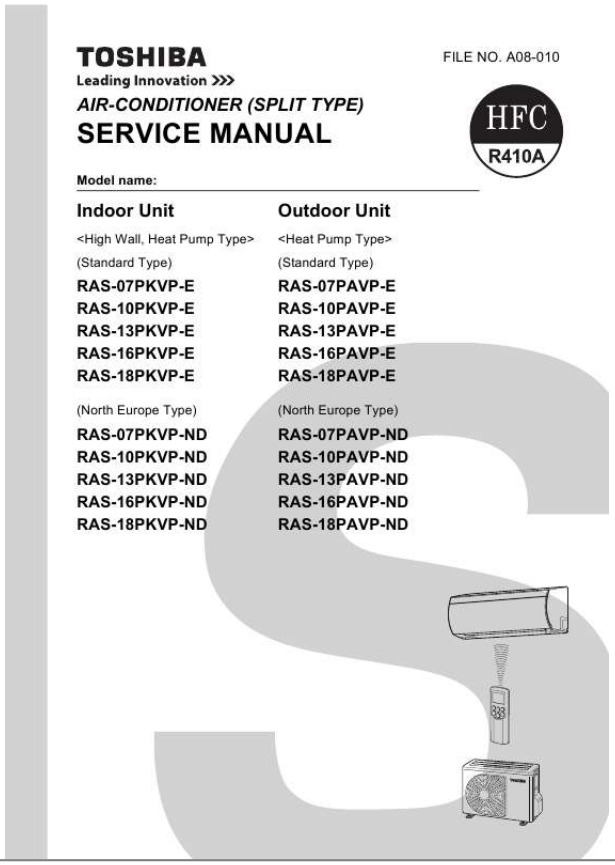

TOSHIBA
Leading Innovation >>>

FILE NO. A08-010

AIR-CONDITIONER (SPLIT TYPE)

SERVICE MANUAL

HFC
R410A

Model name:

Indoor Unit	Outdoor Unit
<High Wall, Heat Pump Type>	<Heat Pump Type>
(Standard Type)	(Standard Type)
RAS-07PKVP-E	RAS-07PAVP-E
RAS-10PKVP-E	RAS-10PAVP-E
RAS-13PKVP-E	RAS-13PAVP-E
RAS-16PKVP-E	RAS-16PAVP-E
RAS-18PKVP-E	RAS-18PAVP-E
(North Europe Type)	(North Europe Type)
RAS-07PKVP-ND	RAS-07PAVP-ND
RAS-10PKVP-ND	RAS-10PAVP-ND
RAS-13PKVP-ND	RAS-13PAVP-ND
RAS-16PKVP-ND	RAS-16PAVP-ND
RAS-18PKVP-ND	RAS-18PAVP-ND

Manual abstract:

@@. . . . . .
. . . . .
. . . . .
. . . . . .

. . . . . .
. . . . .
. . 5 1 SPECIFICATIONS. . .
. . . . . .

. . . . . .
. . . . .
. . . . .
. . . . . .

. . . . . .
. 8 2 REFRIGERANT R410A. . . .
. . . . .
. . . . . .

. . . . . .
. . . . .
. . . . .
. . . . . .

13 3 CONSTRUCTION VIEWS . . . . . .
. . . . .
. . . . .
. . . . . .

. . . . . .
. . . . .
. . 22 4 WIRING DIAGRAM . . .
. . . . . .

. . . . . .
. . . . .
. . . . .
. . . . . .

. . . . . 25 5 SPECIFICATIONS OF ELECTRICAL PARTS .
. . . . .
. . . . .
. . . . . .

. . . . . .
26 6 REFRIGERANT CYCLE DIAGRAM . . . . .
. . . . .
. . . . . .

. . . . . .
. . . . .
. . . . 27 7 CONTROL BLOCK DIAGRAM .
. . . . . .

. . . . . .
. . . . .
. . . . .
. . . . . .

. . 29 8 OPERATION DESCRIPTION . . . . . .
. . . . .
. . . . .
. . . . . .

. @@Please read this Service Manual after understanding the described items thoroughly in the following contents (Indications/Illustrated marks), and T BROKEN OR DISCONNECTED BEFORE SERVICE AND INSTALLATION. FAILURE TO DO SO MAY CAUSE ELECTRIC SHOCK. @@FAILURE TO FOLLOW THIS INSTRUCTION CAN RESULT IN FIRE OR EXPLOSION. @@· WHEN MOVING THE AIR-CONDITIONER FOR INSTALLATION IN ANOTHER PLACE, BE VERY CAREFUL NOT TO ALLOW THE SPECIFIED REFRIGERANT (R410A) TO BECOME MIXED WITH ANY OTHER GASEOUS BODY INTO THE REFRIGERATION CIRCUIT.
IF AIR OR ANY OTHER GAS IS MIXED IN THE REFRIGERANT, THE GAS PRESSURE IN THE REFRIGERATION CIRCUIT WILL BECOME ABNORMALLY HIGH AND IT MAY RESULT IN THE PIPE BURSTING AND POSSIBLE PERSONNEL INJURIES. · IN THE EVENT THAT THE REFRIGERANT GAS LEAKS OUT OF THE PIPE DURING THE SERVICE WORK AND THE INSTALLATION WORK, IMMEDIATELY LET FRESH AIR INTO THE ROOM. IF THE REFRIGERANT GAS IS HEATED, SUble Cylinder Management) DA111A1FD-21F 43 30.0/27.7 Flare connection Ø6.35 Ø9.52 Ø6.35 Ø9.52 20 15 10 R410A 1.15 37.

