.20 / 2.43	0.200 / 0.200	1.76 / 1.94
PEFY-P96NMHU-E-F				2.59 / 2.85	0.230 / 0.230	2.07 / 2.28
PCFY-P15NKMU-E	60Hz	208 / 230V	188 to 253V	0.44 / 0.44	0.090 / 0.090	0.35 / 0.35
PCFY-P24NKMU-E				0.52 / 0.52	0.095 / 0.095	0.41 / 0.41
PCFY-P30NKMU-E				1.22 / 1.22	0.160 / 0.160	0.97 / 0.97
PCFY-P36NKMU-E				1.22 / 1.22	0.160 / 0.160	0.97 / 0.97

Symbols: MCA : Min.Circuit Amps (=1.25xFLA) FLA : Full Load Amps
IFM :Indoor Fan Motor Output : Fan motor rated output

Model	Indoor Unit				IFM	
	Hz	Volts	Voltage range	MCA(A)	Output(kW)	FLA(A)
PKFY-P06NBMU-E	60Hz	208 / 230V	198 to 253V	0.19 / 0.19	0.008 / 0.008	0.15 / 0.15
PKFY-P08NBMU-E				0.19 / 0.19	0.008 / 0.008	0.15 / 0.15
PKFY-P12NHMU-E				0.38 / 0.38	0.030 / 0.030	0.30 / 0.30
PKFY-P15NHMU-E				0.38 / 0.38	0.030 / 0.030	0.30 / 0.30
PKFY-P18NHMU-E				0.38 / 0.38	0.030 / 0.030	0.30 / 0.30
PKFY-P24NKMU-E				0.37 / 0.37	0.056 / 0.056	0.29 / 0.29
PKFY-P30NKMU-E				0.54 / 0.54	0.056 / 0.056	0.43 / 0.43
PFFY-P06NEMU-E	60Hz	208 / 230V	188 to 253V	0.32 / 0.34	0.015 / 0.015	0.25 / 0.27
PFFY-P08NEMU-E				0.32 / 0.34	0.015 / 0.015	0.25 / 0.27
PFFY-P12NEMU-E				0.34 / 0.38	0.018 / 0.018	0.27 / 0.30
PFFY-P15NEMU-E				0.40 / 0.44	0.030 / 0.030	0.32 / 0.35
PFFY-P18NEMU-E				0.48 / 0.53	0.035 / 0.035	0.38 / 0.42
PFFY-P24NEMU-E				0.59 / 0.64	0.063 / 0.063	0.47 / 0.51
PFFY-P06NRMU-E	60Hz	208 / 230V	188 to 253V	0.32 / 0.34	0.015 / 0.015	0.25 / 0.27
PFFY-P08NRMU-E				0.32 / 0.34	0.015 / 0.015	0.25 / 0.27
PFFY-P12NRMU-E				0.34 / 0.38	0.018 / 0.018	0.27 / 0.30
PFFY-P15NRMU-E				0.40 / 0.44	0.030 / 0.030	0.32 / 0.35
PFFY-P18NRMU-E				0.48 / 0.53	0.035 / 0.035	0.38 / 0.42
PFFY-P24NRMU-E				0.59 / 0.64	0.063 / 0.063	0.47 / 0.51

1-2-2. Electrical characteristics of Heat source unit

Symbols: MCA : Min. Circuit Amps
SC : Starting Current RLA : Rated Load Amps

PQHY-P-TGMU

Model	Heat source unit						Compressor	
	Hz	Volts	Voltage range	RLA(A)	MCA(A)	Max. Fuse(A)	Output(kW)	SC(A)
PQHY-P72TGMU-A	60Hz	208 / 230V	198 to 253 V	15.9	19.9	30	5.0	15
				14.4	18.0	30		
PQHY-P96TGMU-A				20.4	25.5	40	6.0	15
				18.4	23.0	40		

Symbols: MCA : Min.Circuit Amps
SC : Starting Current RLA : Rated Load Amps

PQRY-P-TGMU

Model	Heat source unit						Compressor	
	Hz	Volts	Voltage range	RLA(A)	MCA(A)	Max. Fuse(A)	Output(kW)	SC(A)
PQRY-P72TGMU-A	60Hz	208 / 230V	198 to 253 V	15.9	19.9	30	5.0	15
				14.4	18.0	30		
PQRY-P96TGMU-A				20.4	25.5	40	6.0	15
				18.4	23.0	40		

1-2-3. Electrical characteristics of BC controller

Symbols: MCA : Min.Circuit Amps (=1.25 x RLA) FLA : Full Load Amps
RLA : Rated Load Amps

BC-Controller for PQRY-P-TGMU

Model	Hz	Volts	Voltage range	MCA(A)	FLA(A)	RLA(A)
CMB-P104NU-G	60Hz	208 / 230V	198 to 253V	0.36 / 0.34	15 / 15	0.29 / 0.27
CMB-P105NU-G				0.45 / 0.40	15 / 15	0.36 / 0.32
CMB-P106NU-G				0.53 / 0.48	15 / 15	0.42 / 0.38
CMB-P108NU-G				0.68 / 0.61	15 / 15	0.54 / 0.49
CMB-P1010NU-G				0.84 / 0.75	15 / 15	0.67 / 0.60
CMB-P1013NU-G				1.08 / 0.98	15 / 15	0.86 / 0.78
CMB-P1016NU-G				1.31 / 1.19	15 / 15	1.05 / 0.95
CMB-P108NU-GA				0.68 / 0.61	15 / 15	0.54 / 0.49
CMB-P1010NU-GA				0.84 / 0.75	15 / 15	0.67 / 0.60
CMB-P1013NU-GA				1.08 / 0.98	15 / 15	0.86 / 0.78
CMB-P1016NU-GA				1.31 / 1.19	15 / 15	1.05 / 0.95
CMB-P104NU-GB				0.33 / 0.30	15 / 15	0.26 / 0.24
CMB-P108NU-GB				0.64 / 0.59	15 / 15	0.51 / 0.47

1-3. Power cable specifications

Thickness of wire for main power supply, ON / OFF capacities

3-phase 3-wire, 208,230V,60Hz		Minimum wire thickness (mm² / AWG)			Switch (A)		Breaker for wiring (NFB)	Breaker for current leakage
		Main cable	Branch	Ground	Capacity	Fuse		
PQHY-P-TGMU	P72	5.3 / 10	–	5.3 / 10	30	30	30	30 A 100 mA 0.1sec. or less
	P96	8.4 / 8	–	8.4 / 8	40	40	40	40 A 100 mA 0.1sec. or less
Indoor unit		0.41 / 22	0.41 / 22	0.41 / 22	15	15	15	20 A 30 mA 0.1sec. or less

3-phase 3-wire, 208,230V,60Hz		Minimum wire thickness (mm² / AWG)			Switch (A)		Breaker for wiring (NFB)	Breaker for current leakage
		Main cable	Branch	Ground	Capacity	Fuse		
PQRY-P-TGMU	P72	5.3 / 10	–	5.3 / 10	30	30	30	30 A 100 mA 0.1sec. or less
	P96	8.4 / 8	–	8.4 / 8	40	40	40	40 A 100 mA 0.1sec. or less
BC controller and Indoor unit		0.41 / 22	0.41 / 22	0.41 / 22	15	15	15	20 A 30 mA 0.1sec. or less

1. Use a separate power supply for the heat source 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. The power cord size should be 1 rank thicker consideration of voltage drops. Make sure the power-supply voltage does not drop more than 10 %.
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 245 IEC57). For example, use wiring such as YZW.
6. A switch with at least 3 mm [1 / 8 in] contact separation in each pole shall be provided by the Air conditioner installation.

⚠ WARNING

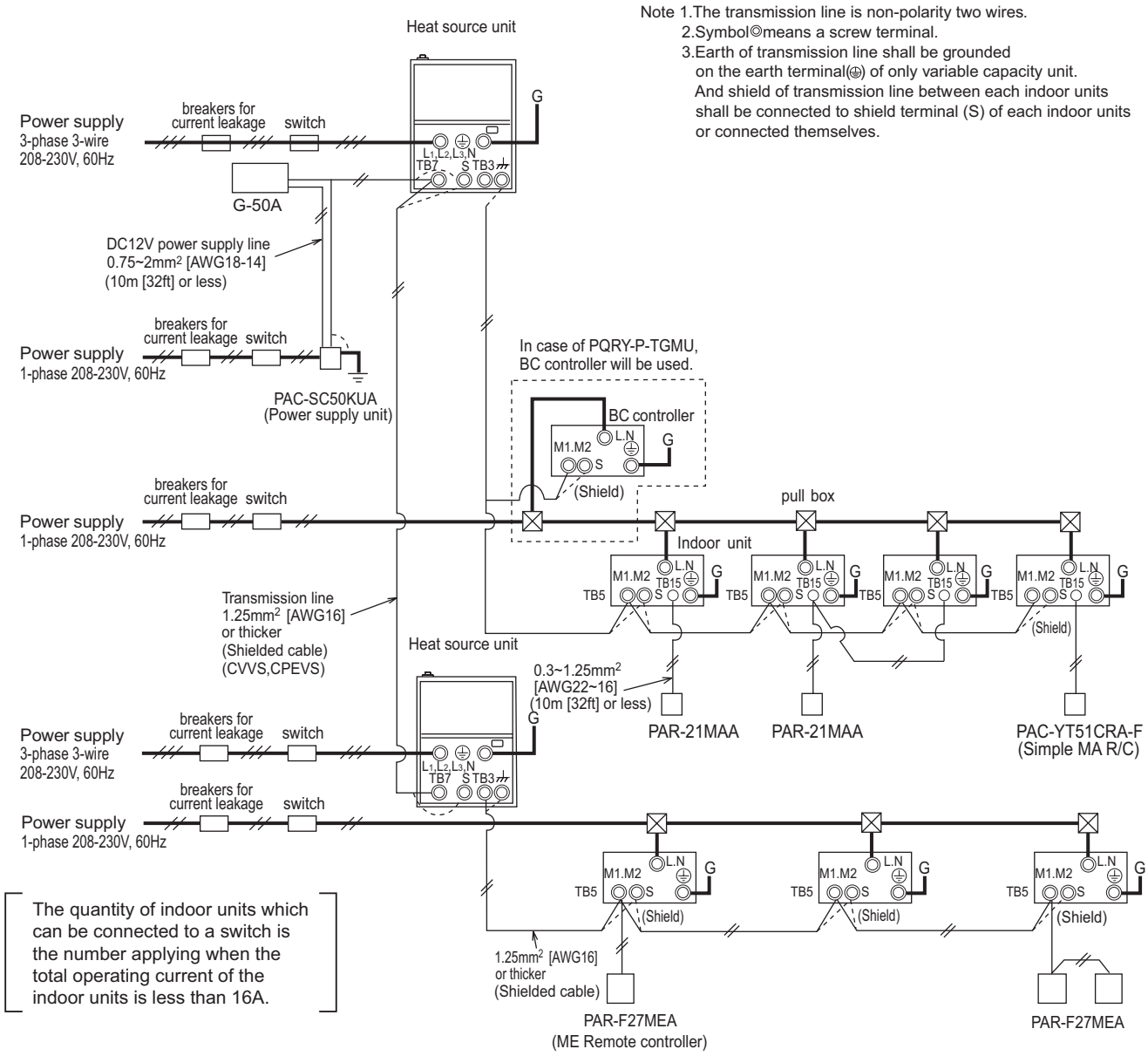
- Be sure to use specified wires to connect so that no external force is imparted to terminal connections. If connections are not fixed firmly, it may cause heating or fire.
- Be sure to use the appropriate type of overcurrent protection switch. Note that generated overcurrent may include some amount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

⚠ CAUTION

- A breaker for current leakage must be attached to the power supply. If no earth leakage breaker is installed, it may cause an electric shock.
- Do not use anything other than breaker and fuse with correct capacity. Using fuse and wire or copper wire with too large capacity may cause a malfunction of unit or fire.

1-4. Power supply examples

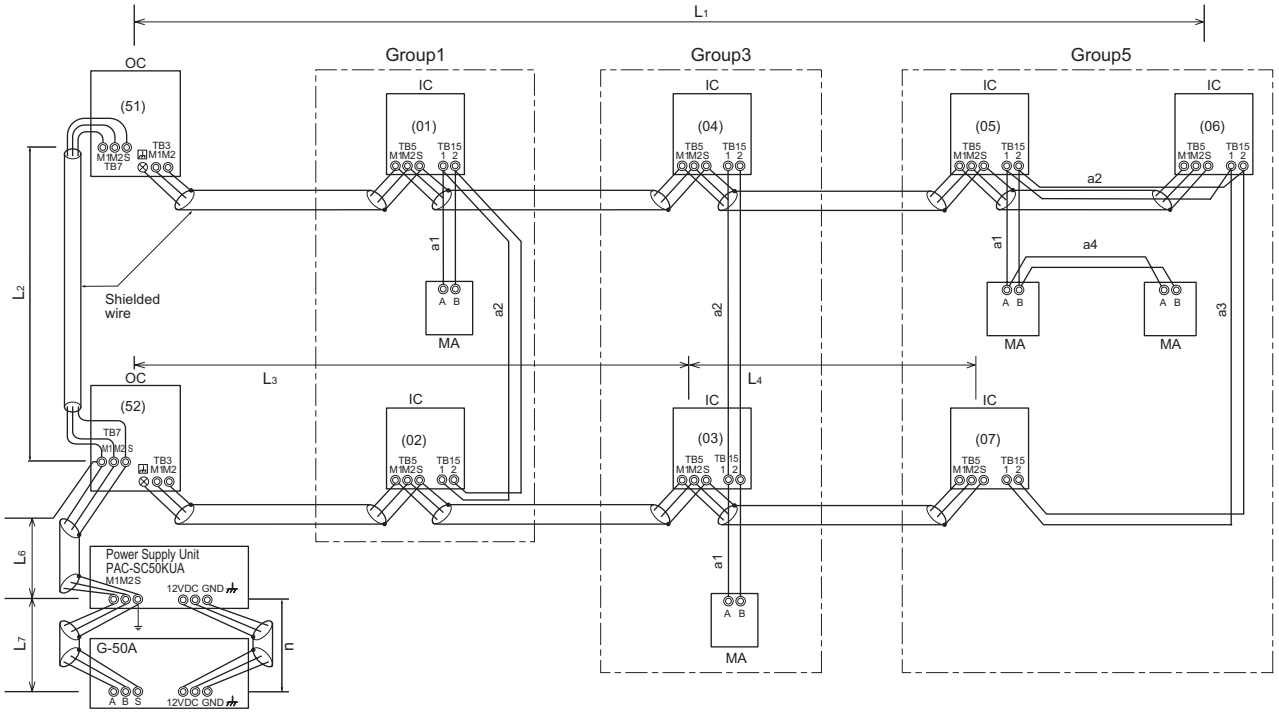
The local standards and/or regualtions is applicable at a higher priority.



