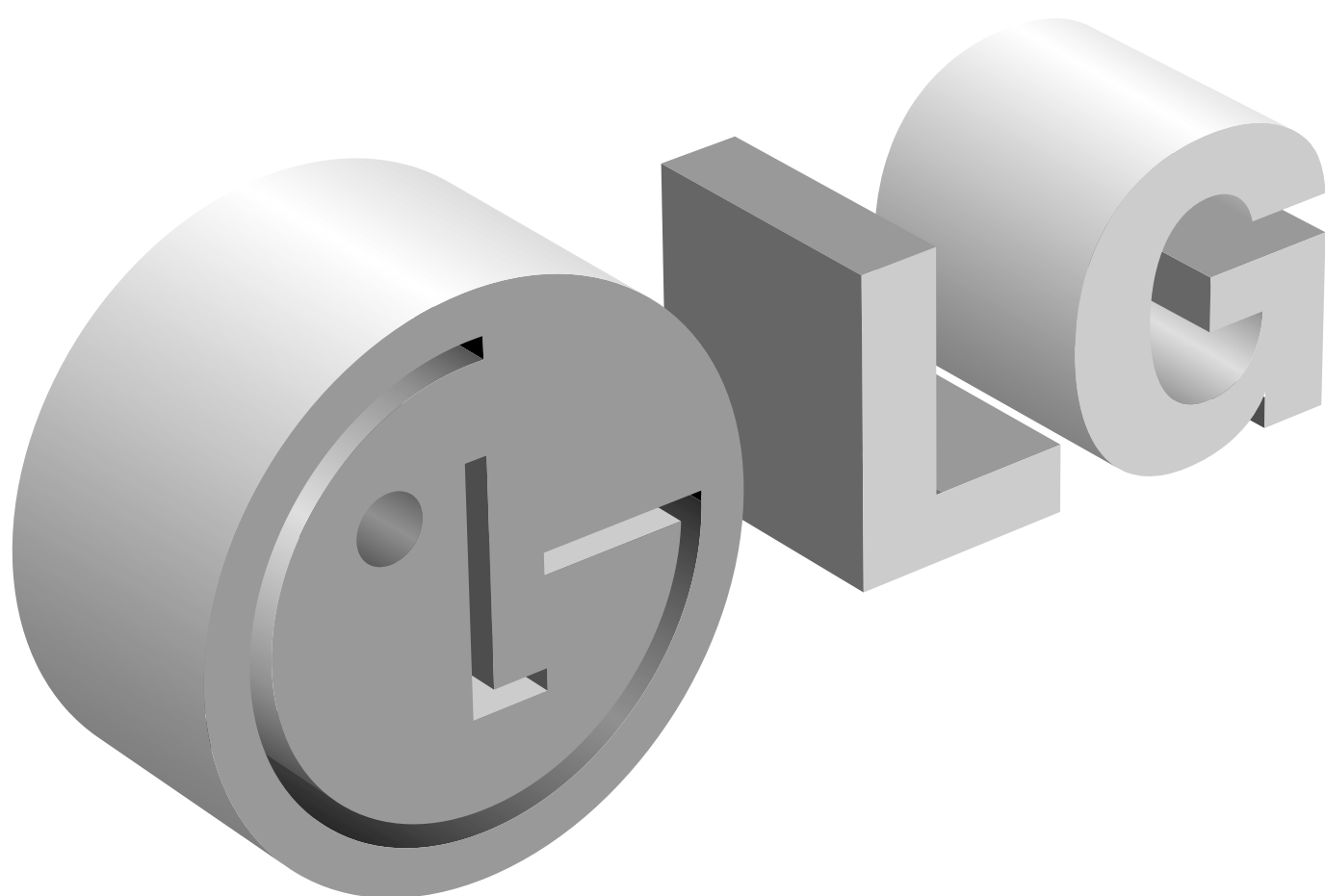


Technical Guide Book **(VRF 4.5HP)**



LG Electronics / Digital Appliance Company

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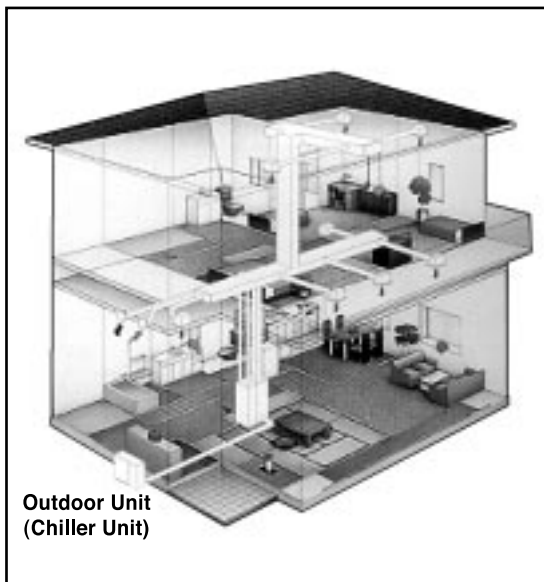
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1. GENERAL INFORMATION

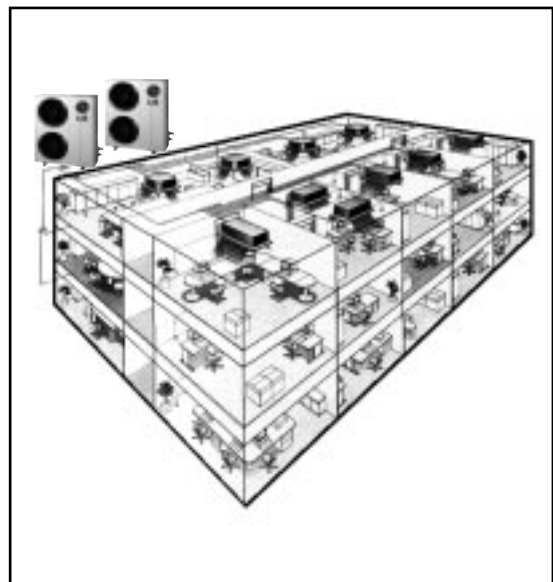
Building Multi system(VRF) is an air conditioning system for commercial building application with sophisticated individual zone control.

DUCT (VAV)



VAV : Variable Air Volume

Multi-A/C (VRF)



VRF : Variable Refrigerant Flow

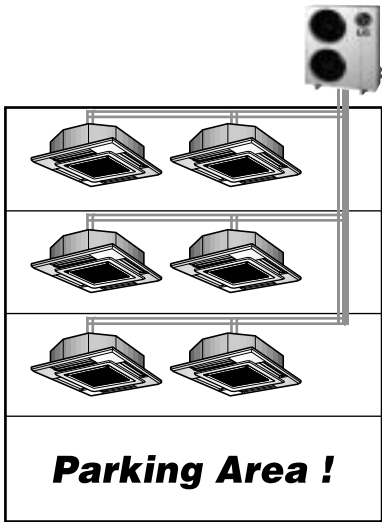
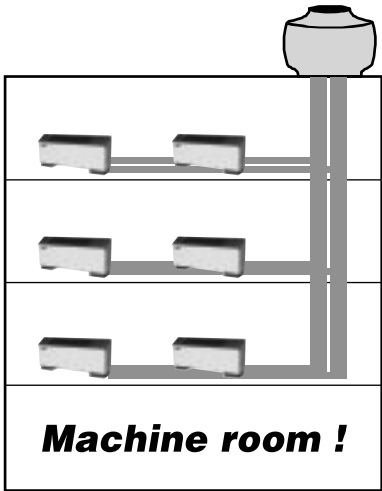