2/34.8 (Cooling/Heating) Width Depth (mm) (mm) (mm) (kg) (W) (m³/min.) 10.2/10.8 RAS-07PAVP-E (-ND) Low (Cooling/Heating) (Cooling/Heating) (Cooling/Heating) (dB-A) (dB-A) (dB-A) (dB-A) Medium (Cooling/Heating) (A) (W) (%) (A) (A) (W) (%) Cooling 1.86/1.78/1.70 330 81 2.56/2.45/2. 34 5.63/5.68 42/42 34/34 26/26 46/46 RAS-07PKVP-E (-ND) 48/48 RAS-10PKVP-E (-ND) 295 790 242 12 30 10.4/11.1 RAS-10PAVP-E (-ND) 550 780 290 40 11.
6/11.6 RAS-13PAVP-E (-ND) Heating 2.35/2.25/2.15 415 80 Cooling RAS-07PKVP-E(-ND) RAS-07PAVP-E(-ND) 2.
0 0.3-3.0 2.5 0.3-5.0 Heating 25 54/54/55 Cooling 2.19/2.10/2.01 450 93 2.77/2.

65/2.54 5.26/5.36 43/43 35/35 27/27 50/50 RAS-13PKVP-E (-ND) Heating 2.56/2.45/2.35 535 95 Cooling 3.44/3.29/3.15 740 98 4.
01/3.84/3.68 4.55/4.76 45/45 36/36 Cooling RAS-10PKVP-E(-ND) RAS-10PAVP-E(-ND) 2.
5 0.3-3.5 3.0 0.3-5.
8 1 Ph/50Hz/220240 V, 1 Ph/60Hz/220-230 V Heating Cooling 30 57 Heating 3.77/3.61/3.46 810 Heating 0.21/0.20/0.19 0.24/0.23/0.22 RAS-13PKVP-E(-ND) RAS-13PAVP-E(-ND) 3.

5 0.3-4.5 4.0 0.3-6.1 Cooling capacity Cooling capacity range Heating capacity Heating capacity range Power supply Maximum length Maximum chargeless length Maximum height difference Refrigerant Wiring connection Name of refrigerant Weight Power cord Connecting cable Usable temperature Indoor range Outdoor · The specifications may be subject to change without notice for purpose of improvement. 8 High Wall, Heat Pump Type Service Manual RAS-16PKVP-E/RAS-18PKVP-E, RAS-16PAVP-E/RAS-18PAVP-E RAS-16PKVP-ND/RAS-18PKVP-ND, RAS-16PAVP-ND/RAS-18PAVP-ND Unit model Indoor Outdoor (kW) (kW) (kW) (kW) Operation mode Indoor Electric characteristics Outdoor Running current(220/230/240V) Power consumption Power factor (220/230/240V) Operation mode Running current (220/230/240V) Power consumption Power factor Starting current(220/230/240V) COP (Cooling/Heating) High Operating noise Indoor Outdoor Unit model Height Dimension Indoor unit Net weight Fan motor output Air flow rate Unit model Height Dimension Net weight Motor output Compressor Type Model Fan motor output Air flow rate Type Indoor unit Piping connection Outdoor unit Liquid side Gas side Liquid side Gas side (m) (m) (m) (kg) (Cooling/Heating) (W) (m³/min.) 37.2/34.8 Flare connection Ø6.
35 Ø12.7 Ø6.35 Ø12.7 20 15 10 R410A 1.15 3 Wires : includes earth line (Outdoor) 4 Wires : includes earth line (Cooling/Heating) (Cooling/Heating) Installation plate Wireless remote controller Batteries Indoor unit Accessory Remote controller holder Mounting screw Remote controller holder mounting screw Installation manual Owner's manual Outdoor unit Drain nipple Water-proof rubber cap (°C) (°C) 2132/028 1046/1524 1 1 2 1 7 (Ø4 × 25L) 2 (Ø3. 1 × 16L) 1 1 1 2 Width Depth Outdoor unit (mm) (mm) (mm) (kg) (W) (Cooling/Heating) Width Depth (mm) (mm) (mm) (kg) (W) (m³/min.) 12.4/12.4 RAS-16PAVP-E (-ND) 550 780 290 40 750 Twin rotary type (Variable Cylinder Management) DA111A1FD-21F 43 39.5/37.
2 Low (Cooling/Heating) (Cooling/Heating) (Cooling/Heating) (dB-A) (dB-A) (dB-A) (dB-A) Medium (Cooling/Heating) (A) (W) (%) (A) (A) (W) (%) Cooling 5.54/5.30/5.08 1195 98 6.24/5.97/5.72 3.69/4.10 47/47 38/38 30/30 50/50 RAS-16PKVP-E (-ND) 295 790 242 12 30 13.4/13.

4 RAS-18PAVP-E (-ND) Cooling 35 59/59/58 Heating 5.97/5.71/5.47 1305 Cooling 6.68/6.39/6.12 1450 99 7.16/6.85/6.57 3. 36/3.90 49/49 41/41 31/31 52/52 RAS-18PKVP-E (-ND) RAS-16PKVP-E(-ND) RAS-16PAVP-E(-ND) 4.5 0.3-5.0 5. 5 0.3-6.5 Heating Cooling 40 61/60/60 Heating 6.86/6.56/6. 29 1500 RAS-18PKVP-E(-ND) RAS-18PAVP-E(-ND) 5.0 0.3-5.5 6.0 0.3-6.7 Heating Cooling capacity Cooling capacity range Heating capacity Heating capacity range Power supply 1 Ph/50Hz/220240 V, 1 Ph/60Hz/220-230 V 0.27/0.26/0.25 0.