2-1. Transmission cable length limitation

2-1-1. Using MA Remote controller

Applicable to Outdoor as follows	Long transmission cable causes voltage down, therefore, the length limitation should be obeyed to secure proper transmission.			
PQHY-P-TGMU	Max. length via Outdoor (M-NET cable)	L1+L2+L3+L4, L1+L2+L6+L7, L3+L4+L6+L7	<=500m[1640ft]	1.25mm^2 [AWG16] or thicker
	Max. length to Outdoor (M-NET cable)	L1, L3+L4, L6, L2+L6, L7	<=200m[656ft]	1.25mm^2 [AWG16] or thicker
	Max. length from MA to Indoor	a1+a2, a1+a2+a3+a4	<=200m[656ft]	-
	DC 12V to G-50A	n	<=10m[32ft]	0.75-2.0 mm^2 [AWG18-14]

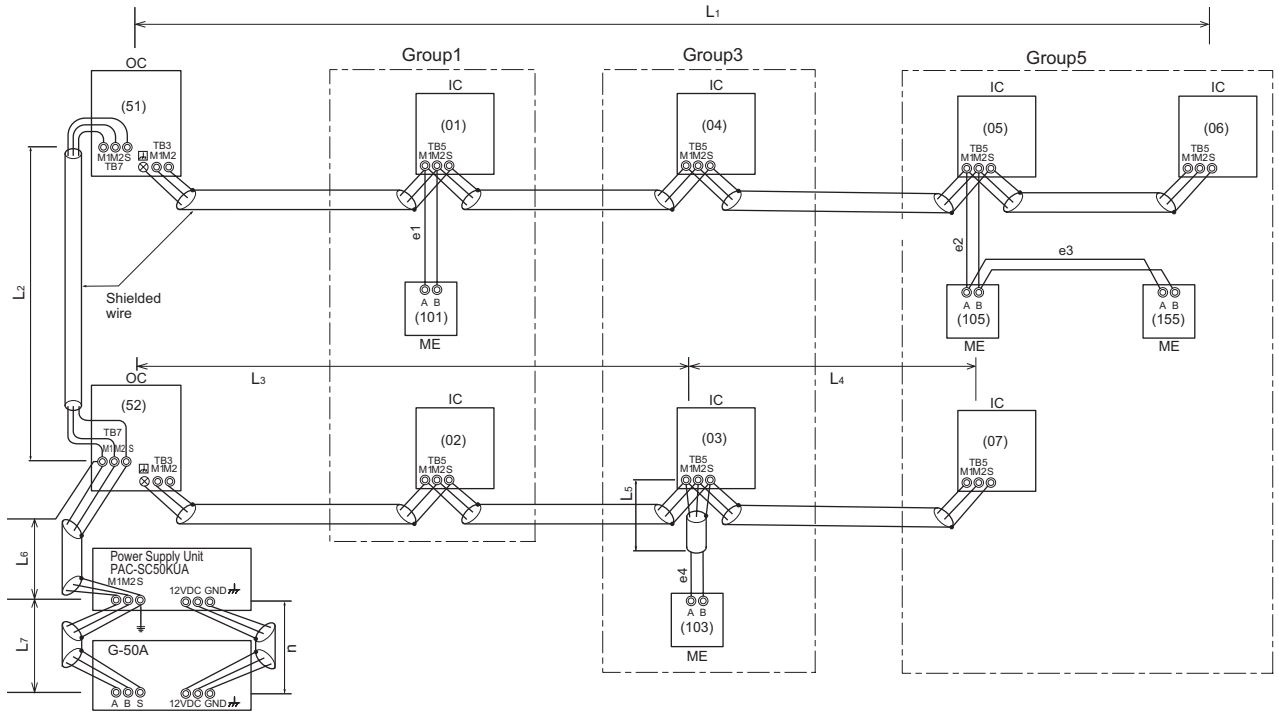


OC: Heat source unit; IC: Indoor unit; MA: MA remote controller

2-1-2. Using ME Remote controller

Applicable to Outdoor as follows	Long transmission cable causes voltage down, therefore, the length limitation should be obeyed to secure proper transmission.			
PQHY-P-TGMU	Max. length via Outdoor (M-NET cable)	L1+L2+L3+L4, L1+L2+L6+L7,L1+L2+L3+L5, L3+L4+L6+L7	<=500m[1640ft]	1.25mm^2 [AWG16] or thicker
	Max. length to Outdoor (M-NET cable)	L1, L3+L4, L6, 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	0.3-1.25 mm^2[AWG22-16] *1
	DC 12V to G-50A	n	<=10m[32ft]	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.

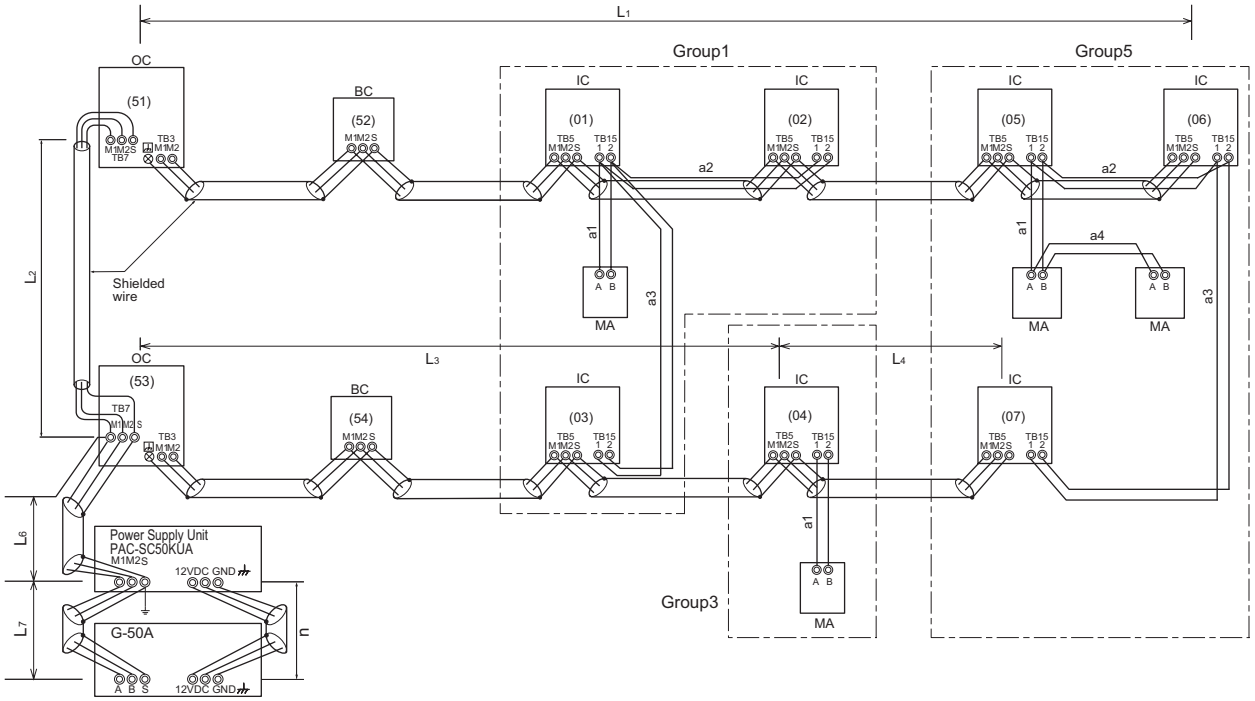


OC: Heat source unit; IC: Indoor unit; ME: ME remote controller

System WY/WR2

2-1-3. Using MA Remote controller and 1 BC controller

Applicable to Outdoor as follows	Long transmission cable causes voltage down, therefore, the length limitation should be obeyed to secure proper transmission.			
PQRY-P72,96TGMU	Max. length via Outdoor (M-NET cable)	L1+L2+L3+L4, L1+L2+L6+L7, L3+L4+L6+L7	<=500m[1640ft]	1.25mm^2 [AWG16] or thicker
	Max. length to Outdoor (M-NET cable)	L1, L3+L4, L6, L2+L6, L7	<=200m[656ft]	1.25mm^2 [AWG16] or thicker
	Max. length from MA to Indoor	a1+a2, a1+a2+a3+a4	<=200m[656ft]	-
	DC 12V to G-50A	n	<=10m[32ft]	0.75-2.0 mm^2 [AWG18-14]

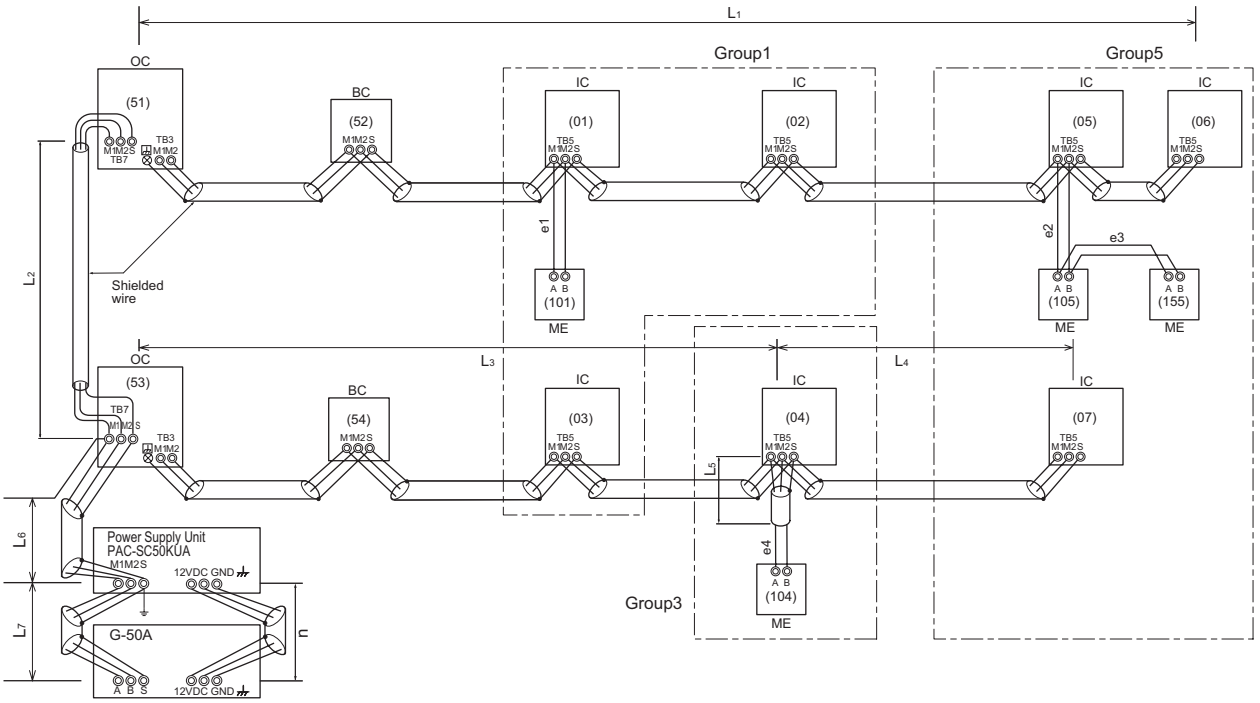


OC: Heat source unit; IC: Indoor unit; MA: MA remote controller; BC: BC controller

2-1-4. Using ME Remote controller and 1 BC controller

Applicable to Outdoor as follows	Long transmission cable causes voltage down, therefore, the length limitation should be obeyed to secure proper transmission.			
PQRY-P72,96TGMU	Max. length via Outdoor (M-NET cable)	L1+L2+L3+L4, L1+L2+L6+L7,L1+L2+L3+L5, L3+L4+L6+L7	<=500m[1640ft]	1.25mm^2 [AWG16] or thicker
	Max. length to Outdoor (M-NET cable)	L1, L3+L4, L6, 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	0.3-1.25 mm^2[AWG22-16] *1
	DC 12V to G-50A	n	<=10m[32ft	0.75-2.0 mm^2 [AWG18-14]

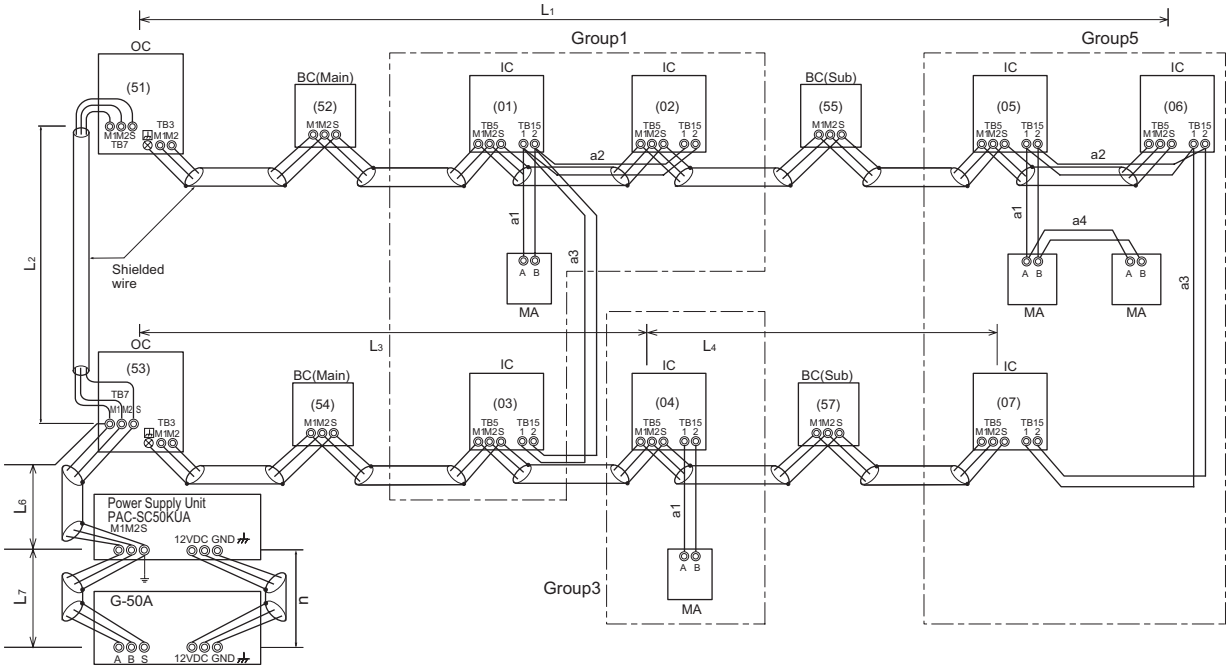
*1. If the length from ME to Indoor exceed 10m, use 1.25 mm^2[AWG16] shielded cable, but the total length should be counted into Max. length via Outdoor.