**Low Efficiency, High Cost
& High Noise**

**Heat Pump
Multi-A/C**

**High Efficiency, Low Cost
& Low Noise**

1. GENERAL INFORMATION

LG' 4.5HP VRF vs Chiller

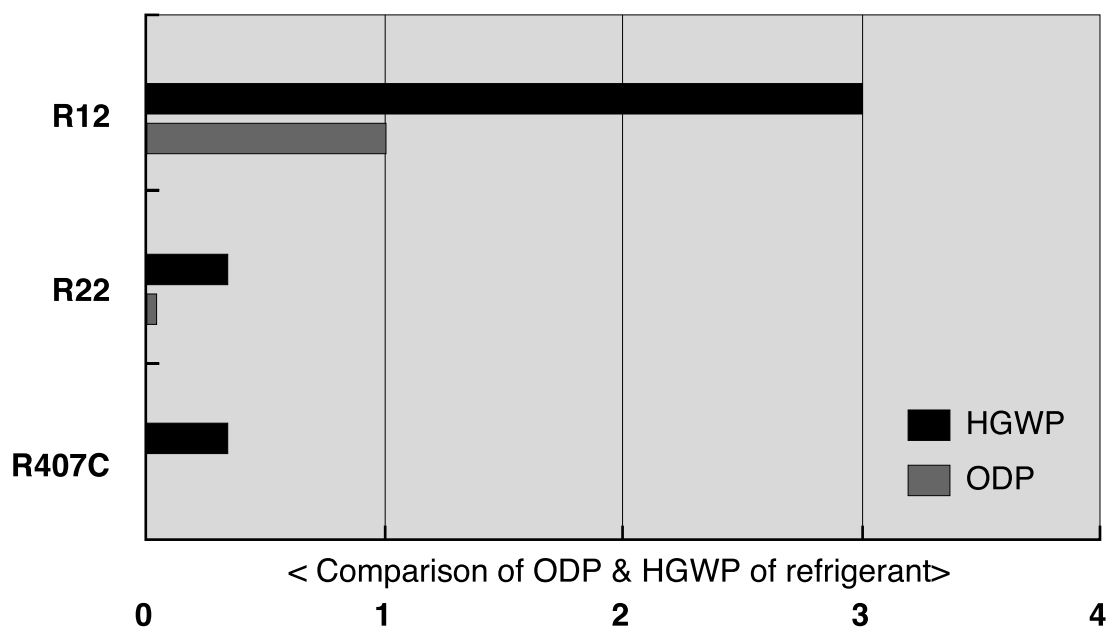
Item	VRF System(Individual-Air cooling)	Chiller(Central-Water cooling)
System Configuration	 <p>Parking Area !</p>	 <p>Machine room !</p>
Duct construction /Reconstruction	Easy to construct	Difficult to construct
Duct diameter	 <p>Liquid / Gas 19.05 / 12.7 mm (100%)</p>	 <p>89mm x 2 (560%)</p>
Control	Central & Individual (MICOM)	Central & Individual manual (mechanical)
Installation area	100 %	300% (Chiller, Pump, Water tank, etc.)
Initial investment	LOW	HIGH
Maintenance	LOW	HIGH (Consistent maintenance is necessary)

1. GENERAL INFORMATION

New Refrigerant R407C System

● General Characteristics ●

1. Differing from R22, R407C refrigerant is an alternate which contains no element destructing an ozone layer.
2. Because it has a similar characteristics with R22, it may be used without the existing air conditioner greatly.
3. Differing from R22, it consists of three alternative refrigerants, R125, R32 and R134a.

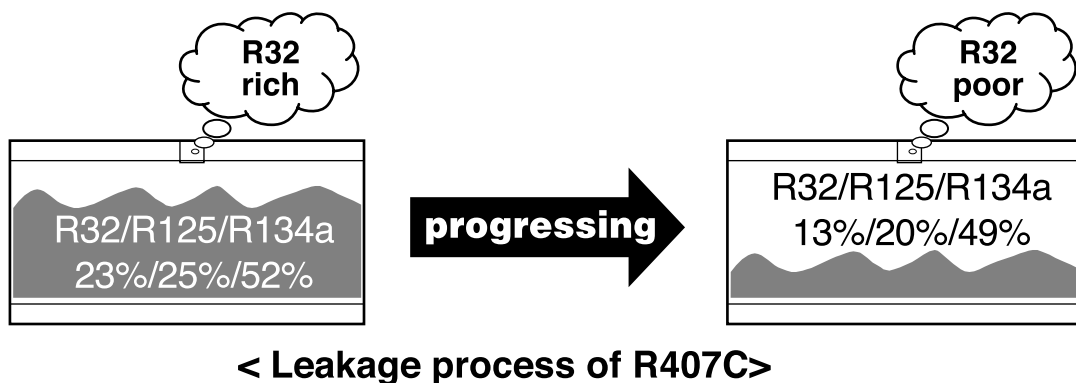
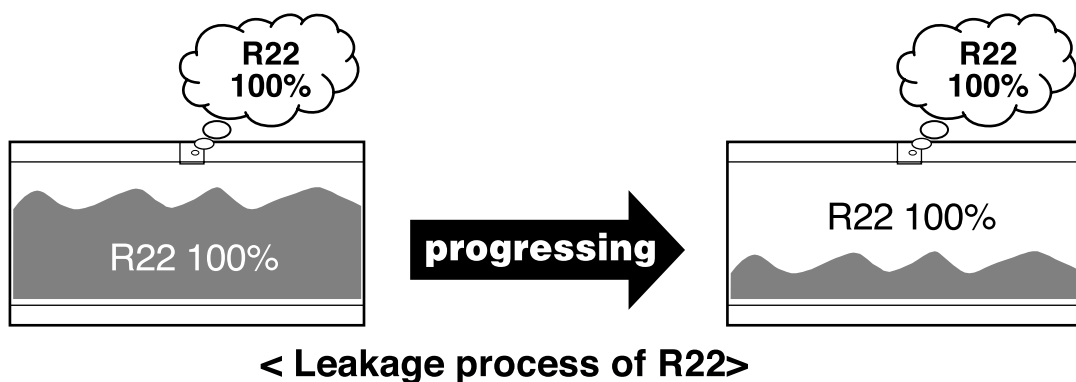


1. GENERAL INFORMATION

Comparison of refrigerants (R407C vs R22)

● Processing of leakage ●

1. Because it is a mixture of three refrigerants, three elements do not leak at the same rate, but the gas of the lowest evaporation at the pertinent pressure starts to leak.
2. At the leakage, the composition ratio is changed, which alters the value of a material characteristics, lowers the evaporation pressure and condensation pressure and so on, so it greatly degrades the performance.