30/0.29/0.28 Maximum length Maximum chargeless length Maximum height difference Refrigerant Wiring connection Name of refrigerant Weight Power cord Connecting cable Usable temperature Indoor range Outdoor · The specifications may be subject to change without notice for purpose of improvement. 9 High Wall, Heat Pump Type Service Manual 1-2. @@@@@@@@The next section describes the precautions for air conditioner using the new refrigerant. Conforming to contents of the next section together with the general cautions included in this manual, perform the correct and safe work. 2-1. Safety During Installation/Servicing As R410A's pressure is about 1.6 times higher than that of R22, improper installation/servicing may cause a serious trouble. By using tools and materials exclusive for R410A, it is necessary to carry out installation/servicing safely while taking the following precautions into consideration. · Never use refrigerant other than R410A in an air conditioner which is designed to operate with R410A. If other refrigerant than R410A is mixed, pressure in the refrigeration cycle becomes abnormally high, and it may cause personal injury, etc. by a rupture. · Confirm the used refrigerant name, and use tools and materials exclusive for the refrigerant R410A. The refrigerant name R410A is indicated on the visible place of the outdoor unit of the air conditioner using R410A as refrigerant.
To prevent mischarging, the diameter of the service port differs from that of R22. · If a refrigeration gas leakage occurs during installation/servicing, be sure to ventilate fully. If the refrigerant gas comes into contact with fire, a poisonous gas may occur. · When installing or removing an air conditioner, do not allow air or moisture to remain in the refrigeration cycle.

Otherwise, pressure in the refrigeration cycle may become abnormally high so that a rupture or personal injury may be caused. · After completion of installation work, check to make sure that there is no refrigeration gas leakage. If the refrigerant gas leaks into the room, coming into contact with fire in the fan-driven heater, space heater, etc., a poisonous gas may occur. · When an air conditioning system charged with a large volume of refrigerant is installed in a small room, it is necessary to exercise care so that, even when refrigerant leaks, its concentration does not exceed the marginal level. If the refrigerant gas leakage occurs and its concentration exceeds the marginal level, an oxygen starvation accident may result. · Be sure to carry out installation or removal according to the installation manual. Improper installation may cause refrigeration trouble, water leakage, electric shock, fire, etc. · Unauthorized modifications to the air conditioner may be dangerous. If a breakdown occurs please call a qualified air conditioner technician or electrician. Improper repair's may result in water leakage, electric shock and fire, etc.

13 High Wall, Heat Pump Type Service Manual 2-2. Refrigerant Piping Installation 2-2-1. Piping Materials and Joints Used For the refrigerant piping installation, copper pipes and joints are mainly used. Copper pipes and joints suitable for the refrigerant must be chosen and installed. Furthermore, it is necessary to use clean copper pipes and joints whose interior surfaces are less affected by contaminants. Copper Pipes It is necessary to use seamless copper pipes which are made of either copper or copper alloy and it is desirable that the amount of residual oil is less than 40 mg/10 m. Do not use copper pipes having a collapsed, deformed or discoloured portion (especially on the interior surface). Otherwise, the expansion valve or capillary tube may become blocked with contaminants. As an air conditioner using R410A incurs pressure higher than when using R22, it is necessary to choose adequate materials. Thicknesses of copper pipes used with R410A are as shown in Table 2-2-1.
Never use copper pipes thinner than 0.8 mm even when it is available on the market. Table 2-2-1 Thicknesses of annealed copper pipes Thickness (mm) Nominal diameter 1/4 3/8 1/2 5/8 Outer diameter (mm) 6.35 9.52 12.
70 15.88 R410A 0.80 0.80 0.80 1.
00 R22 0.80 0.80 0.80 1.00 Joints For copper pipes, flare joints or socket joints are used. Prior to use, be sure to remove all contaminants. · Flare Joints Flare joints used to connect the copper pipes cannot be used for pipings whose outer diameter exceeds 20 mm. In such a case, socket joints can be used. Sizes of flare pipe ends, flare joint ends and flare nuts are as shown in Tables 2-2-3 to 2-2-6 below. · Socket Joints Socket joints are such that they are brazed for connections, and used mainly for thick pipings whose diameter is larger than 20 mm.

Thicknesses of socket joints are as shown in Table 2-2-2. Table 2-2-2 Minimum thicknesses of socket joints Nominal diameter 1/4 3/8 1/2 5/8 Reference outer diameter of copper pipe jointed (mm) 6.35 9.52 12.70 15.88 Minimum joint thickness (mm) 0.50 0.60 0.70 0.80 2-2-2.
Processing of Piping Materials When performing the refrigerant piping installation, care should be taken to ensure that water or dust does not enter the pipe interior, that no other oil than lubricating oils used in the installed air-water heat pump is used, and that refrigerant does not leak. When using lubricating oils in the piping processing, use such lubricating oils whose water content has been removed. When stored, be sure to seal the container with an airtight cap or any other cover. 14 High Wall, Heat Pump Type Service Manual Flare processing procedures and precautions 1) Cutting the Pipe By means of a pipe cutter, slowly cut the pipe so that it is not deformed. 2) Removing Burrs and Chips If the flared section has chips or burrs, refrigerant leakage may occur. Carefully remove all burrs and clean the cut surface before installation. 3) Insertion of Flare Nut 4) Flare Processing Fig. 2-2-1 Make certain that a clamp bar and copper pipe have been Flare processing dimensions cleaned. ØD By means of the clamp bar, perform the flare processing A correctly. Use either a flare tool for R410A or conventional flare tool.
Flare processing dimensions differ according to the type of flare tool. When using a conventional flare tool, be sure to secure "dimension A" by using a gauge for size adjustment. Table 2-2-3 Dimensions related to flare processing for R410A Nominal diameter 1/4 3/8 1/2 5/8 Outer diameter (mm) 6.35 9.52 12.70 15.88 A (mm) Thickness (mm) 0.8 0.8 0.8 1.