OC: Heat source unit; IC: Indoor unit; ME: ME remote controller; BC: BC controller

2-1-5. Using MA Remote controller and 2 BC controller

Applicable to Outdoor as follows	Long transmission cable causes voltage down, therefore, the length limitation should be obeyed to secure proper transmission.			
PQRY-P72,96TGMU	Max. length via Outdoor (M-NET cable)	L1+L2+L3+L4, L1+L2+L6+L7, L3+L4+L6+L7	<=500m[1640ft]	1.25mm^2 [AWG16] or thicker
	Max. length to Outdoor (M-NET cable)	L1, L3+L4, L6, L2+L6, L7	<=200m[656ft]	1.25mm^2 [AWG16] or thicker
	Max. length from MA to Indoor	a1, a1+a2+a2, a1+a2+a3+a4	<=200m[656ft]	-
	DC 12V to G-50A	n	<=10m[32ft]	0.75-2.0 mm^2 [AWG18-14]

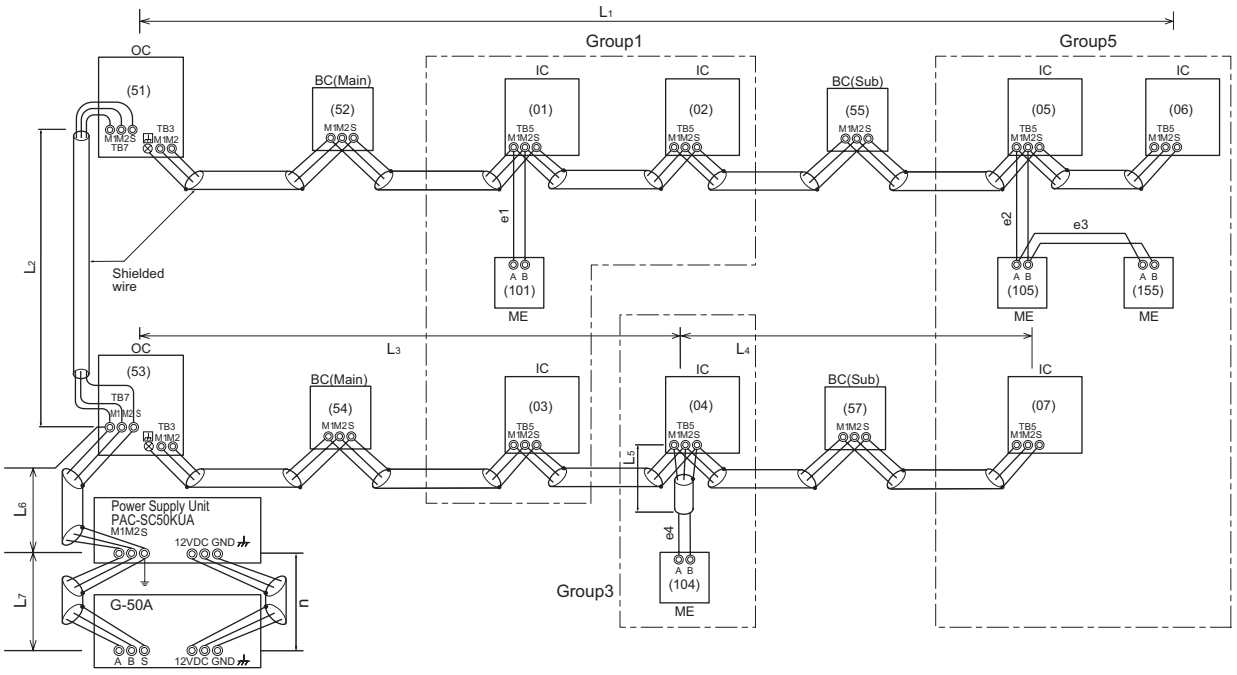


OC: Heat source unit; IC: Indoor unit; MA: MA remote controller; BC: BC controller

2-1-6. Using ME Remote controller and 2 BC controller

Applicable to Outdoor as follows	Long transmission cable causes voltage down, therefore, the length limitation should be obeyed to secure proper transmission.			
PQRY-P72,96TGMU	Max. length via Outdoor (M-NET cable)	L1+L2+L3+L4, L1+L2+L6+L7,L1+L2+L3+L5, L3+L4+L6+L7	<=500m[1640ft]	1.25mm^2 [AWG16] or thicker
	Max. length to Outdoor (M-NET cable)	L1, L3+L4, L6, 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	0.3-1.25 mm^2[AWG22-16] *1
	DC 12V to G-50A	n	<=10m[32ft]	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: Heat source unit; IC: Indoor unit; ME: ME remote controller; BC: BC controller

2-2. Transmission cable specifications

	Transmission cables (L_i)	ME Remote controller cables	MA Remote controller cables
Type of cable	Shielding wire (2-core) CVVS, CPEVS or MVVS	Sheathed 2-core cable (unshielded) CVV	
Cable size	More than 1.25mm^2 [AWG16]	0.3～1.25mm^2 [AWG22～16] (0.75～1.25mm^2 [AWG18~16])*1	0.3～1.25mm^2 [AWG22～16] (0.75～1.25mm^2 [AWG18~16])*1
Remarks	—	When 10m [32ft] is exceeded, use cables with the same specification as transmission cables.	Max length : 200m [656ft]

*1 Connected with simple remote controller.

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

2-3. System configuration restrictions

2-3-1. Common restrictions for the CITY MULTI system

For each 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;
B) Maximum 2 remote controllers for 1 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 Heat source unit.
E) Maximum 3 System controllers are connectable when connecting to TB7 of the Heat source unit, if the transmission power is supplied by the Heat source unit.
F) 4 System controllers or more are connectable when connecting to TB7 of the Heat source unit, if the transmission power is supplied by the power supply unit PAC-SC50(51)KUA. Details refer to 2-3-3-C.
*System controller connected as described in D) and E) would have a risk that the failure of connected Outdoor unit would stop power supply to the System controller.

2-3-2. Ensuring proper communication power for M-NET

In order to ensure proper communication among Heat source unit, Indoor unit, LOSSNAY 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 index of Indoor unit sized P06-P54 as 1, the equivalent power consumption index and supply capability index of others are listed at Table 2-3-1 and Table 2-3-2.

Table 2-3-1 The equivalent power consumption by index Indoor units, LOSSNAY, controllers

Indoor, OA unit	Indoor unit	BC controller	MA RC.LOSSNAY	ME Remote Contr.	Timers, System Contr.		ON/OFF Contr.
Sized P06-P54	Sized P72,P96	CMB	PAR-21MAA PAC-YT51CRA(B) PAR-FA32MA LGH-RX-E PZ-41SLB	PAR-F27MEA PZ-52SF	PAC-SF44SRA PAC-YT34STA G-50A AG-150A	GB-50A	PAC-YT40ANRA
1	2	2	0	1/4	1/2	3	1

*RC : Remote Controller

Table 2-3-2 The equivalent power supply capability index of Trans.Booster, Power supply unit, Connector TB3, TB7 of Heat source unit.

Transmission Booster	Power supply unit		Heat source unit	Heat source unit
PAC-SF46EPA	PAC-SC50KUA	PAC-SC51KUA	Connector TB3 and TB7 total *	Connector TB7 only
25	6	5	32	6

*If PAC-SC50(51)KUA is used to supply power at TB7 side, no power supply need from Heat source unit at TB7, Connector TB3 itself will therefore have 32.

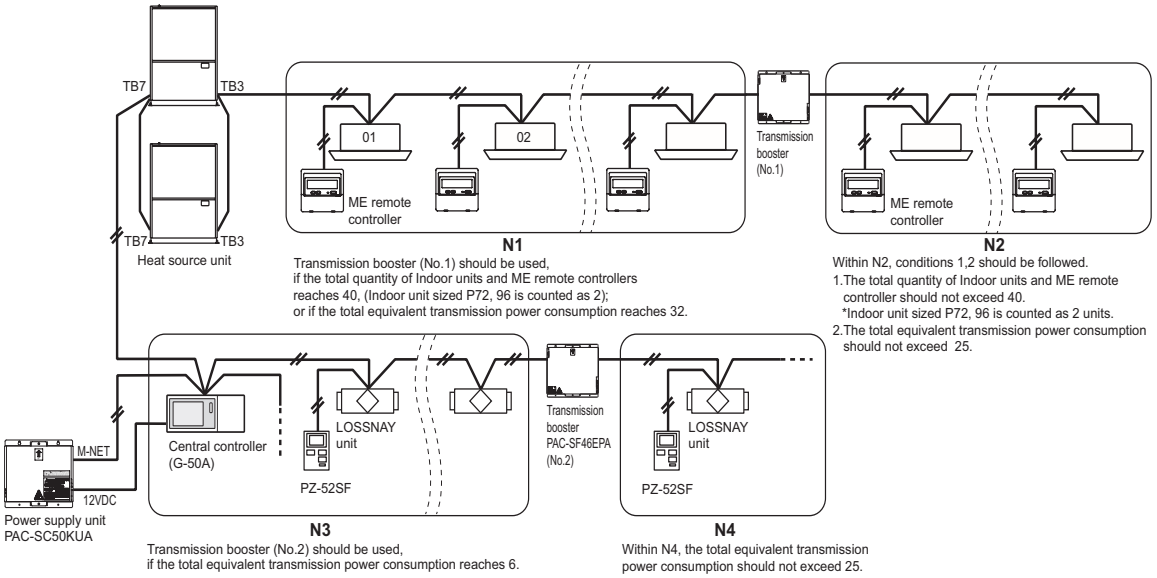
With the equivalent power consumption values in Table 2-3-1 and Table 2-3-2, PAC-SF46EPA can be designed into the air-conditioner system to ensure proper system communication according to 2-3-2-A, B, C.

2-3-2-A) Firstly, count from TB3 at TB3 side the total quantity of Indoor units and ME remote controller, Timers and System controllers.If the total quantity reaches 40, a PAC-SF46EPA should be set.In this case, Indoor unit sized P72, 96 is counted as 2 Indoor units, but MA remote controller(s), LOSSNAY is NOT counted.

2-3-2-B) Secondly, count from TB7 side to TB3 side the total transmission power consumption index. If the total power consumption reaches 32, a PAC-SF46EPA should be set.Yet, if a PAC-SC50(51)KUA is used to supply power at TB7 side, count from index TB3 side only.

2-3-2-C) Thirdly, count from TB7 at TB7 side the total transmission power consumption index, If the total power consumption reaches 6, a PAC-SF46EPA should be set.

■ System example



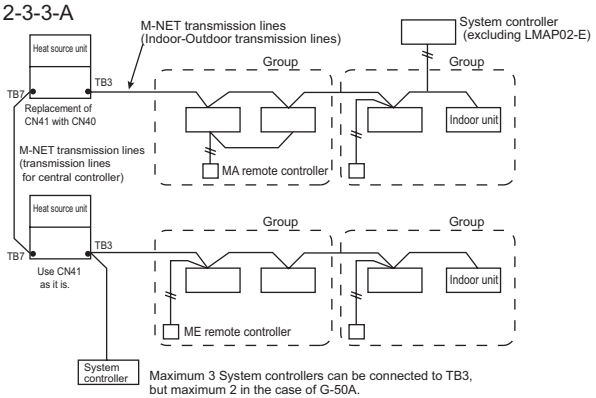
2-3-3. Ensuring proper power supply to System controller

The power to System controller (excluding LMAP03-U) is supplied via M-NET transmission line. M-NET transmission line at TB7 side is called Central control transmission line while one at TB3 side is called Indoor-Outdoor transmission line. There are 3 ways to supply power to the System controller .
A) Connecting to TB3 of the Heat source unit and receiving power from the Heat source unit.
B) Connecting to TB7 of the Heat source unit and receiving power from the Heat source unit.
C) Connecting to TB7 of the Heat source unit but receiving power from power supply unit PAC-SC50KUA.
D) Connecting to TB7 of the Heat source unit but receiving power from power supply unit PAC-SC51KUA.

2-3-3-A. When connecting to TB3 of the Heat source unit and receiving power from the Heat source unit.

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

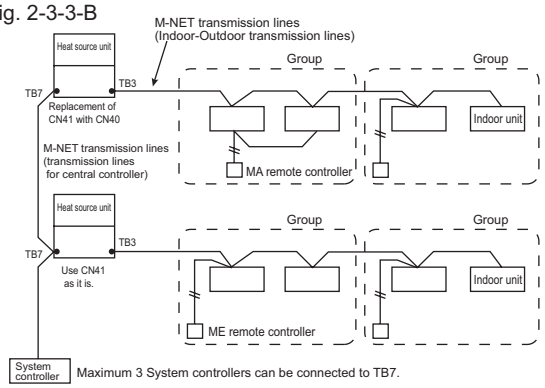
Fig. 2-3-3-A



2-3-3-B. When connecting to TB7 of the Heat source unit and receiving power from the Heat source unit.

Maximum 3 System controllers can be connected to TB7 and receiving power from the Heat source unit.
It is necessary to replace power supply switch connector CN41 with CN40 on one Heat source unit.

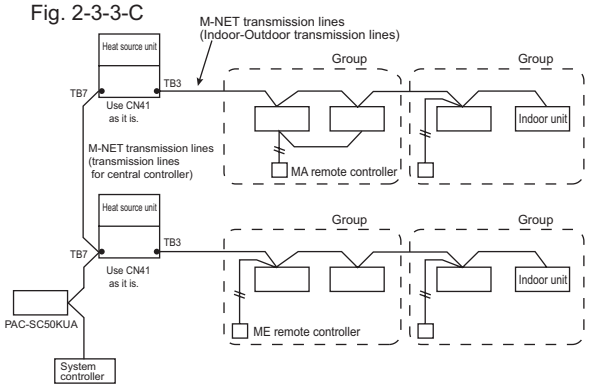
Fig. 2-3-3-B



2-3-3-C. When connecting to TB7 of the Heat source unit but receiving power from PAC-SC50KUA.

When using PAC-SC50KUA to supply transmission power, the power supply connector CN41 should be kept as it is. It is also a factory setting.
1 PAC-SC50KUA supports maximum 2 G-50A units due to the limited power DC 12V at its TB3.
However, 1 PAC-SC50KUA supplies transmission power at its TB2 equal to 6 Indoor units, which is referable at Table 2-3-2.
If PZ-52SF, Timers, System controller, ON/OFF controller connected to TB7 consume transmission power more than 6 (Indoor units), Transmission booster PAC-SF46EPA is needed. PAC-SF46EPA supplies transmission power equal to 25 Indoor units.

Fig. 2-3-3-C



⚠ CAUTION

G-50A is recommended to connect to TB7 because it performs back-up to a number of data.