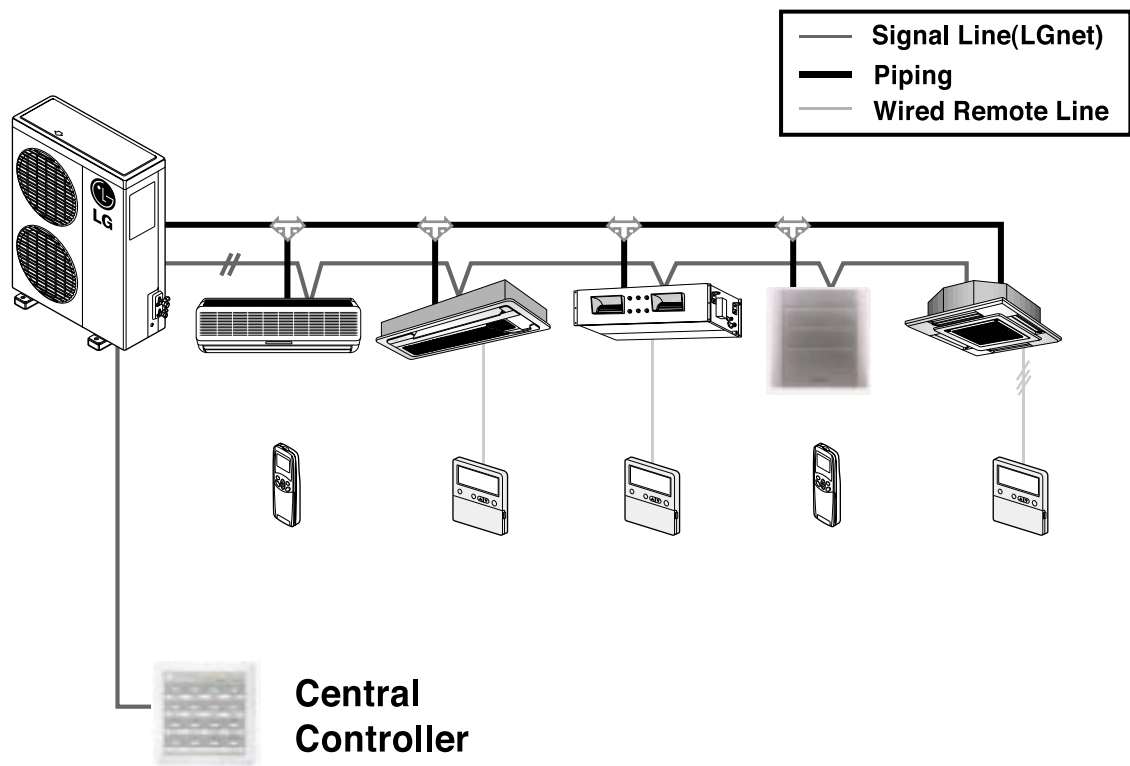


● Processing a leakage ●

1. A refrigerant of a single element such as R22 can become normal by complementing an leaked amount of the refrigerant, but leaking a mixed refrigerant such as R407C changed the composition ratio, so complementing can not restore it to the normal composition ratio.
2. When R407C refrigerant is leaked, you must discharge all of refrigerant and newly restore it.

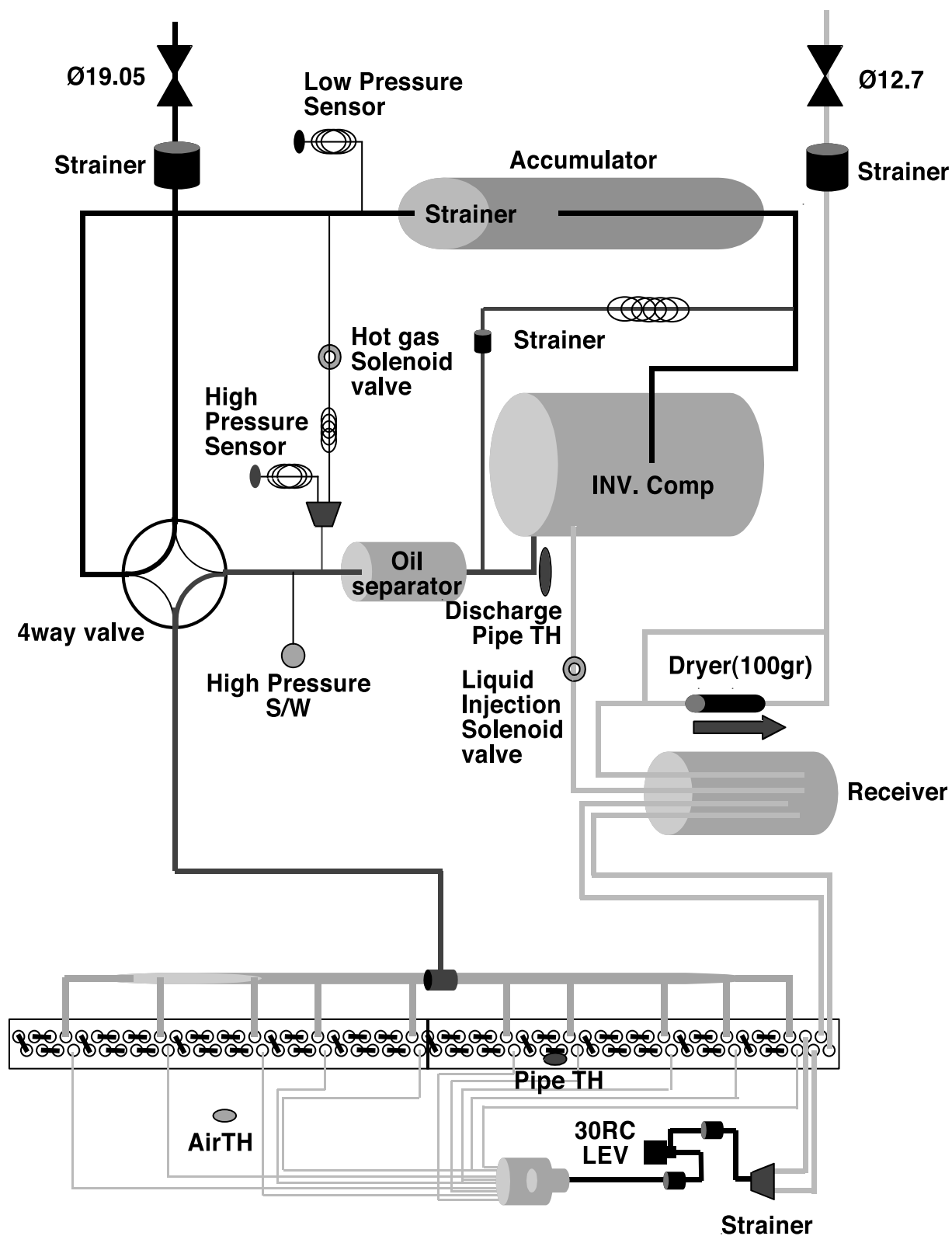
1. GENERAL INFORMATION

System configuration diagram (4.5HP)



2. FUNCTIONS

Outdoor Unit Refrigerant System Diagram (4.5HP)



2. FUNCTIONS

New Refrigerant R407C System

● **INV. Comp** ●

Scroll compressor that operates on 30 ~ 120Hz by inverter drive enables capacity control.

● **Oil separator** ●

The oil separator is a device that collects the discharged from the Compressor. The collected oil is constantly recirculated to the compressor via capillary tube.

● **High Pressure Senor** ●

High pressure sensor for sensing the operating status of the indoor by refrigerant pressure which senses discharge pressure.

● **Low Pressure Senor** ●

Low pressure sensor for sensing the operating status of the indoor by refrigerant pressure which senses suction pressure.

● **Hot gas Solenoid valve** ●

Valve is open by low pressure safety control when low pressure drops.

● **Liquid Injection Solenoid valve** ●

Controls liquid injection in order to prevent overheating.

● **30RC LEV** ●

Expansion valve when heating.

When cooling Expansion valve is fully opened.