0 Flare tool for R410A clutch type 0 to 0.5 0 to 0.5 0 to 0.5 0 to 0.5 Conventional flare tool Clutch type 1.0 to 1.5 1.0 to 1.5 1.0 to 1.
5 1.0 to 1.5 Wing nut type 1.5 to 2.0 1.
5 to 2.0 2.0 to 2.5 2.0 to 2.
5 Table 2-2-4 Dimensions related to flare processing for R22 Nominal diameter 1/4 3/8 1/2 5/8 Outer diameter (mm) 6.35 9.52 12.70 15.88 A (mm) Thickness (mm) 0.8 0.8 0.8 1.0 Flare tool for R22 clutch type 0 to 0.5 0 to 0.

5 0 to 0.5 0 to 0.5 Conventional flare tool Clutch type 0.5 to 1.0 0.5 to 1.0 0.5 to 1.0 0.5 to 1.
0 Wing nut type 1.0 to 1.5 1.0 to 1.5 1.
5 to 2.0 1.5 to 2.0 Table 2-2-5 Flare and flare nut dimensions for R410A Nominal diameter 1/4 3/8 1/2 5/8 Outer diameter (mm) 6.35 9.
52 12.70 15.88 Thickness (mm) 0.8 0.8 0.8 1.0 Dimension (mm) A 9.1 13.2 16.6 19.

7 B 9.2 13.5 16.0 19.0 C 6.5 9.7 12.9 16.0 D 13 20 23 25 Flare nut width (mm) 17 22 26 29 15 High Wall, Heat Pump Type Service Manual Table 2-2-6 Flare and flare nut dimensions for R22 Nominal diameter 1/4 3/8 1/2 5/8 3/4 Outer diameter (mm) 6.35 9.
52 12.70 15.88 19.05 Thickness (mm) 0.8 0.
8 0.8 1.0 1.0 Dimension (mm) A 9.0 13.
0 16.2 19.4 23.3 B 9.2 13.5 16.0 19.0 24.0 C 6.5 9.

7 12.9 16.0 19.2 D 13 20 20 23 34 Flare nut width (mm) 17 22 24 27 36 Fig. 2-2-2 Relations between flare nut and flare seal surface 45° to 4 6° B A C D 43° to 4 5° Flare Connecting Procedures and Precautions 1) Make sure that the flare and union portions do not have any scar or dust, etc. 2) Correctly align the processed flare surface with the union axis. 3) Tighten the flare with designated torque by means of a torque wrench. The tightening torque for R410A is the same as that for conventional R22. Incidentally, when the torque is weak, the gas leakage may occur. When it is strong, the flare nut may crack and may be made non-removable.
When choosing the tightening torque, comply with values designated by manufacturers. Table 3-2-7 shows reference values. NOTE When applying oil to the flare surface, be sure to use oil designated by the manufacturer. If any other oil is used, the lubricating oils may deteriorate and cause the compressor to burn out. Table 2-2-7 Tightening torque of flare for R410A [Reference values] Nominal diameter 1/4 3/8 1/2 5/8 Outer diameter (mm) 6.
35 9.52 12.70 15.88 Tightening torque N·m (kgf·cm) 14 to 18 (140 to 180) 33 to 42 (330 to 420) 50 to 62 (500 to 620) 63 to 77 (630 to 770) Tightening torque of torque wrenches available on the market N·m (kgf·cm) 16 (160), 18 (180) 42 (420) 55 (550) 65 (650) 16 High Wall, Heat Pump Type Service Manual 2-3.

Tools 2-3-1.

*Required Tools The service port diameter of packed valve of the outdoor unit in the air-water heat pump using R410A is changed to prevent mixing of other refrigerant. To reinforce the pressure-resisting strength, flare processing dimensions and opposite side dimension of flare nut (For Ø12.7 copper pipe) of the refrigerant piping are lengthened. The used refrigerating oil is changed, and mixing of oil may cause a trouble such as generation of sludge, clogging of capillary, etc. Accordingly, the tools to be used are classified into the following three types. · Tools exclusive for R410A (Those which cannot be used for conventional refrigerant (R22)) · Tools exclusive for R410A, but can be also used for conventional refrigerant (R22) · Tools commonly used for R410A and for conventional refrigerant (R22) The table below shows the tools exclusive for R410A and their interchangeability. Tools exclusive for R410A (The following tools for R410A are required.) Tools whose specifications are changed for R410A and their interchangeability R410A air-water heat pump installation No. Used tool Usage Conventional air-water heat pump installation Existence of new Whether conventional Whether new equipment equipment for equipment can be can be used with R410A used conventional refrigerant Yes Yes Yes Yes Yes Yes Yes Yes *(Note 2) *(Note 1) *(Note 1) No No No Yes No No No Yes *(Note 1) No No Yes Yes No Yes No 1 2 3 4 5 6 7 8 9 10 Flare tool Copper pipe gauge for adjusting projection margin Torque wrench (For Ø12.7) Gauge manifold Charge hose Vacuum pump adapter Electronic balance for refrigerant charging Refrigerant cylinder Leakage detector Charging cylinder Pipe flaring Flaring by conventional flare tool Connection of flare nut Evacuating, refrigerant charge, run check, etc.*

*Vacuum evacuating Refrigerant charge Refrigerant charge Gas leakage check Refrigerant charge * (Note 1) When flaring is carried out for R410A using the conventional flare tools, adjustment of projection margin is necessary. For this adjustment, a copper pipe gauge, etc. are necessary. * (Note 2) Charging cylinder for R410A is being currently developed. General tools (Conventional tools can be used.) In addition to the above exclusive tools, the following equipment which serve also for R22 are necessary as the general tools. 1. Vacuum pump Use vacuum pump by attaching vacuum pump adapter. 2. Torque wrench (For Ø6.*

35, Ø9.52) 3. Pipe cutter 4. 5. 6.