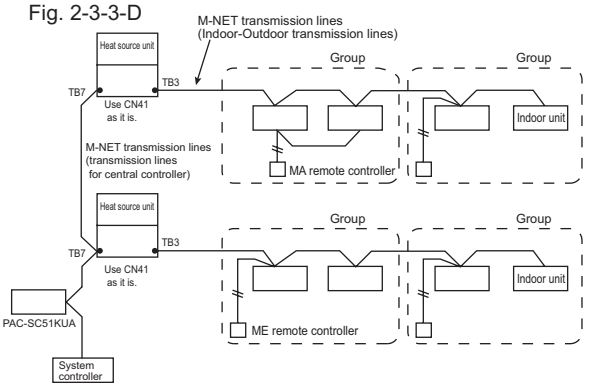
In an air conditioner system has more than 1 Heat source units, G-50A receiving transmission power at TB3 or TB7 on one of the Heat source units would have a risk that the connected Heat source unit failure would stop power supply to G-50A, and disrupt the whole system.

When applying apportioned electric power function, G-50A is necessary to connected to TB7 and has its own power supply unit PAC-SC50KUA.

2-3-3-D. When connecting to TB7 of the Heat source unit but receiving power from PAC-SC51KUA.

When using PAC-SC51KUA to supply transmission power, the power supply connector CN41 should be kept as it is. It is also a factory setting.
1 PAC-SC51KUA supports maximum 1 AG-150A unit due to the limited power DC 24V at its TB3.
However, 1 PAC-SC51KUA supplies transmission power at its TB2 equal to 5 Indoor units, which is referable at Table 2-3-2.
If PZ-52SF, Timers, System controller, ON/OFF controller connected to TB7 consume transmission power more than 5 (Indoor units), Transmission booster PAC-SF46EPA is needed. PAC-SF46EPA supplies transmission power equal to 25 Indoor units.

Fig. 2-3-3-D



⚠ CAUTION

AG-150A is recommended to connect to TB7 because it performs back-up to a number of data.

In an air conditioner system has more than 1 Heat source units, AG-150A receiving transmission power at TB3 or TB7 on one of the Heat source units would have a risk that the connected Heat source unit failure would stop power supply to AG-150A, and disrupt the whole system.

When applying apportioned electric power function, AG-150A is necessary to connected to TB7 and has its own power supply unit PAC-SC51KUA.

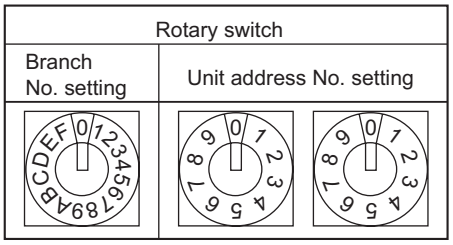
2-3-4. Power supply to LM adapter LMAP03U

1-phase 208-230V AC power supply is needed.
The power supply unit is not necessary when connecting only the LMAP03U. Yet, make sure to change the power supply changeover connector CN41 to CN40 on the LM adapter.

2-4. Address setting

2-4-1. 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.



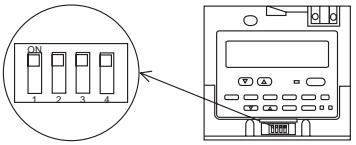
① Address No. of heat source unit, indoor unit and remote controller.
The address No. is set at the address setting board.
In the case of R2 system, it is necessary to set the same No. at the branch No. switch of indoor unit as that of the BC controller connected. (When connecting two or more branches,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

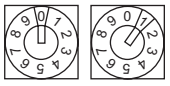
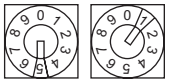
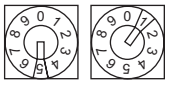
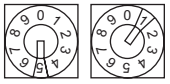
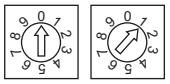
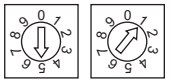
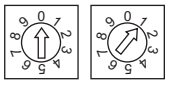
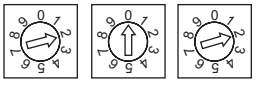
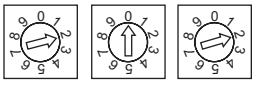
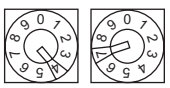


Setting the dip switches

The dip switches are at the bottom of the remote controller.
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 all "ON".)

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 "Main".
2	When remote controller power turned on	Normally on	Timer mode on	When you want to return to the timer mode when the power is restored after a power failure when a Program timer is connected, select "Timer mode".
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 "No".
4	Intake temperature display	Yes	No	When you do not want to display the intake temperature, set to "No".

2-4-2. 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 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)
Heat source unit		51 ~ 99, 100 (Note1)	 10 1	The smallest address of indoor unit in same refrigerant system + 50 Assign sequential address numbers to the heat source units in one refrigerant circuit system. OC and OS are automatically detected. (Note 2) * Please reset one of them to an address between 51 and 99 when two addresses overlap. * The address automatically becomes "100" if it is set as "01~ 50"
BC controller (Main)		52 ~ 99, 100	 10 1	The address of heat source unit + 1 * Please reset one of them to an address between 51 and 99 when two addresses overlap. * The address automatically becomes "100" if it is set as "01~ 50"
BC controller (Sub)		52 ~ 99, 100	 10 1	Lowest address within the indoor units connected to the BC controller (Sub) plus 50.
Local remote controller	ME, LOSSNAY 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"
	ME, LOSSNAY 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	Group remote controller	201 ~ 250	2 Fixed  10 1	The smallest group No. to be managed + 200
	System remote controller	000, 201 ~ 250	 100 10 1	
	ON/OFF remote controller	000, 201 ~ 250	 100 10 1	
	G-50A GB-50A AG-150A	000, 201 ~ 250	0,2 0~5 0~9 100 10 1	
	LMAP03U	201 ~ 250	2 Fixed  10 1	

Note1: To set the address to "100", set it to "50"
Note2: Heat source units OC and OS in one refrigerant circuit system are automatically detected.
OC and OS are ranked in descending order of capacity. If units are the same capacity, they are ranked in ascending order of their address.

2-4-3. System example

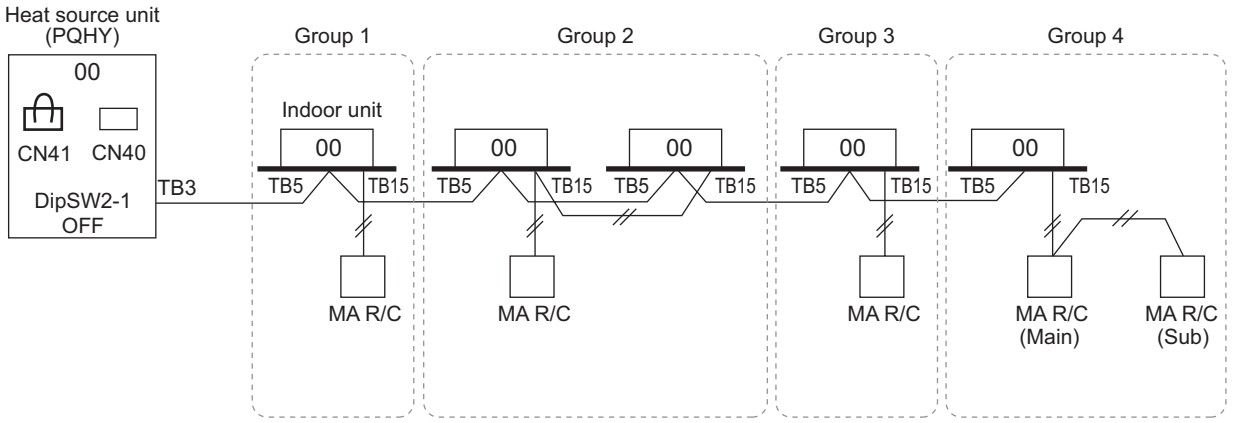
Factory setting

Original switch setting of the outdoors, indoors, controllers, LMAP03U-E at shipment is as follows.

- Heat source unit : Address: 00, CN41: ON, DipSW2-1: OFF
- Indoor unit : Address: 00
- Remote controller : Address: 100
- LMAP : Address: 247, CN41: ON, DipSW1-2: OFF

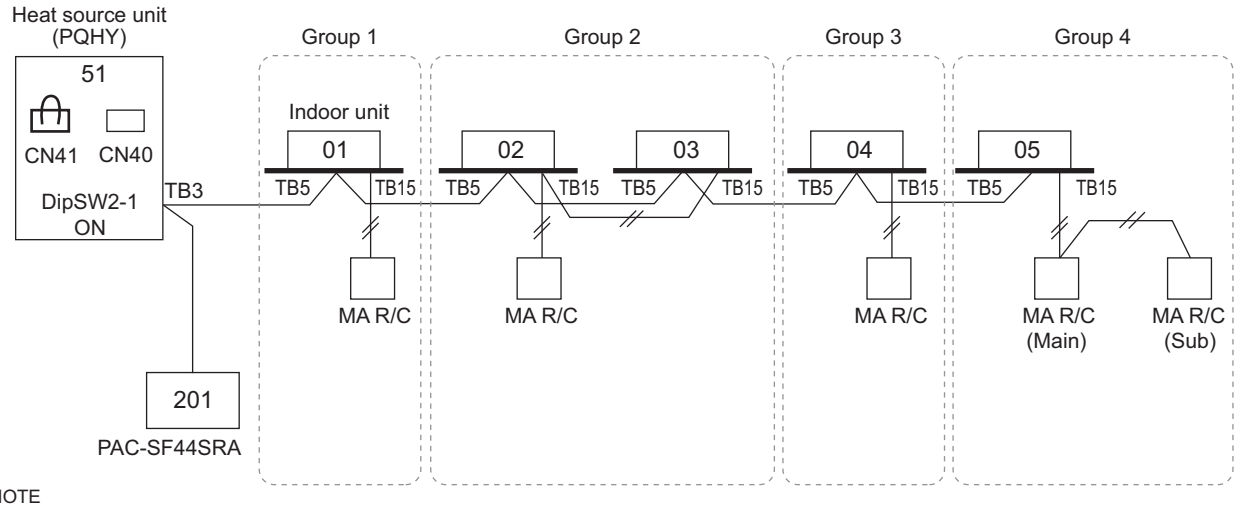
2-4-3-1. Basic (No address setting)

MA R/C : PAR-21MAA



2-4-3-2. Basic, PAC-SF44SRA

MA R/C : PAR-21MAA
System remote controller : PAC-SF44SRA

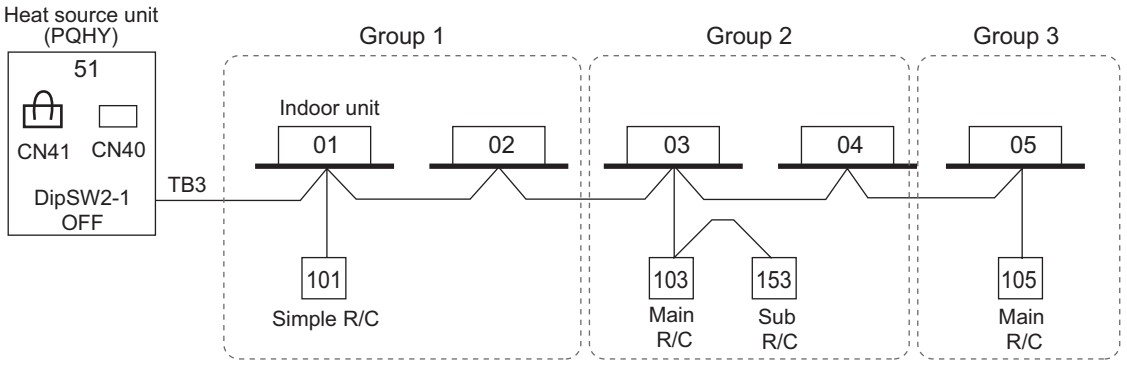


NOTE

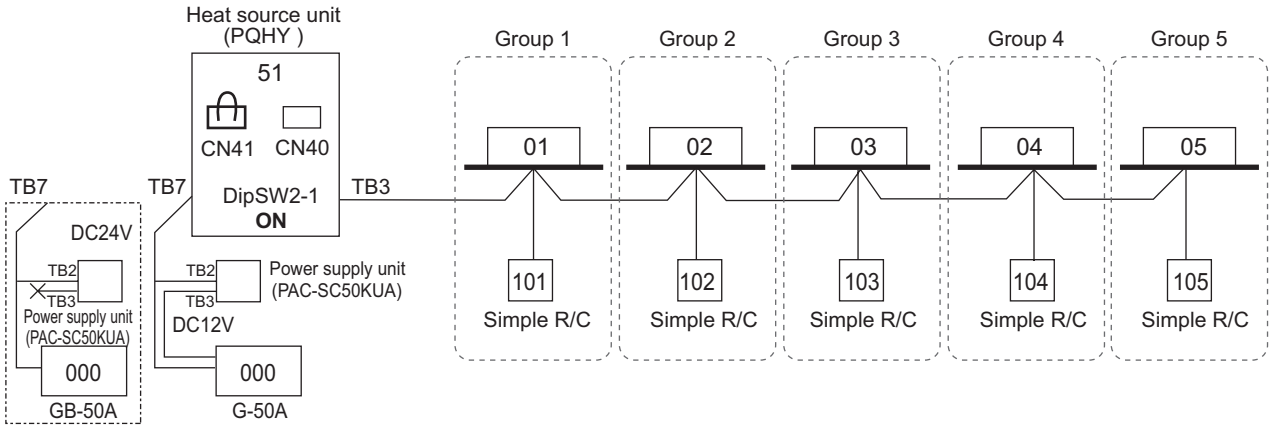
- No system controller should be connected to TB3 of PUMY. System controller for PUMY should always be connected to TB7 of PUMY with power supply unit PAC-SC50KUA together.

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

Main R/C : PAR-F27MEA
Sub R/C : PAR-F27MEA



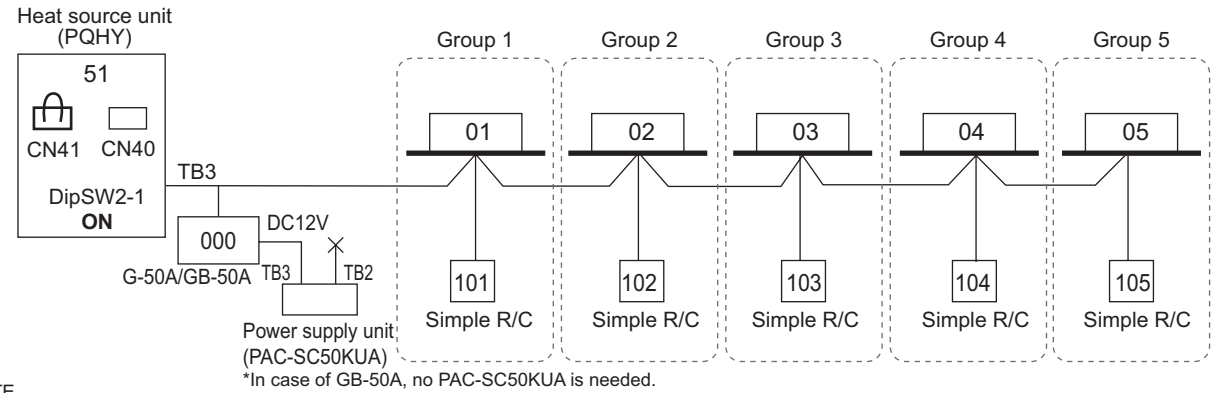
2-4-3-4. G-50A/GB-50A, TB7



*GB-50A doesn't need DC12V. No TB3 connection to power supply unit.