2. FUNCTIONS

Specification of Main Components

Power supply (3-phase)		3Ø, 380~415V, 50Hz	Expansion valve	Maker	Pacific
Rated cooling capacity (80Hz)		12.9kW		Model	30RC
Rated heating capacity (90Hz)		14.8kW		Orifice	Ø3.0
COM- PRE- SSOR	Type	Scroll	Oil sepa rator	Outer diameter	Ø80
	Outer diameter	179Ø		Length	150mm
	Oil	PVE oil		Return capi	Ø1.2, 1.6m
	Operating range	30~120Hz	Pressure sensor	Maker	Saginomiya
Accumulator*		2300cc		Range	0-10bar 0-30bar
Receiver*		1000cc	Hi-pressure shutdown pressure S/W	Maker	Saginomiya
Hot gas bypass		Sol. V/V + Ø1.9 - 60mm		Range	30kg/cm ² (Off)
Outdoor Heat Exchan- ger	Tube	Ø7	4way valve	Maker	Ranco
	Step x Row	52 x 2	Outdoor FAN	Type	Axial
	Length	940mm		OD	Ø460
	Row pitch	12.5mm		No. of Blade	3EA
	Step pitch	21.0mm	Outdoor FAN Motor	Capacitor	6µp
Service valve	Liquid side	Ø12.7		POWER	220V, 50Hz
	Gas side	Ø19.05	Crank case heater		40W

2. FUNCTIONS

Cyclic phenomena from Main component failure

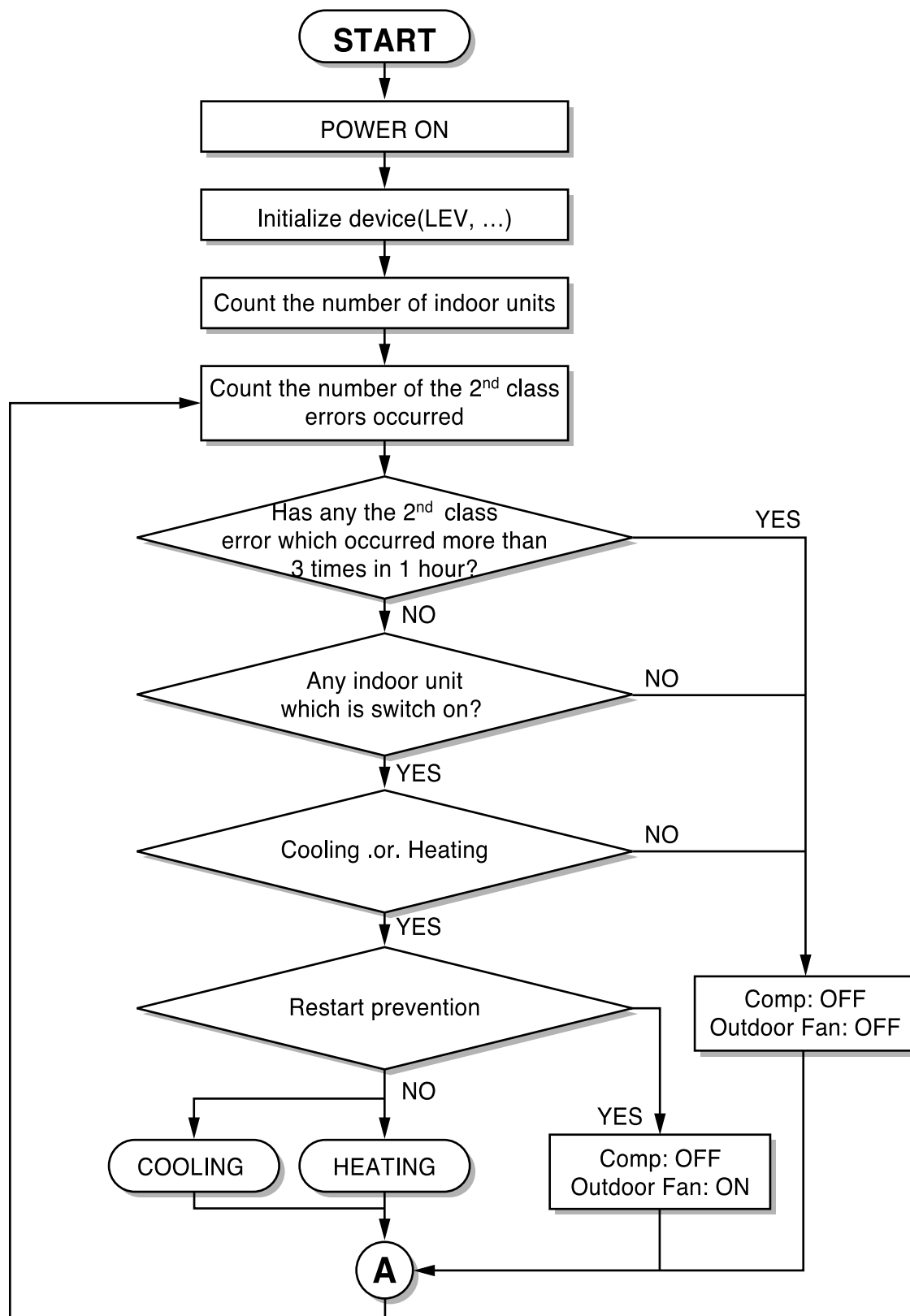
Component	Phenomenon	Cause	Check method and Trouble shooting
Compressor	Not operated	Motor insulation broken	Check resistance between terminals and chassis.
		Strainer locking	
		Oil shortage	Open drain cock and check oil
	Stop during running	Motor insulation failure	Check resistance between terminals and chassis.
	Loud noise during running	Inverse connection	Check wiring
Outdoor fan	Hi-pressure error at cooling	Motor failure Bad ventilation around outdoor heat exchanger	Check whether it operates or not at re-running after being left. Remove obstacles around outdoor device.
	Heating failure, frequent defrosting		
Outdoor LEV	No operating sound at applying the power	Bad connector contact	Check connector
		Coil failure	Check resistance between terminals.
	Heating failure Frozen outdoor HEX part	LEV clogged	
	Low pressure error after running Injection temperature error	LEV clogged	

Operation to secure Reliability

- Running to call back oil
- Running to control Hot gas bypass solenoid valve
- Running to control Liquid injection solenoid valve
- Running to control for preventing injection temperature from rising