7. 8. Reamer Pipe bender Level vial Screwdriver (+,) Spanner or Monkey wrench 9. Hole core drill (Ø65) 10. Hexagon wrench Opposite side 4mm) 11. Tape measure 12. Metal saw Also prepare the following equipment for other installation method and run check. 1. Clamp meter 2. Thermometer 3. Insulation resistance tester 4. Electroscope 17 High Wall, Heat Pump Type Service Manual 2-4. Recharging Refrigerant When it is necessary to recharge refrigerant, charge the specified amount of new refrigerant according to the following steps. Recover the refrigerant, and check no refrigerant remains in the equipment. Connect the charge hose to packed valve service port at the outdoor unit's gas side.

When the compound gauge's pointer has indicated 0.1 Mpa (76 cmHg), place the handle Low in the fully closed position, and turn off the vacuum pump's power switch. Connect the charge hose to the vacuum pump adapter. Keep the status as it is for 1 to 2 minutes, and ensure that the compound gauge's pointer does not return. Open fully both packed valves at liquid and gas sides. Set the refrigerant cylinder to the electronic balance, connect the connecting hose to the cylinder and the connecting port of the electronic balance, and charge liquid refrigerant. (For refrigerant charging, see the figure below.) Place the handle of the gauge manifold Low in the fully opened position, and turn on the vacuum pump's power switch. Then, evacuating the refrigerant in the cycle. CAUTION · Never charge refrigerant exceeding the specified amount.

· If the specified amount of refrigerant cannot be charged, charge refrigerant bit by bit in COOL mode. · Do not carry out additional charging. When additional charging is carried out if refrigerant leaks, the refrigerant composition changes in the refrigeration cycle, that is characteristics of the air conditioner changes, refrigerant exceeding the specified amount is charged, and working pressure in the refrigeration cycle becomes abnormally high pressure, and may cause a rupture or personal injury. Fig. 2-4-1 Configuration of refrigerant charging (Water heat exchanger unit) (Outdoor unit) Opened Refrigerant cylinder (with siphon) Check valve Opened Open/close valve for charging Opened Closed Service port Electronic balance for refrigerant charging 18 High Wall, Heat Pump Type Service Manual NOTE · Be sure to make setting so that liquid can be charged.

· When using a cylinder equipped with a siphon, liquid can be charged without turning it upside down. It is necessary for charging refrigerant under condition of liquid because R410A is mixed type of refrigerant. Accordingly, when charging refrigerant from the refrigerant cylinder to the equipment, charge it turning the cylinder upside down if cylinder is not equipped with siphon. NOTE R410A refrigerant is HFC mixed refrigerant. Therefore, if it is charged with gas, the composition of the charged refrigerant changes and the characteristics of the equipment varies.

Fig. 2-4-2 Cylinder with siphon Gauge manifold OUTDOOR unit Refrigerant cylinder Electronic balance Siphon Fig. 2-4-3 Cylinder without siphon Gauge manifold OUTDOOR unit Refrigerant cylinder Electronic balance 19 High Wall, Heat Pump Type Service Manual 2-5. Brazing of Pipes 2-5-1. Materials for Brazing Silver brazing filler Silver brazing filler is an alloy mainly composed of silver and copper. It is used to join iron, copper or copper alloy, and is relatively expensive though it excels in solder ability. Types of flux · Non corrosive flux Generally, it is a compound of borax and boric acid. It is effective in case where the brazing temperature is higher than 800°C. · Activated flux Most of fluxes generally used for silver brazing are this type. It features an increased oxide film removing capability due to the addition of compounds such as potassium fluoride, potassium chloride and sodium fluoride to the borax-boric acid compound.

Phosphor bronze brazing filler Phosphor bronze brazing filler is generally used to join copper or copper alloy. Low temperature brazing filler Low temperature brazing filler is generally called solder, and is an alloy of tin and lead. Since it is weak in adhesive strength, do not use it for refrigerant pipes. REQUIREMENT · Phosphor bronze brazing filler tends to react with sulfur and produce a fragile compound water solution, which may cause a gas leakage.

Therefore, use any other type of brazing filler at a hot spring resort, etc., and coat the surface with a paint. · When performing brazing again at time of servicing, use the same type of brazing filler. Piping materials for brazing and used brazing filler/flux Piping material Copper - Copper Copper - Iron Iron - Iron Used brazing filler Phosphor copper Silver Silver Used flux Do not use Paste flux Vapour flux NOTE · Do not enter flux into the refrigeration cycle. · When chlorine contained in the flux remains within the pipe, the lubricating oil deteriorates. Therefore, use a flux which does not contain chlorine. · When adding water to the flux, use water which does not contain chlorine (e.g. distilled water or ionexchange water). · Remove the flux after brazing. 2-5-2. Flux Reason why flux is necessary · By removing the oxide film and any foreign matter on the metal surface, it assists the flow of brazing filler. · In the brazing process, it prevents the metal surface from being oxidized. · By reducing the brazing filler's surface tension, the brazing filler adheres better to the treated metal. 2-5-3. Brazing As brazing work requires sophisticated techniques, experiences based upon a theoretical knowledge, it must be performed by a person qualified.

In order to prevent the oxide film from occurring in the pipe interior during brazing, it is effective to proceed with brazing while letting dry Nitrogen gas (N2) flow. Characteristics required for flux · Activated temperature of flux coincides with the brazing temperature. · Due to a wide effective temperature range, flux is hard to carbonize. · It is easy to remove slag after brazing. · The corrosive action to the treated metal and brazing filler is minimum. · It excels in coating performance and is harmless to the human body. As the flux works in a complicated manner as described above, it is necessary to select an adequate type of flux according to the type and shape of treated metal, type of brazing filler and brazing method, etc. CAUTION Never use gas other than Nitrogen gas. 20 High Wall, Heat Pump Type Service Manual Brazing method to prevent oxidation 1) Attach a reducing valve and a flow-meter to the Nitrogen gas cylinder. 2) Use a copper pipe to direct the piping material, and attach a flow-meter to the cylinder.