NOTE
- It is necessary to turn on the DipSW 2-1 on the heat source unit control board when the central controller is connected.
- Be sure to connect other controllers (Ex. G-50A) when the simple R/C is used because the running mode can not be changed by simple R/C.

2-4-3-5. G-50A/GB-50A, TB3

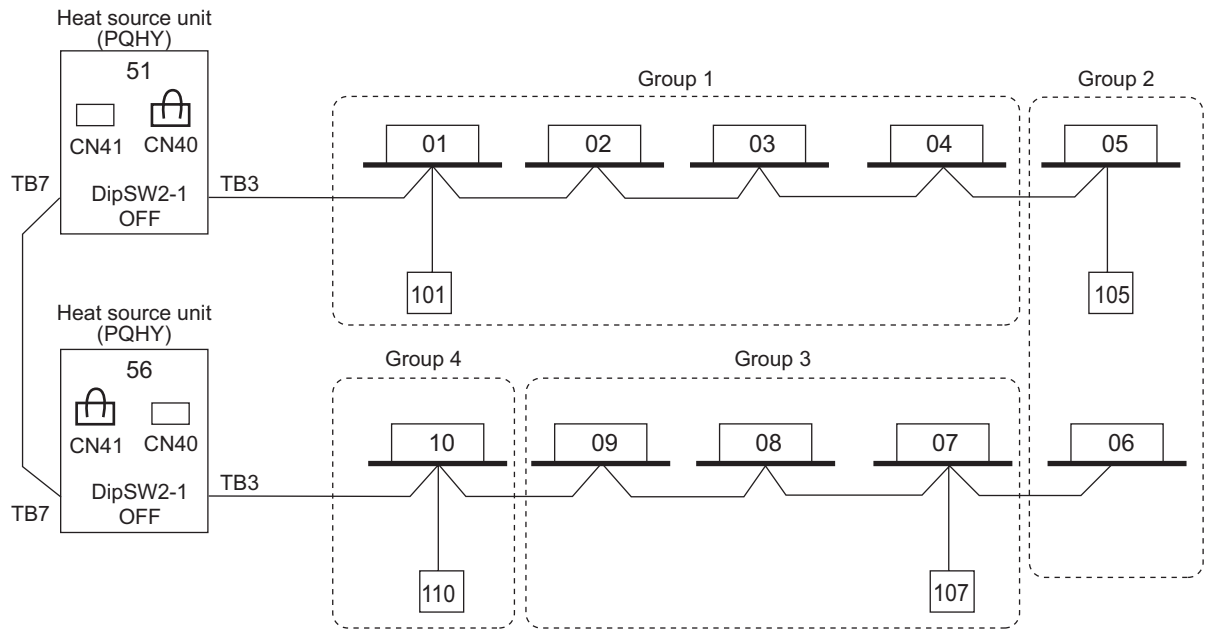


*In case of GB-50A, no PAC-SC50KUA is needed.

NOTE
- It is not necessary to connect the M-NET line between G-50A and Power supply unit (TB2) when G-50A is connected on the indoor line.
- No system controller should be connected to TB3 of PUMY. System controller for PUMY should always be connected to TB7 of PUMY with power supply unit PAC-SC50KUA together.

System WY/WR2

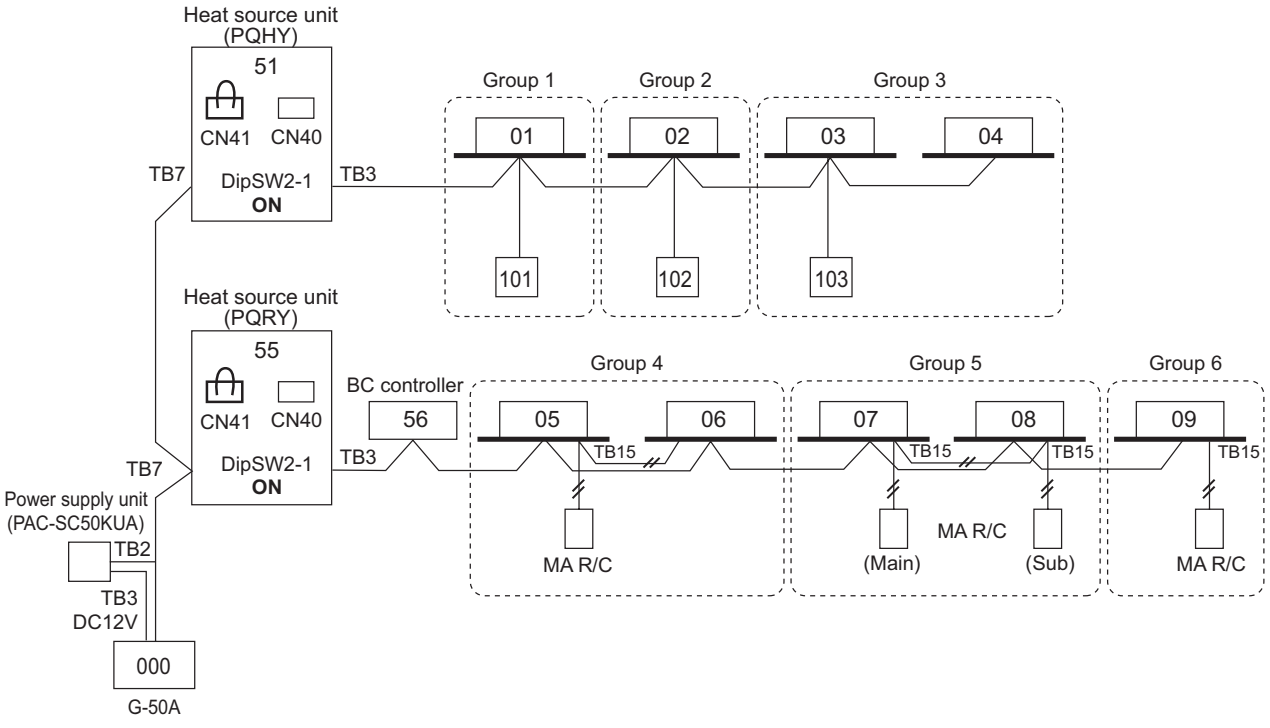
2-4-3-6. Grouping in different refrigerant system



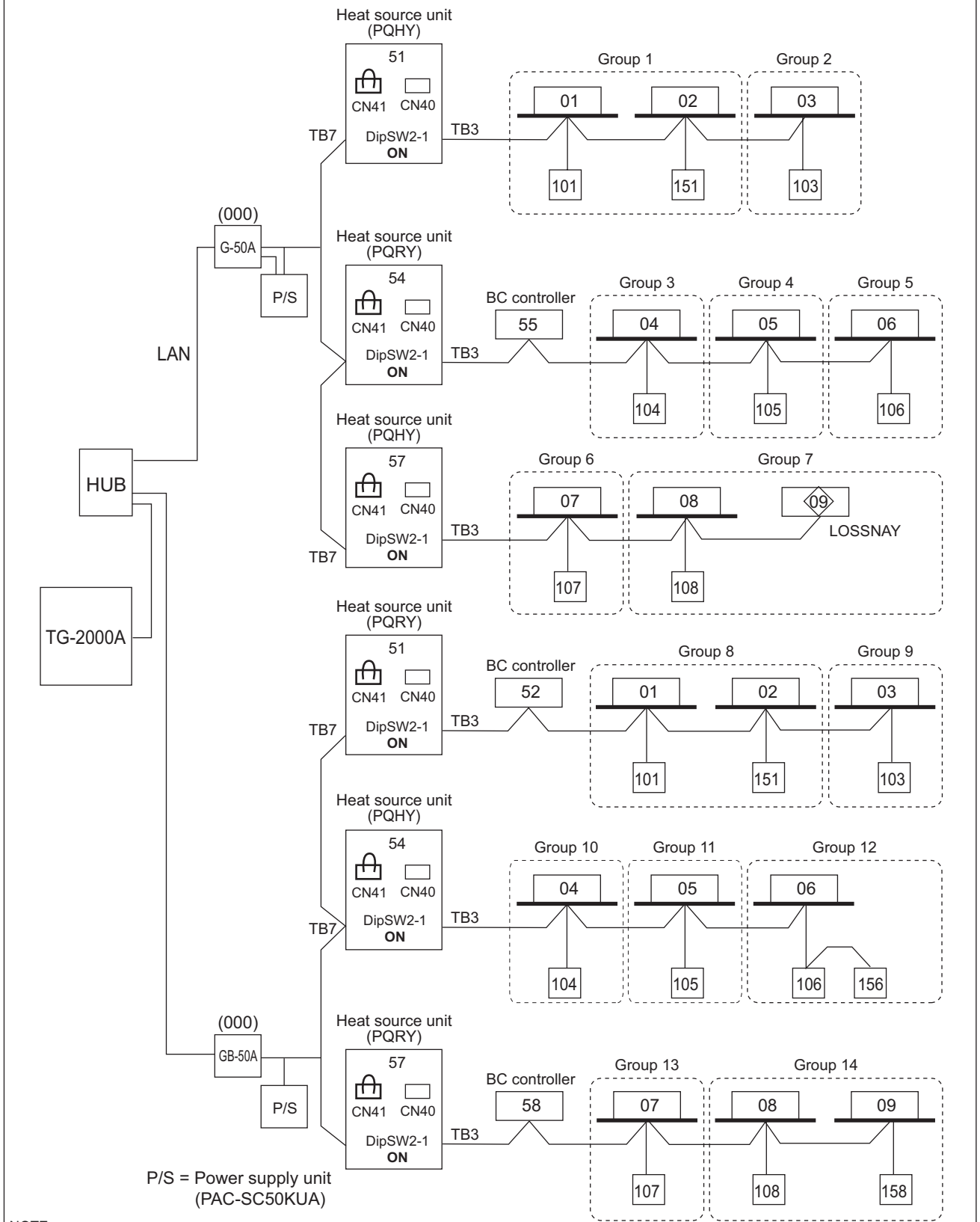
NOTE

- It is necessary to change the connecter to CN40 on the heat source unit control board (only one Heat source 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.

2-4-3-7. 2 Heat source units, G-50A, MA



2-4-3-8. TG-2000A+G-50A/GB-50A

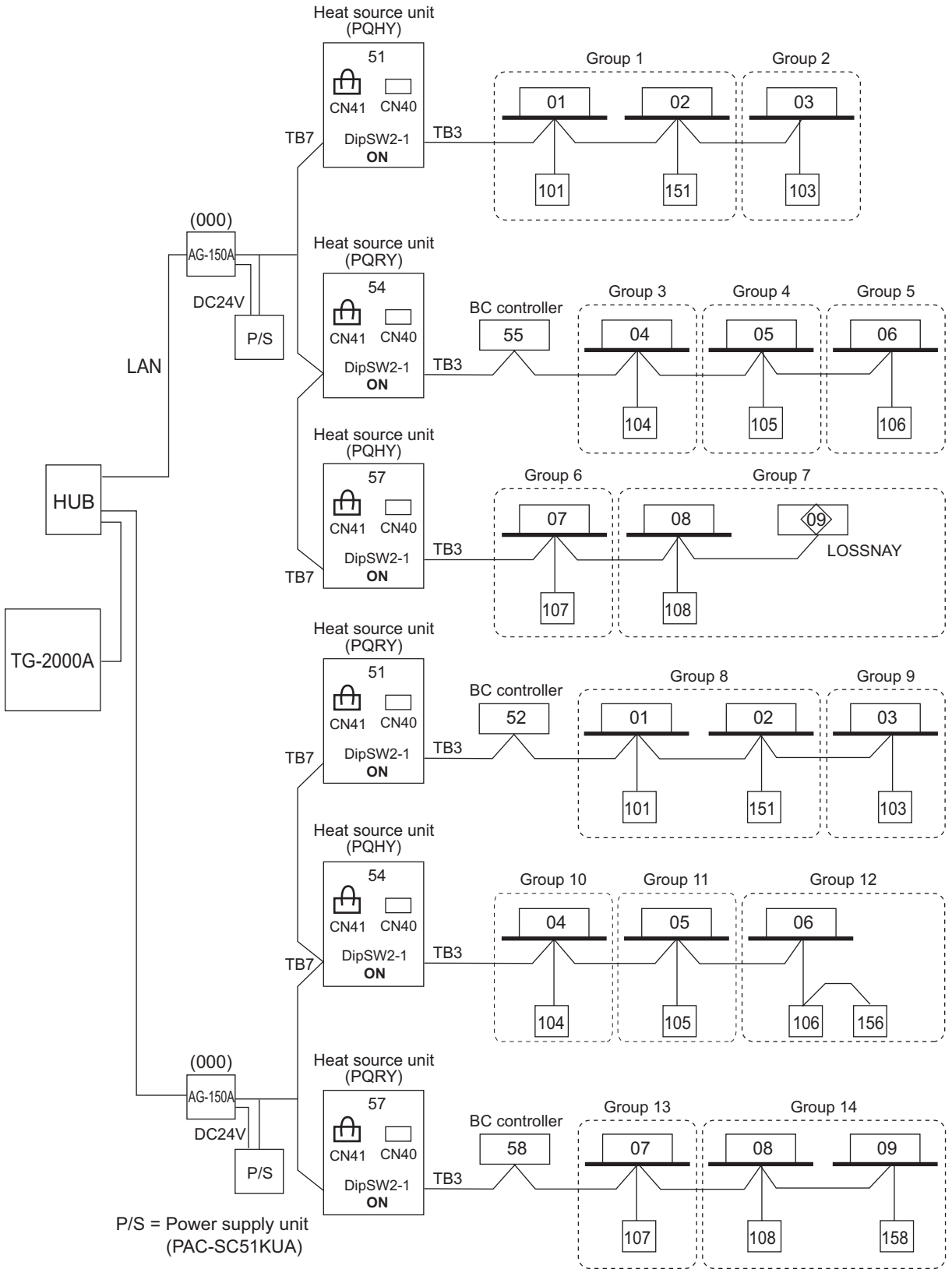


NOTE
- G-50A can control maximum 50 indoor units.
- TG-2000A can control maximum 40 G-50As.
- TG-2000A can control maximum 2000 indoor units.