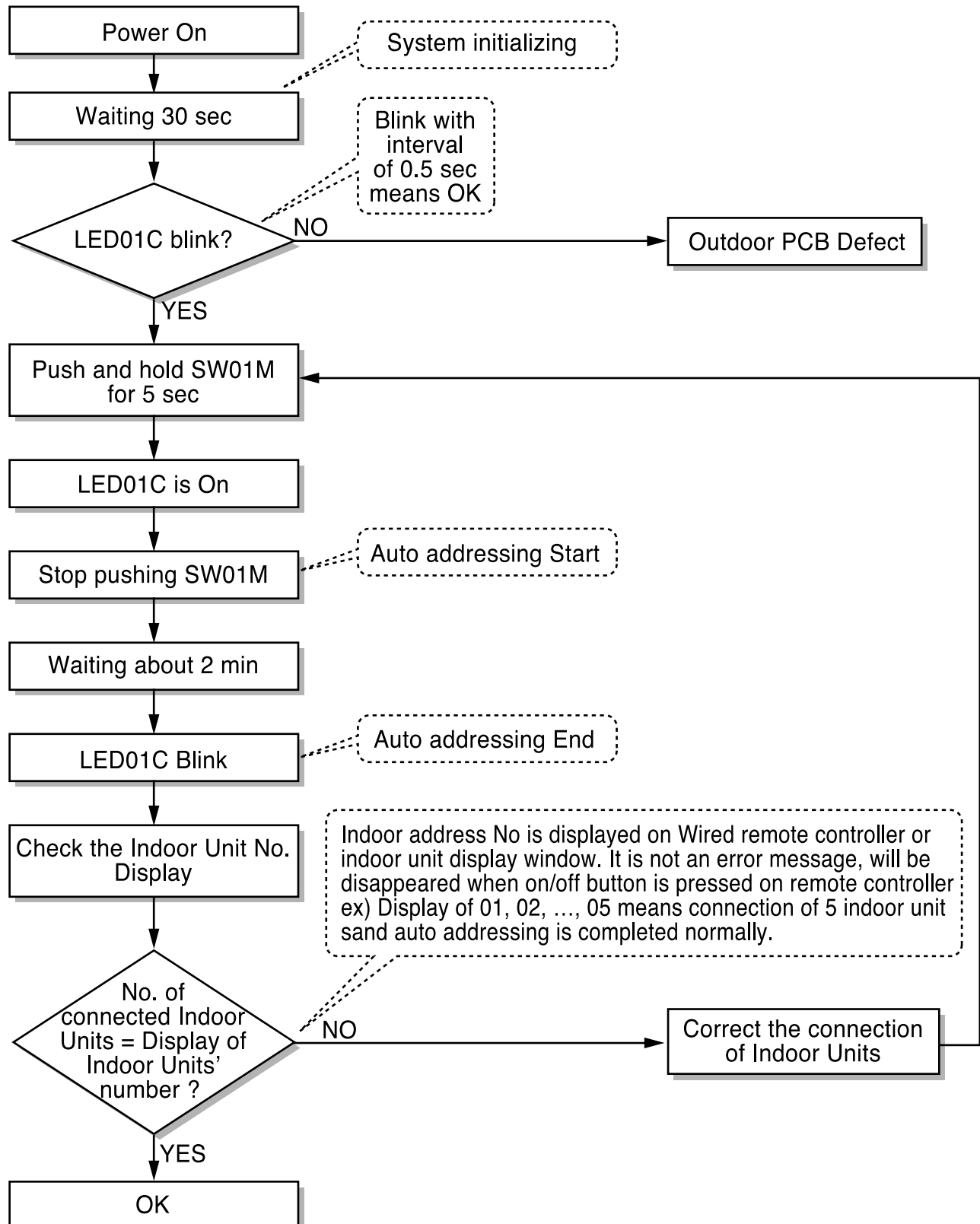
2. FUNCTIONS

Operation flow chart



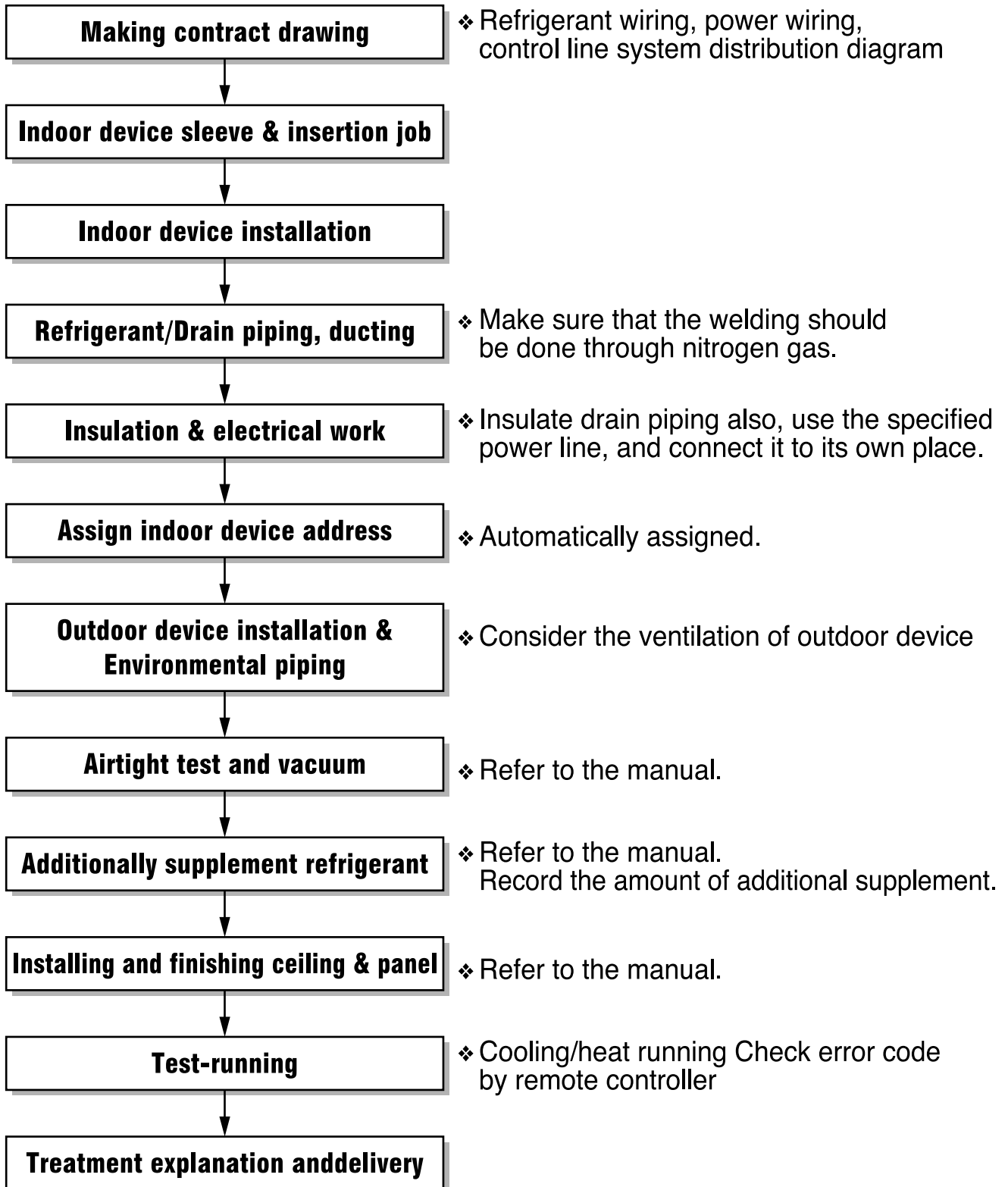
2. FUNCTIONS

Checking for Automatic Addressing of Indoor Unit



3. INSTALLATION

Installation Procedure



3. INSTALLATION

Refrigerant pipe work

● LINE BRANCH METHOD ●

ex) 5 indoor devices connected

Ⓐ : outdoor device

Ⓑ : 1st branch(branch union)

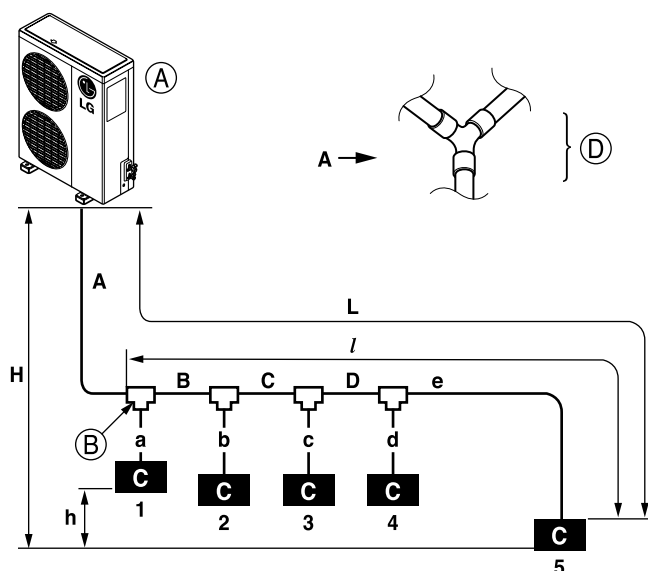
Ⓒ : indoor device

Ⓓ : downward indoor device

- ❑ Piping diameter (mm) of outdoor 1st branch(A)

Liquid pipe : Ø12.7

Gas pipe : Ø19.05



Allowed Length	Entire line length	$A+B+C+D+a+b+c+d+e \leq 100$ meter
	Longest line length (L)	$A+B+C+D+e \leq 70$ meter
	Longest line length after branching (I)	$B+C+D+e \leq 30$ meter
Allowed High/Low difference	High/Low difference at Indoor/Outdoor device (H)	Less than or equal to 30 meter (20 meter if the outdoor device is lower)
	High/Low difference at Indoor/Indoor device (h)	Less than or equal to 12 meter

- ❑ Select Indoor device from branch (a,b,c,d,e).