3) Apply a seal onto the clearance between the piping material and inserted copper pipe for Nitrogen in order to prevent backflow of the Nitrogen gas. 4) When the Nitrogen gas is flowing, be sure to keep the piping end open. 5) Adjust the flow rate of Nitrogen gas so that it is lower than 0.05 m3/Hr or 0.02 MPa (0.2kgf/cm2) by means of the reducing valve. 6) After performing the steps above, keep the Nitrogen gas flowing until the pipe cools down to a certain extent (temperature at which pipes are touchable with hands). 7) Remove the flux completely after brazing. Fig. 2-5-1 Prevention of oxidation during brazing M Flow meter Stop valve Nitrogen gas cylinder From Nitrogen cylinder Pipe Nitrogen gas Rubber plug 21 High Wall, Heat Pump Type Service Manual 3 CONSTRUCTION VIEWS 3-1.

Indoor Unit RAS-07PKVP-E, RAS-10PKVP-E, RAS-13PKVP-E, RAS-16PKVP-E, RAS-18PKVP-E RAS-07PKVP-ND, RAS-10PKVP-ND, RAS-13PKVP-ND, RAS-16PKVP-ND, RAS-18PKVP-ND 296.2 9 (At the time of operation) 790 Plasma ion charger 790 Moving panel 242 (At the time of a stop) Front panel 77 62 Piping port from left/right sides Air filter Guard wire Piping port from left/right sides (Knockout system) From wall to air outlet length 100 64 34 dia.4.2 8 (Knockout system) 62 8 4.5 125.

5 19 (Drain hose detail) dia.14 Inner diameter dia.16 Outer diameter 163 19 74.5 Remote controller holder 18 77 Name Plate 77 37 Installation plate hanging section Refrigerant pipe connecting port Gas side Refrigerant pipe connecting port Liquid side Flare dia. 6.

*35 Outside length 0.4m Flare dia. 9.52 (16,18PKVP-E (-ND) :dia. 12.7) Outside length 0.35m 58 Installation plate hanging section 312 590 450 312 55 or more Hanging section Recommend 70 or more Drain hose VP16 Outside length 0.54mm Wireless remote controller 100 Stud bolt hole For dia.8 to 10 100 Model RAS-**PKVP-E Series RAS-**PKVP-ND Series Stud bolt hole For dia.8 to dia.*

10 Remote controller WH-H06JE WH-H07JE 12 Minimum distance to ceiling Heat insulation 45.5(dia.65) 53(dia.80) 46 Minimum distance to wall Minimum distance to wall 130 or more Recommend 180 or more 130 or more Recommend 180 or more dia.65 di Shape line installation plate 330 790 330 22 45.5(dia.65) 53(dia.80) a. 80 Lower part hanging section Center line of main unit Center line of installation plate Lower part hanging section dia.28 77 295 62 65 a.

di dia.80 High Wall, Heat Pump Type Service Manual 3-2. Outdoor Unit RAS-07PAVP-E, RAS-10PAVP-E RAS-07PAVP-ND, RAS-10PAVP-ND [A] leg part dia.11-14 U-shape hole (For dia.8-10 anchor bolt) 600 90 Anchor bolt long hole pitch Dia.

11 ×14 long hole (For dia.8-10 anchor bolt) 8-dia.7 hole (For fixing outdoor unit) [B] leg part 257 145 157 79 26 C L 483 21 69.5 147 di a. 43 6 Fan guard 108 6 dia.

7 hole pitch 320 290 306 21 Packed valve cover 483 550 449 Connecting pipe port (Pipe dia.6.35) Connecting pipe port (Pipe dia.9.52) 35 52 32 500 780 69 Charging port 4-dia.4.5 embossment Drain long hole 54 38 600 5 R1 hole 2-dia.7 31 342 143 20 60 88 Detailed [A] leg part 20 30 11 320 28 Drain hole 166 108 448 125 R5 di a. 320 88 .5 25 93 11 Drain long hole Outside line of product 2-dia.

7 hole Outside line of product R5 .5 38 54 600 Detailed [B] leg part 22 25 Fin guard Mounting dimensions of anchor bolt 600 2-dia.11 × 14 U-shape hole (for dia.8-10 anchor bolt) Intake [D] 50 or more When installing the outdoor unit, leave open in at least two of directions [A], [B], [C] and [D] shown in the figure below. 250 or more 320 100 or more [A] Outside line of product [C] 200 or more (Minimum distance from wall [B] Outlet 2-dia.11 × 14 long hole (for dia.8-10 anchor bolt) 23 501) 137 54 8 5 R1 High Wall, Heat Pump Type Service Manual RAS-13PAVP-E, RAS-16PAVP-E, RAS-18PAVP-E RAS-13PAVP-ND, RAS-16PAVP-ND, RAS-18PAVP-ND [A] leg part dia.11-14U-shape hole (For dia.8-10 anchor bolt) 600 90 dia.11x14 long hole (For dia. 8-10 anchor bolt) 8-dia.7 hole (For fixing outdoor unit) [B] leg part 145 157 79 26 483 21 69.5 147 di a. 43 C L 108 257 Fan guard 6 6 Anchor bolt long hole pitch dia.7 hole pitch 290 306 320 483 550 449 21 Packed valve cover Connecting pipe port (Pipe dia.

6.35) 35 52 8 32 500 31 143 780 69 Charging port Connecting pipe port (Pipe dia.