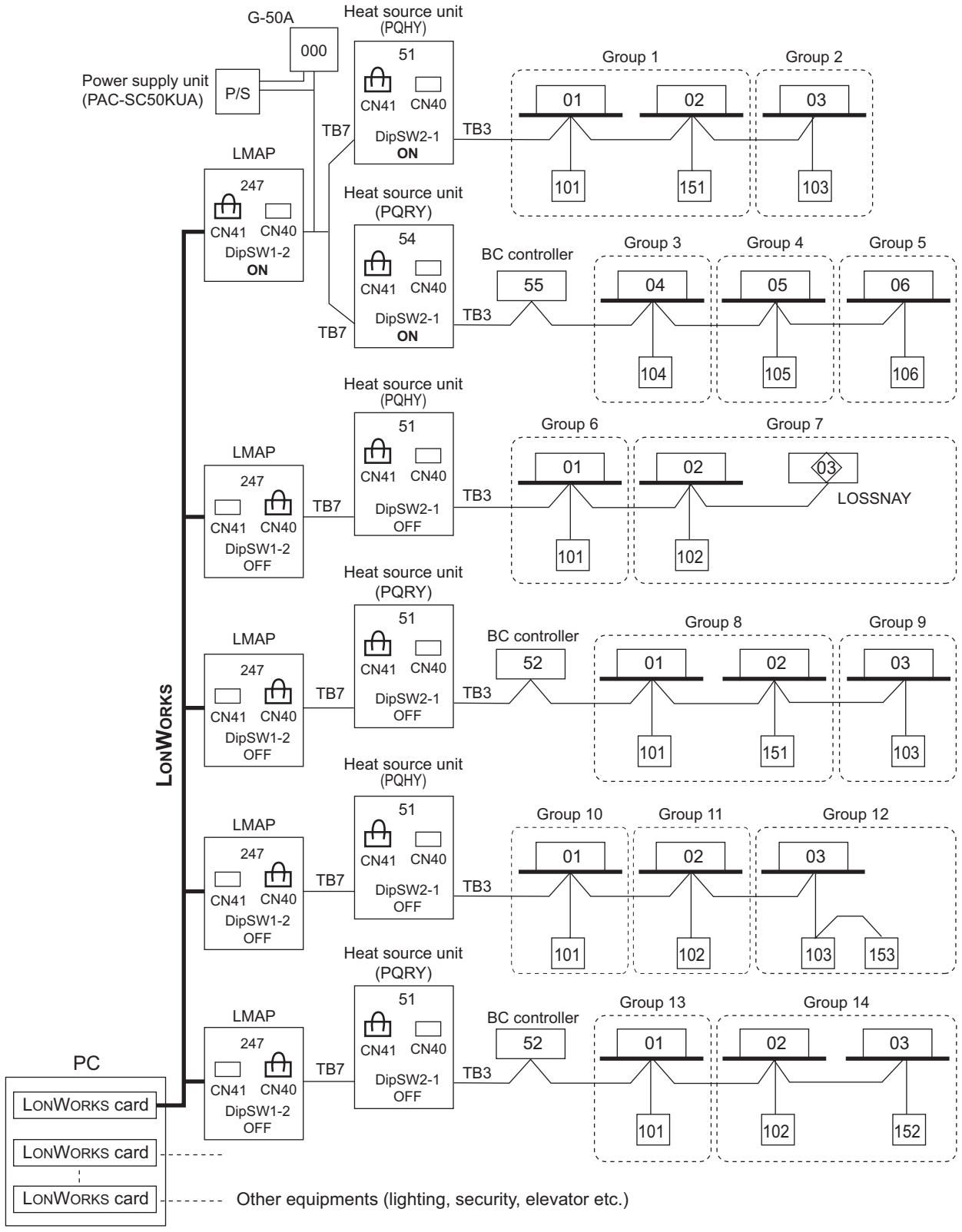
System WY/WR2

2-4-3-9. TG-2000A (Ver.5.5* series)+AG-150A (Ver.1** series)

AG-150A can control max. 50 indoor units;
TG-2000A can control max. 40 pieces of AG-150A;
TG-2000A can control max. 2000 indoor units.



2-4-3-10. LONWORKS



NOTE

- LMAP (LMAP03U) can control 50 indoor units .
- It is necessary to turn on the DipSW1-2 on the LMAP control board and the DipSW2-1 on the heat source unit control board with central controller (Power supply unit).
- It is necessary to change the connector to CN40 on the LMAP control board without central controllers (Power supply unit).

System WY/WR2

3-1. 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 Table 3-1, or You shall follow the local industrial standard. Pipes of radical thickness 0.7mm or less shall not be used.

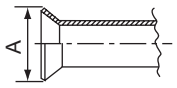
Table 3-1. Copper pipe size and radial thickness for R410A CITY MULTI.

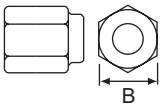
Size (mm)	Size (inch)	Radial thickness (mm)	Radial thickness (mil)	Pipe type
ø6.35	ø1/4"	0.8	[32]	Type-O
ø9.52	ø3/8"	0.8	[32]	Type-O
ø12.7	ø1/2"	0.8	[32]	Type-O
ø15.88	ø5/8"	1.0	[40]	Type-O
ø19.05	ø3/4"	1.2	[48]	Type-O
ø19.05	ø3/4"	1.0	[40]	Type-1/2H or H
ø22.2	ø7/8"	1.0	[40]	Type-1/2H or H
ø25.4	ø1"	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

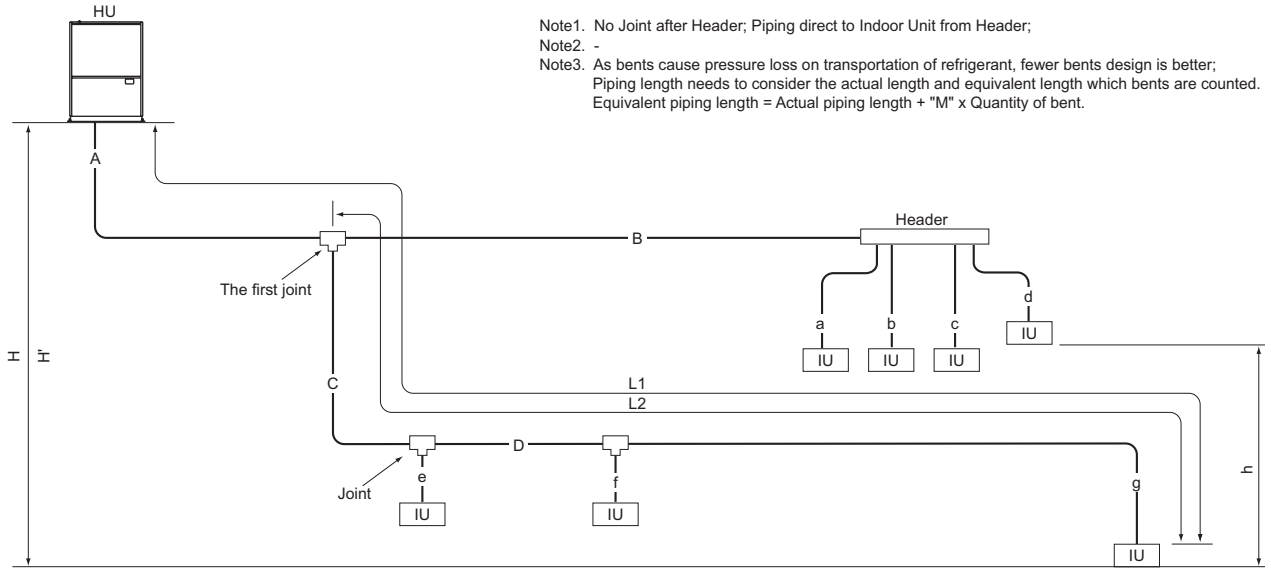
Due to the relative higher operation pressure of R410A compared to R22, the flare connection should follow dimensions mentioned below so as to achieve enough the air-tightness.

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

3-2. Piping Design

3-2-1. PQRY-P72,96TGMU Piping



Note1. No Joint after Header; Piping direct to Indoor Unit from Header;
Note2. -
Note3. As bents cause pressure loss on transportation of refrigerant, fewer bents design is better;
Piping length needs to consider the actual length and equivalent length which bents are counted.
Equivalent piping length = Actual piping length + "M" x Quantity of bent.

Fig. 3-2-1-1. PQHY-P72,96TGMU piping scheme

IU : Indoor unit , HU : Heat source unit

Table3-2-1-1. PQHY-P72,96TGMU's piping length limitation (m [ft.])

Item	Piping in the figure	Max. length	Max. equivalent length
Total piping length	A+B+C+D+a+b+c+d+e+f+g	300 [984]	-
Farthest IU from HU (L1)	A+C+D+g / A+B+d	150 [492]	175 [574]
Farthest IU from first Joint (L2)	C+D+g / B+d	40 [131]	40 [131]
Height between HU and IU (HU above IU)	H	50 [164]	-
Height between HU and IU (HU under IU)	H'	40 [131]	-
Height between IU and IU	h	15 [49]	-

IU: Indoor Unit; HU: PQHY-P72,96TGMU

Table3-2-1-2. PQHY-P-TGMU's bends equivalent length "M"

Outdoor Model	M (m/bends [ft./bends])
PQHY-P72TGMU	0.35 [1.15]
PQHY-P96TGMU	0.42 [1.38]

Table3-2-1-3. PQHY-P72,96TGMU's piping "A"size selection rule (mm [in.])

Heat source unit and the first Joint	Pipe(Liquid)	Pipe(Gas)
PQHY-P72TGMU=CMY-Y102S-G1	ø9.52 [3/8]	ø19.05 [3/4]
PQHY-P96TGMU=CMY-Y102L-G1	ø9.52 [3/8] *1	ø22.20 [7/8]

*1. "A">=90m [295ft.], ø12.7 [1/2"]

Table3-2-1-6. R410A Joint selection rule

Total down-stream Indoor capacity	Joint
~ P72	CMY-Y102S-G
P73 ~ P144	CMY-Y102L-G1
P145 ~ P234	CMY-Y202-G1

*Concerning detailed usage of Joint parts, refer to its Installation Manual.

Table3-2-1-4. PQHY-P72,96TGMU's piping"B","C","D"size selection rule (mm [in.])

Total down-stream Indoor capacity	Pipe(Liquid)	Pipe(Gas)
~ P54	ø9.52 [3/8]	ø15.88 [5/8]
P55 ~ P72	ø9.52 [3/8]	ø19.05 [3/4]
P73 ~ P108	ø9.52 [3/8]	ø22.20 [7/8]
P109 ~	ø12.70 [1/2]	ø28.58 [1-1/8]

Table3-2-1-7. R410A Header selection rule

	4-branch Header	8-branch Header	10-branch Header
	CMY-Y104-G	CMY-Y108-G	CMY-Y1010-G
Total down-stream Indoor capacity	<=P72	<=P144	<=P234

* CMY-Y104-G can directly connect PQHY-P72TGMU, but can NOT directly connect PQHY-P96TGMU or above;
* CMY-Y108-G can directly connect PQHY-P72TGMU;
* CMY-Y1010-G can directly connect PQHY-P72,P96TGMU;
* CMY-Y104-G can NOT connect P72,P96 Indoor, but CMY-Y108, Y1010-G can do;
* Concerning detailed usage of Header parts, refer to its Installation Manual.

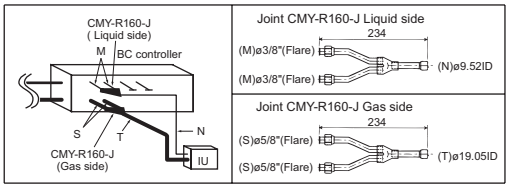
Table3-2-1-5. R410A Indoor's direct piping"a","b","c","d","e","f","g"size selection rule (mm [in.])

Indoor Unit size	Pipe(Liquid)	Pipe(Gas)
P06,P08,P12,P15,P18	ø6.35 [1/4]	ø12.70 [1/2]
P24,P27,P30,P36,P48,P54	ø9.52 [3/8]	ø15.88 [5/8]
P72	ø9.52 [3/8]	ø19.05 [3/4]
P96	ø9.52 [3/8]	ø22.20 [7/8]

Note4. Indoor capacity is described as its model size.
For example, PEFY-P08NMSU-E, its capacity is P08;
Note5. Total down-stream Indoor capacity is the summary of the model size of Indoors downstream.
For example, PEFY-P08NMSU-E+PEFY-P06NMSU-E: Total Indoor capacity=P08+P06=P14;
Note6. The pipe size determined by the Total down-stream indoor capacity is NOT necessary to be bigger than the up-stream one.
i.e. A>=B; A>=C>=D

3-2-2. PQRY-P72,96TGMU (with 1 BC controller) Piping

Fig. 3-2-2-4



Note1. No Header usable;
Note2. Indoor unit sized P72, P96 should be connected to BC controller via Y shape joint CMY-R160-J;
Note3. Indoor unit sized P72, P96 does NOT share BC controller ports with other Indoor units;
Note4. Piping length needs to consider the actual length and equivalent length which bents are counted.
Equivalent piping length = Actual piping length + "M" x Quantity of bent.

Fig. 3-2-2-1 PQRY-P72,96TGMU piping scheme

IU : Indoor unit , HU : Heat source unit

Table3-2-2-1. PQRY-P72,96TGMU's piping length limitation (m [ft.])

Item	Piping in the figure	Max. length	Max. equivalent length
Total piping length	A+B+a+b+c+d+e	300 [984] *2	-
Farthest IU from HU	A+e	150 [492]	175 [574]
Distance between HU and BC	A	110 [360] *2	110 [360] *2
Farthest IU from BC	e	40 [131] *3	40 [131] *3
Height between HU and IU (HU above IU)	H	50 [164]	-
Height between HU and IU (HU under IU)	H'	40 [131]	-
Height between IU and BC	h1	15(10) [49(32)] *1	-
Height between IU and IU	h2	15(10) [49(32)] *1	-

IU: Indoor Unit; HU: PQRY-P72,P96TGMU; BC: BC controller
*1. Height of Indoor sized P72, P96 from BC must be less than 10m [32ft.], if any;
*2. Total piping length can expand more than 300m [984ft.] till 400m [1312ft.], details refer to Fig.3-2-2-2;
*3. Farthest Indoor from BC controller "e" can exceed 40m [131ft.] till 60m [196ft.] if no Indoor sized P72, P96 connected. Details refer to Fig. 3-2-2-3.

Table3-2-2-2. PQRY-P-TGMU's bends equivalent length "M"

Outdoor Model	M (m/bends [ft./bends])
PQRY-P72TGMU	0.35 [1.15]
PQRY-P96TGMU	0.42 [1.38]

Table3-2-2-3. PQRY-P-TGMU's piping "A"size selection rule (mm [in.])