→ Indoor device pipe diameter

(Select pipe size from the right table.)

Indoor device capacity (Btu)	Pipe diameter (mm)	
	Liquid pipe	Gas pipe
7k , 9k	Ø6.35	Ø12.7
12k	Ø6.35	Ø12.7
18k	Ø9.52	Ø15.88

- ❑ Select from branch to branch (B,C,D).

→ Refrigerant pipe diameter from branch to branch

(Select pipe size from the right table.)

Downward indoor device model total capacity (Btu)	Liquid pipe (mm)	Gas pipe (mm)
~ 14k or less	Ø6.35	Ø12.7
14k ~ 28k or less	Ø9.52	Ø15.88
28k ~ 51k or less	Ø12.7	Ø19.05

3. INSTALLATION

● HEADER BRANCH METHOD ●

ex) 5 indoor devices connected

Ⓐ: outdoor device

Ⓑ: 1st branch

Ⓒ: indoor device

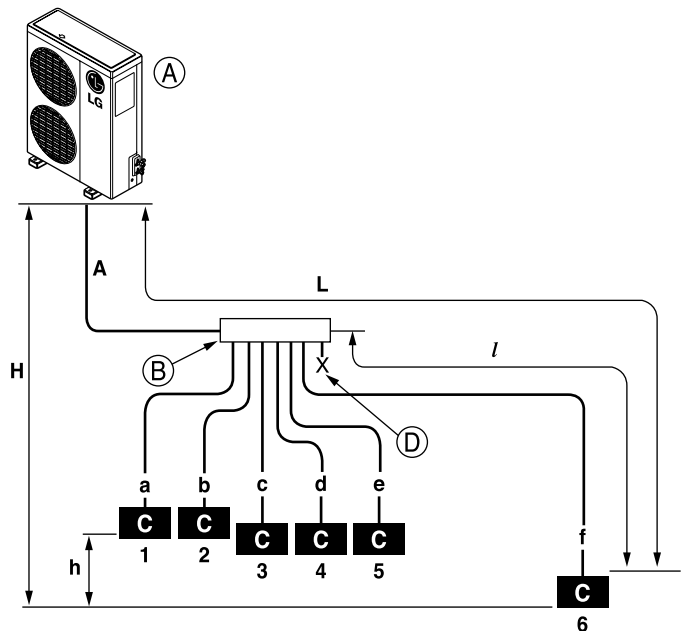
Ⓓ: charge

- ❑ Piping diameter(mm) of outdoor 1st branch(A)

Liquid pipe : Ø12.7

Gas pipe : Ø19.05

- ❑ Branch pipe can not be used after header branching.



Allowed Length	Entire line length	$A+a+b+c+d+e+f \leq 100$ meter
	Longest line length (L)	$A+f \leq 70$ meter
	Longest line length after branching (l)	$f \leq 30$ meter
Allowed High/Low difference	High/Low difference at Indoor/Outdoor device (H)	Less than or equal to 30 meter (20 meter if the outdoor device is lower)
	High/Low difference at Indoor/Indoor device (h)	Less than or equal to 12 meter

- ❑ Select Indoor device from branch (a,b,c,d,e).

➔ Indoor device pipe diameter

(Select pipe size from the right table.)

Indoor device capacity (Btu)	Pipe diameter (mm)	
	Liquid pipe	Gas pipe
7k , 9k	Ø6.35	Ø12.7
12k	Ø6.35	Ø12.7
18k	Ø9.52	Ø15.88

3. INSTALLATION

● MULTIPLE LINE/HEADER ●

ex) 5 indoor devices connected

Ⓐ: Outdoor device

Ⓑ: 1st branch

Ⓒ: branch jointer

Ⓓ: Indoor device

Ⓔ: Branch header

Ⓕ: Charge

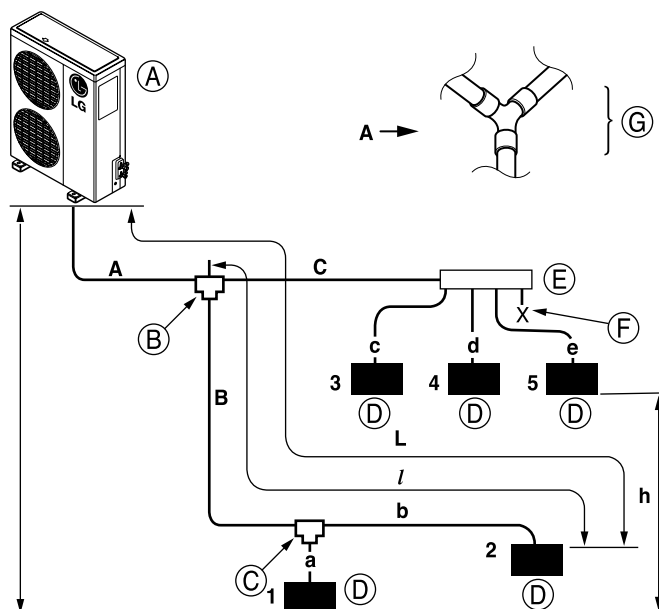
Ⓖ: Downward indoor device

- ☐ Piping diameter(mm) of outdoor 1st branch(A)

Liquid pipe : Ø12.7

Gas pipe : Ø19.05

- ☐ Branch pipe can not be used after header branching.



Allowed Length	Entire line length	$A+B+C+a+b+c+d+e \leq 100$ meter
	Longest line length (L)	$A+B+b \leq 70$ meter
	Longest line length after branching (I)	$B+b \leq 30$ meter
Allowed High/Low difference	High/Low difference at Indoor/Outdoor device (H)	Less than or equal to 30 meter (20 meter if the outdoor device is lower)
	High/Low difference at Indoor/Indoor device (h)	Less than or equal to 12 meter

- ☐ Select Indoor device from branch (a,b,c,d,e).

→ Indoor device pipe diameter

(Select pipe size from the right table.)

Indoor device capacity (Btu)	Pipe diameter (mm)	
	Liquid pipe	Gas pipe
7k , 9k	Ø6.35	Ø12.7
12k	Ø6.35	Ø12.7
18k	Ø9.52	Ø15.88

- ☐ Select from branch to branch (B,C,D).

→ Refrigerant pipe diameter from branch to branch

(Select pipe size from the right table.)

Downward indoor device model total capacity (Btu)	Liquid pipe (mm)	Gas pipe (mm)
~ 14k or less	Ø6.35	Ø12.7
14k ~ 28k or less	Ø9.52	Ø15.88
28k ~ 51k or less	Ø12.7	Ø19.05

3. INSTALLATION

Determining Additional Refrigerant Amount

● **Additionally charging refrigerant** ●

At shipping, FMU4480RAH of outdoor device has 3.2 kg of refrigerant charged.