9.52 : 13PAVP-E (-ND)) (Pipe dia.12.
7 : 16PAVP-E (-ND)) (Pipe dia.12.7 : 18PAVP-E (-ND)) 600 Drain long hole 4-dia.4.5 embossment 54 38 5 R1 hole 2-dia.7 320 88 93 20 60 88 20 30 28 Drain hole 166 108 448 125 R5 .5 11 Outside line of product Detailed [A] leg part 11 320 2-dia.7 hole Outside line of product Drain long hole R5 .5 38 54 600 Detailed [B] leg part 22 25 Fin guard Mounting dimensions of anchor bolt 600 2-dia.11 × 14 U-shape hole (for dia.

8-10 anchor bolt) Intake When installing the outdoor unit, leave open in at least two of directions [A], [B], [C] and [D] shown in the figure below. [D] 50 or more 250 or more Intake 320 100 or more [A] Outside line of product [C] 200 or more (Minimum distance from wall 501) [B] Outlet 2-dia.11 × 14 long hole (for dia.8-10 anchor bolt) 24 137 54 di a. 25 5 R1 High Wall, Heat Pump Type Service Manual 4 WIRING DIAGRAM RAS-07PAVP-E, RAS-10PAVP-E, RAS-13PAVP-E, RAS-16PAVP-E, RAS-18PAVP-E RAS-07PKVP-E, RAS-10PKVP-E, RAS-13PKVP-E, RAS-16PKVP-E, RAS-18PKVP-E RAS-07PAVP-ND, RAS-10PAVP-ND, RAS-13PAVP-ND, RAS-16PAVP-ND, RAS-18PAVP-ND RAS-07PKVP-ND, RAS-10PKVP-ND, RAS-13PKVP-ND, RAS-16PKVP-ND, RAS-18PKVP-ND (CONDENSER PIPE TEMP. SENSOR) (DISCHARGE PIPE TEMP. SENSOR) (OUTDOOR TEMP. SENSOR) (SUCTION PIPE TEMP. SENSOR) TE TD TO TS FM RED WHI BLK 123 123 PMV 654321 654321 REACTOR FAN MOTOR PULSE MOTOR VALVE 21 21 12 12 1 1 3 3 12 12 1 1 3 3 P07 WHI WHI 4WAY VALVE COIL FOR SWITCHING COOLING AND HEATING CN704 CN705 (WHI) 1 1 RED 22 22 CN600 CN601 P15 P14 P35 P25 DIODE BLOCK + ~ ~ - CN602 CN603 CN300 CN700 P17 P16 YEL YEL RED (RED) 1 1 PTC C10 THERMISTOR C09 C08 POWER RELAY + - ++ -- MOSFET Q300 ~ Q305 F03 FUSE 250V ~ T3.15A SURGE ABSORBER VARISTOR CT F01 FUSE 250V ~ T25A 4WAY VALVE COIL FOR SWITCHING CYLINDERS DB01 11 22 YEL P21 YEL P32 DIODE BLOCK F04 FUSE 250V ~ 15A POWER MODULE REDP06 WHI P05 BLK P04 11 22 33 Q404 IGBT DB02 RELAY CN703 WHI P02 BLK P01 REACTOR IC200 P11 P10 FUSE 250V ~ COMPRESSOR T3.
15A CM 21 21 FUSE 250V ~ T3.15A FUSE 250V T6.3A 321 321 HEATER FOR ANTI FREEZE 1 2 3 L N -ND model only POWER SUPPLY 220-240V ~ ,50Hz 220-230V ~ ,60Hz Indoor Terminal Block Outdoor Unit Indoor Unit 321 RED WHI BLK Heat Exchanger GRN&YEL Air purifier Electrode High-voltage Power Supply 1234 BRW RED RED RED BLU 21 21 SHEET METAL BLK Micro SW BRW Heat Exchanger Sensor BLK (TC) 1 BLK BLK 11 BLK 22 1 22 CN501 CN602 (BLU) (YEL) CN03 CN01 1234 1234 CN21 CN402 (WHI) CN401 (RED) CN603 CN601 (WHI) Power Supply Circuit Heat Exchanger Sensor BLK (TCj) 1 1 BLK 22 Thermo Sensor (TA) Humidity Sensor BLK 11 BLK 22 T3.15A 250VAC Fuse F01 Varistor R01 Line Filter DC5V DC12V DC29V ~ ~ + + CN604 (RED) 24 23 22 21 20 19 19 18 18 17 16 16 15 14 14 13 12 12 11 10 10 CN382 (WHI) Louver Motor right RED RED RED RED WHI 5 4 3 2 1 5 4 3 2 1 Louver Motor left YEL YEL YEL YEL WHI 5 4 3 2 1 5 4 3 2 1 5 4 3 2 1 5 4 3 2 1 CN212 1 2 3 4 Main P.C Board MCC-5068A CN801 123456 9 8 7 6 5 4 3 2 1 9 8 7 6 5 4 3 2 1 CN383 (WHI) 12345 12345 WHI YEL YEL YEL YEL BLU BLU BLU BLU BLU BLU BLU BLU BLU WHI CN301(WHI) BLU YEL WHI BLK RED WHI WHI WHI WHI RED CN261 10 9 10 9 (WHI) 87654321 87654321 6543 6543 1 1 Louver Motor Horizontal 12345 12345 CN221 10 9 9 (WHI) 10 87654321 87654321 54321 Moving Panel Wireless Unit Assembly MCC-5068B DC Motor Fan Motor 25 ORN P.C.BOARD MCC-5070 3 3 1 1 P03 High Wall, Heat Pump Type Service Manual 5 No. 1 2 3 4 5 6 7 SPECIFICATIONS OF ELECTRICAL PARTS 5-1. Indoor Unit RAS-07PKVP-E, RAS-10PKVP-E, RAS-13PKVP-E, RAS-16PKVP-E, RAS-18PKVP-E RAS-07PKVP-ND, RAS-10PKVP-ND, RAS-13PKVP-ND, RAS-16PKVP-ND, RAS-18PKVP-ND Parts name Fan motor (for Indoor Unit) Room temp. sensor (TA-sensor) Heat exchanger temp. sensor (TC-sensor) Heat exchanger temp. sensor (TCj-sensor) Humidity sensor Louver motor (right, left, Horizontal) Louver motor (Moving panel) Type E:ICF-340-30-4 ND:ICF-340-30-4A ( ) ( ) ( ) C7-M3R-TC2 MP24Z3N MP24Z4N Specifications DC280340V, 30W 10k at 25°C 10k at 25°C 10k at 25°C 31k 60%RH Output (Rated) 1W, 16 poles, DC12V Output (Rated) 1W, 16 poles, DC12V 5-2. Outdoor Unit RAS-07PAVP-E, RAS-10PAVP-E, RAS-13PAVP-E, RAS-16PAVP-E, RAS-18PAVP-E RAS-07PAVP-ND, RAS-10PAVP-ND, RAS-13PAVP-ND, RAS-16PAVP-ND, RAS-18PAVP-ND No. 1 2 3 4 5 6 7 8 9 10 11 12 13 Parts name Reactor Fan motor (for Outdoor Unit) Suction temp. sensor (TS sensor) Discharge temp. sensor (TD sensor) Outside air temp. sensor (TO sensor) Heat exchanger temp. sensor (TE sensor) Terminal block (6P) Compressor Coil for P.M.V.