Outdoor and BC controller	Pipe(Low press.)	Pipe(High press.)
PQRY-P72TGMU=CMB-P-NU-G(A)	ø15.88 [5/8]	ø19.05 [3/4]
PQRY-P96TGMU=CMB-P-NU-G(A)	ø19.05 [3/4]	ø22.20 [7/8]

Fig. 3-2-2-2 PQRY-P-TGMU's total piping length

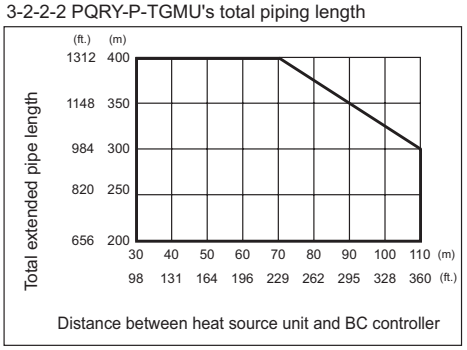
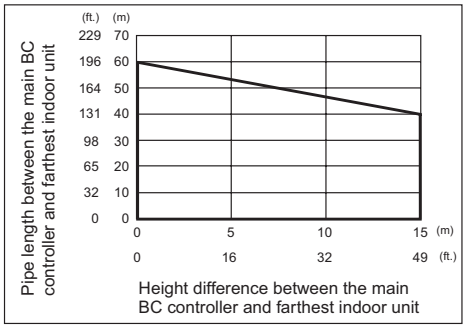


Fig. 3-2-2-3 Piping length and height between Indoor and BC controller



Note5. Indoor capacity is described as its model size.
For example, PEFY-P08NMSU-E, its capacity is P08;
Note6. Total down-stream Indoor capacity is the summary of the model size of Indoors downstream.
For example, PEFY-P08NMSU-E+PEFY-P06NMSU-E: Total Indoor capacity=P08+P06=P14.

Table3-2-2-4. PQRY-P-TGMU's piping"B"size selection rule (mm [in.])

Total down-stream Indoor capacity	Pipe(Liquid)	Pipe(Gas)
~ P54	ø9.52 [3/8]	ø15.88 [5/8]

Table3-2-2-5. R410A Indoor's direct piping "a","b","c","d","e" size selection rule (mm [in.])

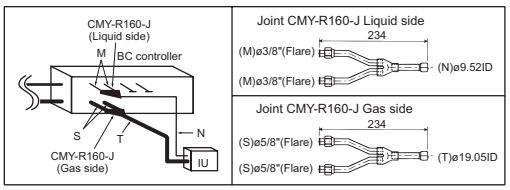
Indoor Unit size	Pipe(Liquid)	Pipe(Gas)
P06,P08,P12,P15,P18	ø6.35 [1/4]	ø12.70 [1/2]
P24,P27,P30,P36,P48,P54	ø9.52 [3/8]	ø15.88 [5/8]
P72 *1	ø9.52 [3/8]	ø19.05 [3/4]
P96 *1	ø9.52 [3/8]	ø22.20 [7/8]

*1. CMY-R160-J is used to combine two ports of BC controller for the Indoor sized P72,P96.

System WY/WR2

3-2-3. PQRY-P72,96TGMU (with 2 or 3 BC controllers)

Fig. 3-2-3-4



Note1. No Header usable;
Note2. Indoor unit sized P72, P96 should be connected to BC controller via Y shape joint CMY-R160-J;
Note3. Indoor unit sized P72, P96 does NOT share BC controller ports with other Indoor units;
Note4. Piping length needs to consider the actual length and equivalent length which bents are counted.
Equivalent piping length = Actual piping length + "M" x Quantity of bent.

Fig. 3-2-3-1 PQRY-P72,96TGMU piping scheme

IU : Indoor unit , HU : Heat source unit

Table3-2-3-1. PQRY-P72,96TGMU's piping length limitation (m [ft.])

Item	Piping in the figure	Max. length	Max. equivalent length
Total piping length	A+B+C+a+b+c+d+e	300 [984] *2	-
Farthest IU from HU	A+C+e	150 [492]	175 [574]
Distance between HU and BC	A	110 [360] *2	110 [360] *2
Farthest IU from BC (Main/Sub)	B+d / e	40 [131] *3	40 [131] *3
Height between HU and IU (HU above IU)	H	50 [164]	-
Height between HU and IU (HU under IU)	H'	40 [131]	-
Height between IU and BC (Main/Sub)	h1	15(10) [49(32)] *1	-
Height between IU and IU	h2	15(10) [49(32)] *1	-
Height between BC(Main) and BC(Sub)	h3	15(10) [49(32)] *1*4	-

Table3-2-3-2. PQRY-P-TGMU's bends equivalent length "M"

Outdoor Model	M (m/bends [ft./bends])
PQRY-P72TGMU	0.35 [1.15]
PQRY-P96TGMU	0.42 [1.38]

IU: Indoor Unit; HU: PQRY-P72,96TGMU; BC: BC controller
*1. Height of Indoor sized P72, P96 from BC must be less than 10m, if any;
*2. Total piping length can expand more than 300m [984ft.] till 400m [1312ft.], details refer to Fig.3-2-3-2;
*3. Farthest Indoor from BC controller "e" can exceed 40m [131ft.] till 60m [196ft.] if no Indoor sized P72, P96 connected. Details refer to Fig. 3-2-3-3;
*4. When using 2 Sub BC controllers, max. height "h2" should be considered.

Fig. 3-2-3-2 PQRY-P-TGMU's total piping length

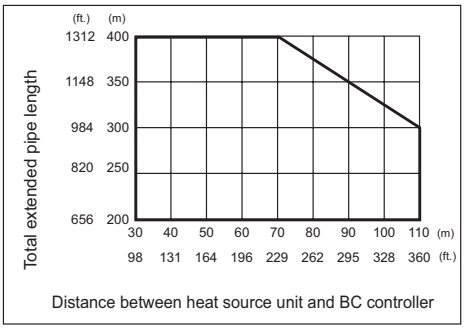
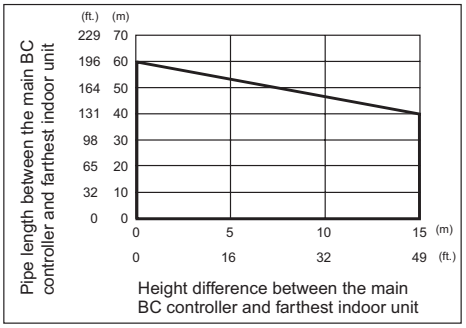


Fig. 3-2-3-3 Piping length and height between Indoor and BC controller



Note5. Indoor capacity is described as its model size.
For example, PEFY-P08NMSU-E, its capacity is P08;
Note6. Total down-stream Indoor capacity is the summary of the model size of Indoors downstream.
For example, PEFY-P08NMSU-E+PEFY-P06NMSU-E: Total Indoor capacity=P08+P06=P14.

Table3-2-3-3. PQRY-P-TGMU's piping "A"size selection rule (mm [in.])

Outdoor and BC controller	Pipe(Low press.)	Pipe(High press.)
PQRY-P72TGMU=CMB-P-NU-G(A)	ø15.88 [5/8]	ø19.05 [3/4]
PQRY-P96TGMU=CMB-P-NU-G(A)	ø19.05 [3/4]	ø22.20 [7/8]

Table3-2-3-4. PQRY-P-TGMU's piping"B"size selection rule (mm [in.])

Total down-stream Indoor capacity	Pipe(Liquid)	Pipe(Gas)
~ P54	ø9.52 [3/8]	ø15.88 [5/8]

Table3-2-3-5. PQRY-P-TGMU's piping"C"size selection rule (mm [in.])

Total down-stream Indoor capacity	Pipe(Liquid)	Pipe(HP Gas)	Pipe(LP Gas)
~ P72	ø9.52 [3/8]	ø15.88 [5/8]	ø19.05 [3/4]
P73 ~ P108	ø9.52 [3/8]	ø19.05 [3/4]	ø22.20 [7/8]
P109 ~ P126	ø12.70 [1/2]	ø19.05 [3/4]	ø28.58 [1-1/8]

* HP: High pressure ; LP: Low pressure

Table3-2-3-6. R410A Indoor's direct piping "a","b","c","d","e" size selection rule (mm [in.])

Indoor Unit size	Pipe(Liquid)	Pipe(Gas)
P06,P08,P12,P15,P18	ø6.35 [1/4]	ø12.70 [1/2]
P24,P27,P30,P36,P48,P54	ø9.52 [3/8]	ø15.88 [5/8]
P72 *1	ø9.52 [3/8]	ø19.05 [3/4]
P96 *1	ø9.52 [3/8]	ø22.20 [7/8]

*1. CMY-R160-J is used to combine two ports of BC controller for the Indoor sized P72,P96.

System WY/WR2

3-3. Refrigerant charging calculation

3-3-1. PQHY-P-TGMU

(1) Original charge of refrigerant and the maximum total charge.

At factory shipment, refrigerant are charged in the Heat source unit as shown at Table3-3-1. When extending the piping in the field, additional charge of refrigerant is needed. Yet, the maximum total charge in the air conditioner system should not be exceeded. The maximum additional charge varies on models, shown as at Table3-3-1.

Table 3-3-1

PQHY-P-TGMU		P72	P96
Original charge	A (kg) [A'(oz)]	7.0 [247]	8.0 [282]
Maximum total charge	B (kg) [B'(oz)]	40.0 [1411]	40.0 [1411]
Maximum additional charge	C (kg) [C'(oz)]	33.0 [1164]	32.0 [1129]

(2) Calculate the additional charge for the air conditioner system in the field.

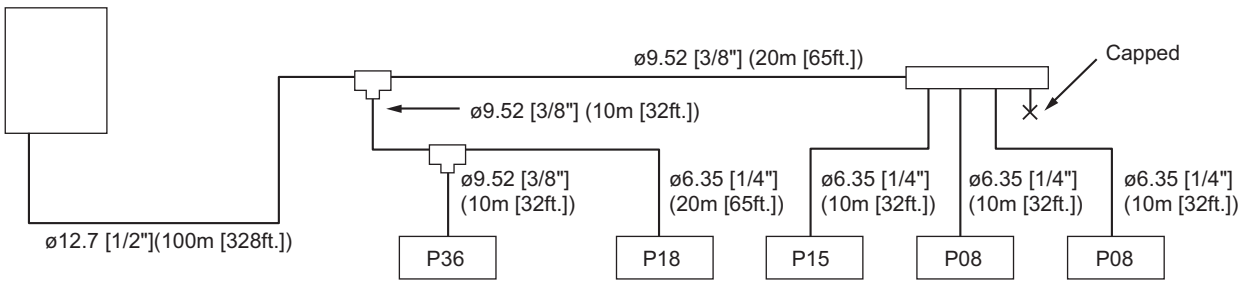
The additional charge (F kg [F'(oz)]) is calculated using the formula below, base on the length and size of the liquid pipes in the system. F(F') should be rounded up to 0.1(1) digital, like 10.52 → 10.6 kg(371.2 → 372oz). Yet, if F(F') results bigger than C(C'), the additional charge is the maximum additional charge C(C').

F (kg) =(0.12xLe) +(0.06xLf) +(0.024xLg) + D
F' (oz) =(1.29xLe') +(0.65xLf') +(0.26xLg') + D'

Where Le (m) [Le'(ft.)] : Length of liquid pipe sized ø12.7 [1/2"]
Lf (m) [Lf'(ft.)] : Length of liquid pipe sized ø9.52 [3/8"]
Lg (m) [Lg'(ft.)] : Length of liquid pipe sized ø6.35 [1/4"]
D (kg) [D'(oz)] : Additional charge of refrigerant required by the total capacity of indoor units in the refrigerant system.

Total capacity of indoor units connected	~60	61~126	127~180
D (kg) [D'(oz)]	1.5 [53]	2.0 [71]	2.5 [89]

Example: PQHY-P96TGMU



This calculation concerns only the liquid pipes.

Le (ø12.7) : 100m [Le' (1/2") : 328ft.]
Lf (ø9.52) : 10m + 20m + 10m = 40m [Lf' (3/8") : 32ft. + 65ft. + 32ft. = 129ft.]
Lg (ø6.35) : 20m + 10m + 10m + 10m = 50m [Lg' (1/4") : 65ft. + 32ft. + 32ft. + 32ft. = 161ft.]

Total capacity of indoor units connected:

36 + 18 + 15 + 08 + 08 = 85

Therefore, D = 2.0kg [D'=71oz]

Calculation of additional amount :

F (kg) = (0.12 x 100)+(0.06 x 40)+(0.024 x 50)+2.0 = 17.6 kg
F<C=32.0 kg
Therefore, F=17.6 kg

F'(oz) = (1.29 x 328)+(0.65 x 129)+(0.26 x 161)+71=619.8≒620 oz
F'<C'=1129 oz
Therefore, F'=620 oz

System WY/WR2

3-3-2. PQRY-P-TGMU

(1) Original charge of refrigerant and the maximum total charge.

At factory shipment, refrigerant are charged in the heat source unit as shown at Table3-3-2. When extending the piping in the field, additional charge of refrigerant is needed. Yet, the maximum total charge in the air conditioner system should not be exceeded. The maximum additional charge varies on models, shown as at Table3-3-2.

Table 3-3-2

PQRY-P-TGMU		P72	P96
Original charge	A (kg) [A'(oz)]	7.5 [265]	8.5 [300]
Maximum total charge	B (kg) [B'(oz)]	51.7 [1823]	51.7 [1823]
Maximum additional charge	C (kg) [C'(oz)]	44.2 [1558]	43.2 [1523]

(2) Calculate the additional charge for the air conditioner system in the field.

The additional charge (F kg[F'(oz)] is calculated using formula below, based on the length and size of
high pressure refrigerant pipes between Outdoor and BC controller,
high pressure refrigerant pipes between BC controllers, and
liquid pipes between BC controller and Indoor.

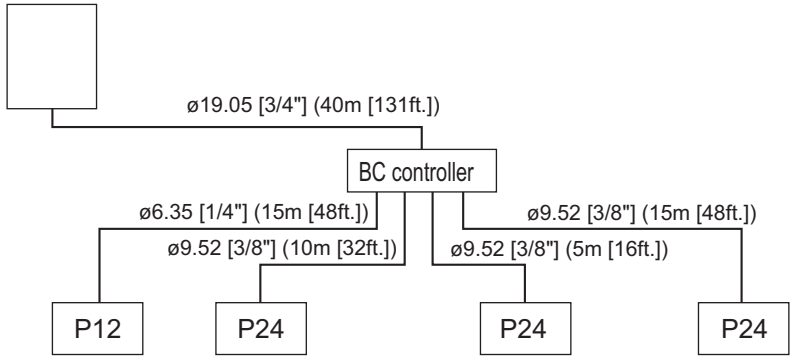
F (F') should be rounded up to 0.1(1) digital, like 10.52 → 10.6kg(371.2 → 372oz).