Because a refrigerant is charged according to the piping expansion, the refrigerant should be added as much as the expanded length.

For the future service, it is necessary to record the size and length of each refrigerant piping and the additionally charged amount of the refrigerant.

● **Calculation of the additionally charged amount of the refrigerant** ● **(rounded at the second decimal point)**

Added amount of refrigerant = Entire length (m) of liquid piping (Ø12.7) × 0.12
+ Entire length (m) of liquid piping (Ø9.52) × 0.06
+ Entire length (m) of liquid piping (Ø6.35) × 0.03
+ number of connected indoor devices × 0.2

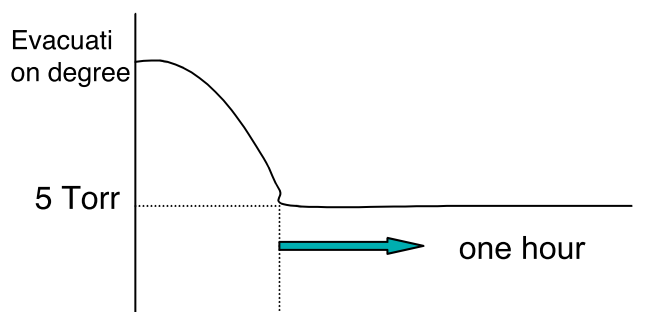
❑ The result is rounded at the second decimal point.

3. INSTALLATION

Pre-Test

● Vacuum ●

- Run for 4 ~ 6 hours by the vacuum pump until the pressure becomes to 5 Torr (665 Pa), and then vacuum one hour or so.
- Spec of vacuum pump : discharge air speed - 15m³/h
attainable pressure - 6.7×10^{-2} Pa (5×10^{-4} Torr)
- Vacuum both gas pipe and liquid pipe
- When the vacuum is not correctly done :
Compressor damage due to moisture, capacity shortage, refrigerant noise



● Refrigerant charging ●

- Charge by the calculation according to the installation manual and then record it
- Check according to the operation data

● Wiring ●

- Do not connect the power line (220V/380V) to the communication line.
- The outdoor device does not supply the power to the indoor device.
- Separate the indoor device power (3 phase) from the communication line when connecting.
- Watch out the wrong wiring (Single phase 220V for indoor device, 3-phase 380v for outdoor device)
- The wrong wiring of R,S,T,N makes the product inoperable.

● Power supply ●

- Turn on for 12 hours (at least 6 hours) before pre-running for preventing the compressor from being damaged due to the liquid compression.

● Others : Non-oxidizing brazing ●

(Removing moisture within piping), Pipe quality, Air tight test (Compress the nitrogen gas to 30 kgf/cm²(2.94MPa)) Do not make the pump down.

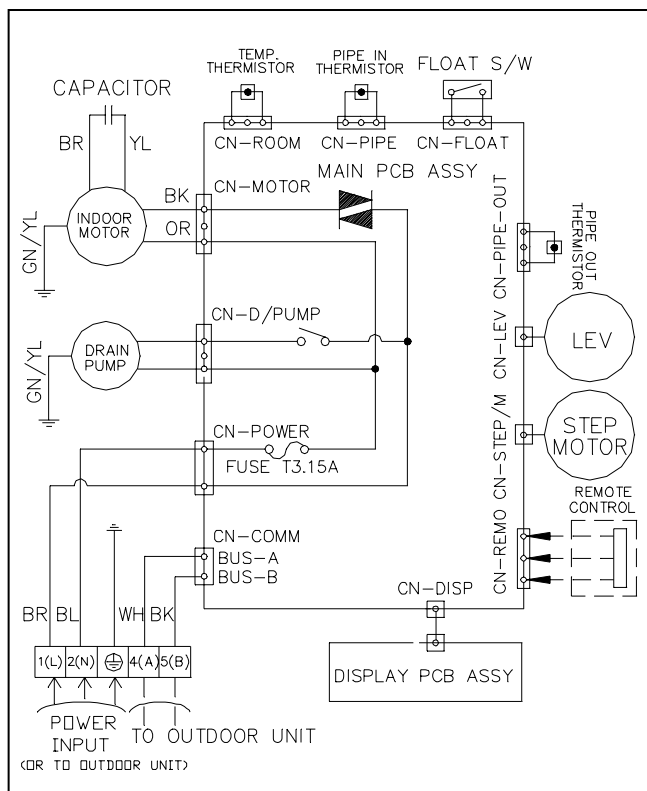
4. Error Code Table

Display Number		Error	Cause
0	1	Indoor sensor(air)	Indoor sensor (air) open or short
0	2	Indoor sensor (inlet piping)	Indoor sensor (inlet piping) open or short
0	3	Wired remocon ↔ indoor communication	The indoor device can not receive the wired remocon signal for 3 minutes
0	4	Drain pump	Drain pump failure
0	5	Outdoor ↔ Indoor communication	The indoor device can not receive the outdoor device signal for 3 minutes
0	6	Indoor sensor(Outlet piping)	Indoor sensor(Outlet piping) open or short
0	7	Different characteristics	In case of running at the operation mode different from the previously run indoor device
0	8	Indoor LEV failure	Not available
0	9	Serial No. Error	Product serial number of indoor device EEPROM is 0 or FFFFFF
2	1	dc peak	IPM damage or compressor failure is generated three times within 1 hour
2	2	max ct	Current over the maximum limit is detected
2	3	dc link	It is not charged at DC for 45 min after start RY on
2	4	High pressure/heatproof sw	Compressor turns off three times within 1 hour due to high pressure SW
2	5	Under/Over voltage	The input voltage of the installation area is greater than 487V or less than or equal to 270V
3	1		
3	2	Injection temperature inv	Compress turns off three times within 1 hour due to inv injection temperature overriving
3	3	Injection temperature stopped	Compress turns off three times within 1 hour due to onoff injection temperature overriving
3	4	High pressure	Compress turns off three times within 1 hour due to high pressure
3	5	Low pressure	Compress turns off three times within 1 hour due to low pressure
3	6	Refrigerant leakage	Not available
3	7	4way failure	Not available
3	8	Outdoor LEV failure	Not available
4	0	Inv sensor(ct)	Inv sensor(ct) open or short
4	1	Inv sensor(injection temperature	Inv sensor(injection temperature) open or short
4	2	Outdoor sensor(low pressure)	Outdoor sensor (low pressure) open or short
4	3	Outdoor sensor(high pressure)	Outdoor sensor(high pressure) open or short
4	4	Outdoor sensor(outdoor air)	Outdoor sensor(outdoor air) open or short
4	5	Outdoor sensor(outdoor piping-upper)	Outdoor sensor(outdoor piping-upper) open or short
4	6	Outdoor sensor(inlet)	Outdoor sensor(inlet) open or short
4	7	Outdoor sensor(injection temperature)	Outdoor sensor(injection temperature) open or short
4	8	Outdoor sensor(outdoor piping-lower)	Outdoor sensor(outdoor piping-lower) open or short
4	9	Outdoor sensor(voltage)	Outdoor sensor(voltage) open or short
5	1	Over connected access(capacity)	Connected more than the indicated number of indoor device (different according to outdoor device)
5	2	inv ↔ main communication	It can not receive inv signal from main for 20 seconds
5	3		
5	4	RST inversion detected	RST wiring inverted or failure
5	5	Central controller ↔ outdoor device communication	It can not receive central controller signal from outdoor device for 3 minutes