F (kg) = (0.16xLc) +(0.11xLd) +(0.12xLe) +(0.06xLf) +(0.024xLg) +D +E
F'(oz) = (1.72xLc') +(1.18xLd') +(1.29xLe') +(0.65xLf') +(0.26xLg') +D' +E'

Where
Lc(m) [Lc'(ft.)] : Length of high pressure pipe sized ø19.05 [3/4"]
Ld(m) [Ld'(ft.)] : Length of high pressure pipe sized ø15.88 [5/8"]
Le(m) [Le'(ft.)] : Length of liquid pipe sized ø12.7 [1/2"]
Lf (m) [Lf'(ft.)] : Length of liquid pipe sized ø9.52 [3/8"]
Lg(m) [Lg'(ft.)] : Length of liquid pipe sized ø6.35 [1/4"]
D(kg) [D'(oz)] : Additional charge of refrigerant required by the total capacity of indoor units in the refrigerant system.
E(kg) [E'(oz)] : Additional charge of refrigerant required by the BC controller (Sub).
F(kg) [F'(oz)] : The additional charge.

Total capacity of indoor units connected	~60	61~126	127~180
D (kg) [D'(oz)]	1.5 [53]	2.0 [71]	2.5 [89]
E (kg) [E'(oz)]	One BC controller (Sub), E=1.0kg; [E'=36oz] ; More than 1 BC controller (Sub), E=2.0kg [E'=71oz]		

Example: PQRY-P96TGMU



This calculation concerns only the high pressure (liquid) pipes.

Lc(ø19.05) : 40m [Lc' (3/4") : 131ft.]
Lf (ø9.52) : 10m + 5m + 15m = 30m [Lf' (3/8") : 32ft.+16ft.+48ft.=96ft.]
Lg(ø6.35) : 15m [Lg' (1/4") : 48ft.]

Total capacity of indoor units connected:

12 + 24 + 24 + 24 = 84

Therefore, D = 2.0kg E = 0.0kg
[D'= 71oz E'= 0.0oz]

Calculation of additional amount :

F(kg)=(0.16x40)+(0.06x30)+(0.024x15)+2.0=10.56 kg≒10.6 kg
F<C=43.2 kg
Therefore, F=10.6 kg

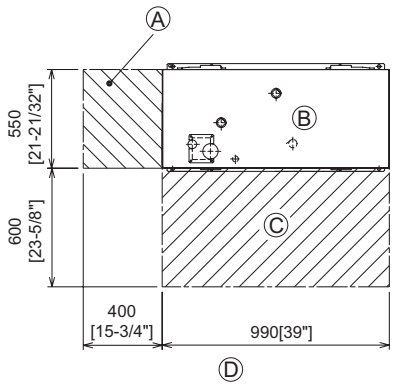
F'(oz)=(1.72x131)+(0.65x96)+(0.26x48)+71=371.2 oz ≒ 372 oz
F'<C'=1523 oz
Therefore, F'=372 oz

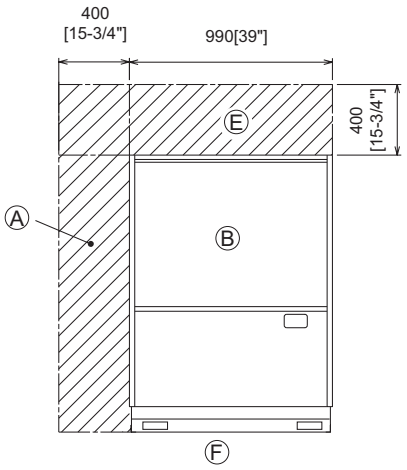
System WY/WR2

4-1. Requirement on installation site

1. No direct thermal radiation to the unit.
2. No possibility of annoying the neighbors by the sound of the unit.
3. Avoid the sites where strong winds blow.
4. With strength to bear the weight of the unit.
5. Drain flow from the unit is cared at heating mode.
6. Enough space for installation and service as shown at 4-2.
7. Avoid the sites where acidic solutions or chemical sprays (sulfur series) are used frequently.
8. The unit should be secure from combustible gas, oil, steam, chemical gas like acidic solution, sulfur gas and so on.

4-2. Spacing





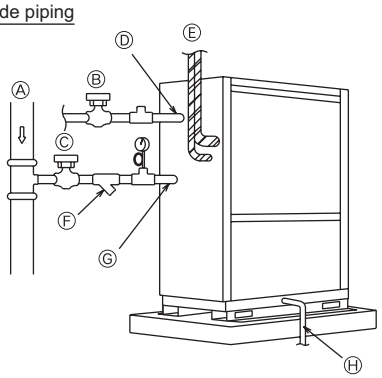
Ⓐ Piping space (for side piping)
Ⓑ Heat source unit
Ⓒ Service space (front side)
Ⓓ (Top view)
Ⓔ Piping space
Ⓕ Front view

System WY/WR2

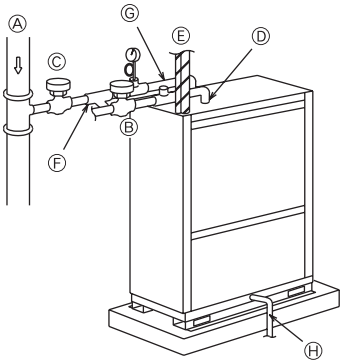
4-3. Piping direction

[Fig. 4.3]
<Model : P72·96>

Side piping



Top piping



Ⓐ Water circulation pipe
Ⓑ Close valve
Ⓒ Close valve
Ⓓ Water outlet
Ⓔ Refrigerant piping
Ⓕ Y-type strainer
Ⓖ Water inlet
Ⓗ Drain pipe

1. Insulation installation

With City Multi WY/ WR2 Series piping, as long as the temperature range of the circulating water is kept to average temperatures year-round (29.4°C[85°F] in the summer, 21.1°C[70°F] in the winter), there is no need to insulate or otherwise protect indoor piping from exposure. You should use insulation in the following situations:
• Any heat source piping.
• Indoor piping in cold-weather regions where frozen pipes are a problem.
• When air coming from the outside causes condensation to form on piping.
• Any drainage piping.

2. Water processing and water quality control

To preserve water quality, use the closed type of cooling tower for WY/ WR2. When the circulating water quality is poor, the water heat exchanger can develop scales, leading to a reduction in heat-exchange power and possible corrosion of the heat exchanger. Please pay careful attention to water processing and water quality control when installing the water circulation system.
• Removal of foreign objects or impurities within the pipes.
During installation, be careful that foreign objects, such as welding fragments, sealant particles, or rust, do not enter the pipes.
• Water Quality Processing
① Depending on the quality of the cold-temperature water used in the air conditioner, the copper piping of the heat exchanger may become corroded. We recommend regular water quality processing.
Cold water circulation systems using open heat storage tanks are particularly prone to corrosion.
When using an open-type heat storage tank, install a water-to-water heat exchanger, and use a closed-loop circuit on the air conditioner side. If a water supply tank is installed, keep contact with air to a minimum, and keep the level of dissolved oxygen in the water no higher than 1mg/ℓ.
② Water quality standard

Items			Lower mid-range temperature water system		Tendency	
			Recirculating water [20<T<60°C] [68<T<140°F]	Make-up water	Corrosive	Scale-forming
Standard items	pH (25°C)[77°F]		7.0 ~ 8.0	7.0 ~ 8.0	○	○
	Electric conductivity (mS/m) (25°C)[77°F] (μS/cm) (25°C)[77°F]		30 or less [300 or less]	30 or less [300 or less]	○	○
	Chloride ion	(mg Cl^-/ ℓ)	50 or less	50 or less	○	
	Sulfate ion	(mg SO_4^{2-}/ ℓ)	50 or less	50 or less	○	
	Acid consumption (pH4.8)	(mg $CaCO_3$/ ℓ)	50 or less	50 or less		○
	Total hardness	(mg $CaCO_3$/ ℓ)	70 or less	70 or less		○
	Calcium hardness	(mg $CaCO_3$/ ℓ)	50 or less	50 or less		○
	Ionic silica	(mg SiO_2/ ℓ)	30 or less	30 or less		○
Reference items	Iron	(mg Fe/ ℓ)	1.0 or less	0.3 or less	○	○
	Copper	(mg Cu/ ℓ)	1.0 or less	0.1 or less	○	
	Sulfide ion	(mg S^{2-}/ ℓ)	not to be detected	not to be detected	○	
	Ammonium ion	(mg NH_4^+/ ℓ)	0.3 or less	0.1 or less	○	
	Residual chlorine	(mg Cl/ ℓ)	0.25 or less	0.3 or less	○	
	Free carbon dioxide	(mg CO_2/ ℓ)	0.4 or less	4.0 or less	○	
	Ryzner stability index		–	–	○	○

Reference : Guideline of Water Quality for Refrigeration and Air Conditioning Equipment. (JRA GL02E-1994)

③ Please consult with a water quality control specialist about water quality control methods and water quality calculations before using anti-corrosive solutions for water quality management.
④ When replacing a previously installed air conditioning device (even when only the heat exchanger is being replaced), first conduct a water quality analysis and check for possible corrosion.
Corrosion can occur in cold-water systems even if there has been no prior signs of corrosion. If the water quality level has dropped, please adjust water quality sufficiently before replacing the unit.

5. Caution for refrigerant leakage

The installer and/or air conditioning system specialist shall secure safety against refrigerant leakage according to local regulations or standards.
The following standard may be applicable if no local regulation or standard is available.

5-1. Refrigerant property

R410A refrigerant is harmless and incombustible. The R410A is heavier than the indoor air in density. Leakage of the refrigerant in a room has possibility to lead to a hypoxia situation. Therefore, the Critial concentration specified below shall not be exceeded even if the leakage happens.

- **Critical concentration**

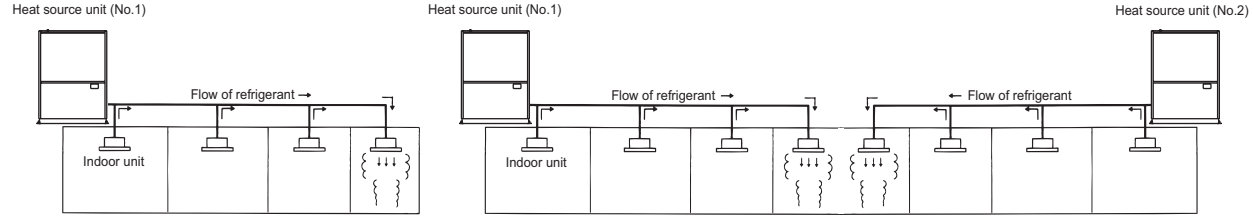
Critical concentration hereby is the refrigerant concentration in which no human body would be hurt if immediate measures can be taken when refrigerant leakage happens.

Critical concentration of R410A: 0.30kg/m^3
(The weight of refrigeration gas per 1 m^3 air conditioning space.);
* The Critical concentration is subject to ISO5149, EN378-1.

For the CITY MULTI system, the concentration of refrigerant leaked should not have a chance to exceed the Critical concentration in any situntion.

5-2. Confirm the Critical concentration and take countermeasure

The maximum refrigerant leakage concentration (Rmax) is defined as the result of the possible maximum refrigerant weight (Wmax) leaked into a room divided by its room capacity (V). It is referable to Fig. 5-1. The refrigerant of Heat source unit here includes its original charge and additional charge at the site.
The additional charge is calculated according to **"3-3 Refrigerant charging calculation"**, and shall not be over charged at the site. Procedure 5-2-1~3 tells how to confirm maximum refrigerant leakage concentration (Rmax) and how to take countermeasures against a possible leakage.



Maximum refrigerant leakage concentration (Rmax)
Rmax=Wmax / V (kg/m^3)

Maximum refrigerant leakage concentration (Rmax)
Rmax=Wmax / V (kg/m ^{3}) W1: Refrigerant weight of Heat source unit No.1
where, Wmax=W1+W 2 W2: Refrigerant weight of Heat source unit No.2

Fig. 5-1 The maximum refrigerant leakage concentration

5-2-1. Find the room capacity (V),
If a room having total opening area more than 0.15% of the floor area at a low position with another room/space, the two rooms/space are considered as one. The total space shall be added up.
5-2-2. Find the possible maximum leakage (Wmax) in the room. If a room has Indoor unit(s) from more than 1 Heat source unit, add up the refrigerant of the Heat source units.
5-2-3. Divide (Wmax) by (V) to get the maximum refrigerant leakage concentration (Rmax).
5-2-4. Find if there is any room in which the maximum refrigerant leakage concentration (Rmax) is over 0.30kg/m^3.
If no, then the CITY MULTI is safe against refrigerant leakage.
If yes, following countermeasure is recommended to do at site.
Countermeasure 1: Let-out (making V bigger)
Design an opening of more than 0.15% of the floor area at a low position of the wall to let out the refrigerant whenever leaked.
e.g. make the upper and lower seams of door big enough.
Countermeasure 2: Smaller total charge (making Wmax smaller)
e.g. Avoid connecting more than 1 Heat source unit to one room.
e.g. Using smaller model size but more Heat source units.
e.g. Shorten the refrigerant piping as much as possible.
Countermeasure 3: Fresh air in from the ceiling (Ventilation)
As the density of the refrigerant is bigger than that of the air. Fresh air supply from the ceiling is better than air exhausting from the ceiling. Fresh air supply solution refers to Fig. 5-2~4.

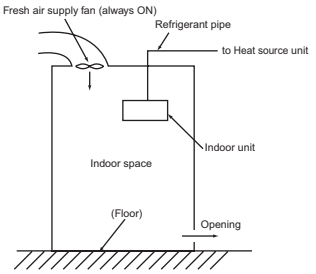


Fig.5-2. Fresh air supply always ON

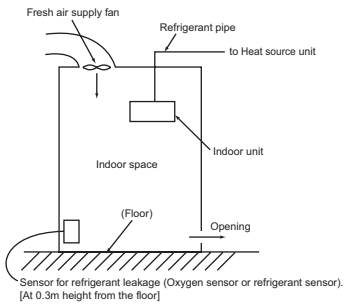


Fig.5-3. Fresh air supply upon sensor action

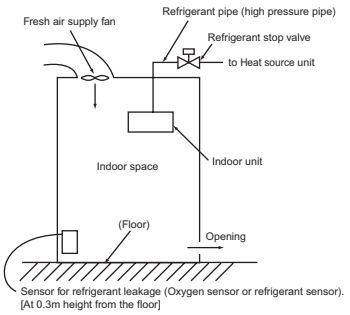


Fig.5-4. Fresh air supply and refrigerant shut-off upon sensor action

Note 1. Countermeasure 3 should be done in a proper way in which the fresh air supply shall be on whenever the leakage happens.
Note 2. In principle, MITSUBISHI ELECTRIC requires proper piping design, installation and air-tight testing after installation to avoid leakage happening.
In the area should earthquake happen, anti-vibration measures should be fully considered.
The piping should consider the extension due to the temperature variation.

CITY MULTI U5
R410A Series

DATA BOOK

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