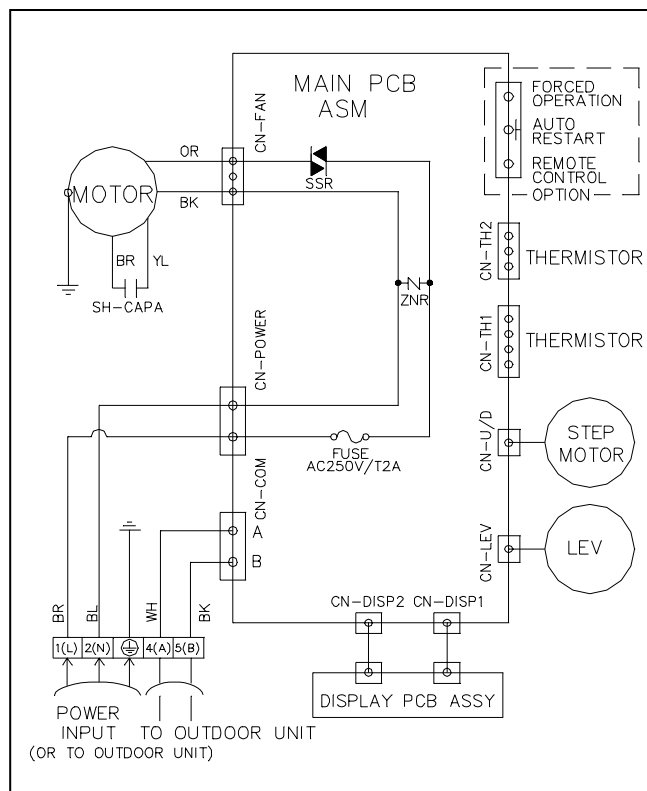
5. Wiring diagram

Indoor Unit

● Cassette ●

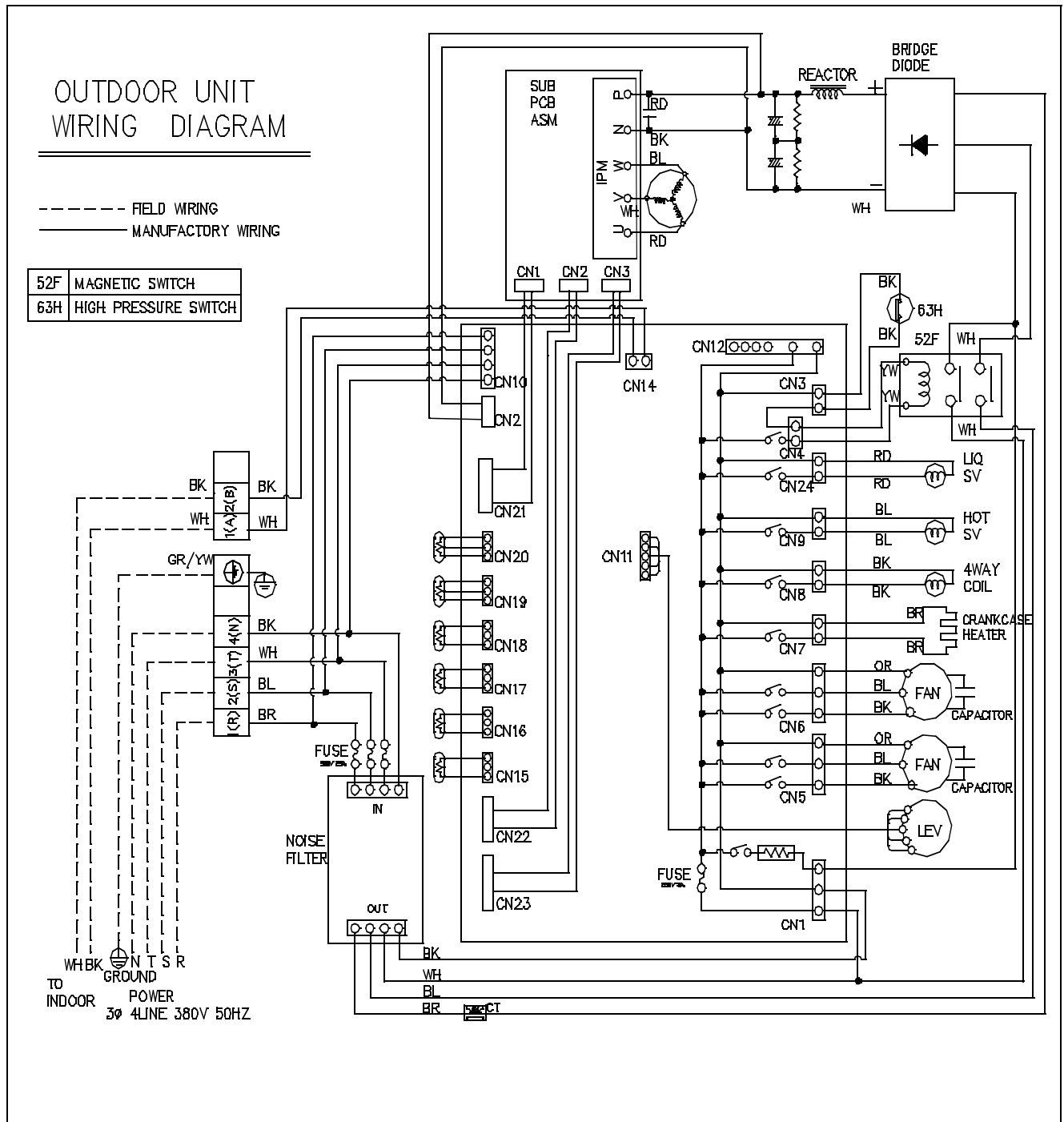


● Split type ●



5. Wiring diagram

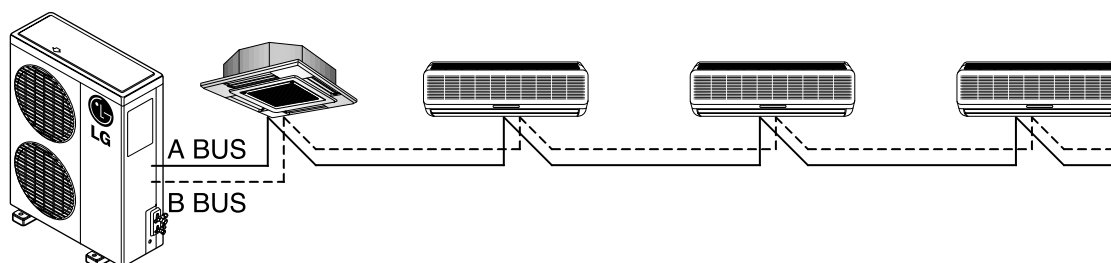
OUTDOOR UNIT 4.5Hp



6. Checking Indoor/Outdoor communication

Communication principle and checking method

- ❑ Communication type : RS485
- ❑ Communication speed : 1200BPS
- ❑ Communication characteristics :
 - Because RS485 communication sends data by the differential signal, the maximum communication length is 1.2Km
 - It supports the multipoint communication network, and it can connect 32 drivers or receivers over one communication line (two lines)
 - Easy to install.
 - Because it uses one communication line, it may cause data conflict, which can be solved by the switch of Mycom.
- ❑ Communication line connection method
 - [Serial connection]



- ❑ Trouble shooting for communication error
 - Are communication line bus A and B connected inversely?
 - ❖ normal connection
 - Is communication connector and connection part (MAIN PCB) normal?
 - ❖ normal assembly
 - Is communication line disconnected at the course to the other indoor device?
 - ❖ reconnect
 - Is communication connection length about 1.2km or longer?
 - ❖ reconnect with the shortest distance

6. Checking Indoor/Outdoor communication