Coil for 4-way valve (Cooling/heating switching) Coil for 4-way valve (Comp. cylinder switching) Cord heater assembly (-ND model only) Heater fuse assembly (-ND model only) Model name CH-57 ICF-140-43-4R (Inverter attached) (Inverter attached) (Inverter attached) (Inverter attached) JXO-6B DA111A1FD-21F C12A-80A VHV-01AZ535A1 VHV-01AZ535B1 CSC-2 -- Rating L = 10mH, 16A DC140V, 43W 10k (25°C) 1,905k (120°C) 10k (25°C) 10k (25°C) 20A, AC250V 3-phases 4 poses 750W DC12V DC12V DC12V AC230V, 75W AC250V, 3.15A 26 High Wall, Heat Pump Type Service Manual 6 REFRIGERANT CYCLE DIAGRAM TA 6-1. Refrigerant Cycle Diagram INDOOR UNIT Indoor heat exchanger P Pressure measurement Gauge attaching port V Vacuum pump connecting port TC T1 TCj Temp. measurement Allowable height difference : 10m Strainer Pulse motor valve (SEV16RCC) Cross flow fan Deoxidized copper pipe Outer dia. : 6.35mm Thickness : 0.8mm Sectional shape of heat insulator Allowable pipe length Deoxidized copper pipe Outer dia.: 07PAVP-E(-ND) : 9.52mm 10PAVP-E(-ND) : 9.
52mm 13PAVP-E(-ND) : 9.52mm 16PAVP-E(-ND) : 12.7mm 18PAVP-E(-ND) : 12.7mm Thickness : 0.8mm Max.
: 20m Min. : 2m Chargeless : 15m Charge : 20g/m (16 to 20m) Muffler 4-way valve a (STF-0218G) TD 4-Way valve (STF-0125G) 1 2 Compressor (DA111A1FD-21F) Muffler 2 1 TS TO Outdoor heat exchanger Capillary Ø1.2x80 Distributor T1 TE Propeller fan T1 T2 Temp. measurement Refrigerant amount : 07PAVP-E(-ND) : 1.12kg 10PAVP-E(-ND) : 1.
12kg 13PAVP-E(-ND) : 1.15kg 16PAVP-E(-ND) : 1.15kg 18PAVP-E(-ND) : 1.15kg OUTDOOR UNIT 1 2 Gas leak check position Refrigerant flow (Cooling) Refrigerant flow (Heating) Refrigerant flow (Comp. 1 cylinder operation) Refrigerant flow (Comp. 2 cylinder operation) Temp. Sensor NOTE The maximum pipe length of this air conditioner is 20 m. When the pipe length exceeds 15m, the additional charging of refrigerant, 20g per 1m for the part of pipe exceeded 15m is required.

(Max. 100g) 27 High Wall, Heat Pump Type Service Manual 6-2.

Operation Data Cooling Temperature condition (°C) Indoor Outdoor Model name RAS07PKVP-E 07PKVP-ND 10PKVP-E 10PKVP-ND 10PKVP-E 10PKVP-ND 16PKVP-E 16PKVP-ND 18PKVP-E 18PKVP-ND Standard pressure P (MPa) 1.0 to 1.2 1.0 to 1.2 0.9 to 1.1 0.8 to 1.0 0.8 to 1.
0 Heat exchanger pipe temp. T1 (°C) T2 (°C) 14 to 16 13 to 15 10 to 13 8 to 11 7 to 10 39 to 42 40 to 43 42 to 45 44 to 47 45 to 48 Indoor fan mode High High High High High Outdoor fan mode High High High High High Compressor revolution (rps) 26 34 54 77 90 27/19 35/ Heating Temperature condition (°C) Indoor Outdoor Model name RAS07PKVP-E 07PKVP-ND 10PKVP-E 10PKVP-ND 13PKVP-E 13PKVP-ND 16PKVP-E 16PKVP-ND 18PKVP-E 18PKVP-ND Standard pressure P (MPa) 1.8 to 2.0 2.0 to 2.
2 2.2 to 2.4 2.5 to 2.7 2.
6 to 2.8 Heat exchanger pipe temp. T1 (°C) T2 (°C) 32 to 34 35 to 37 38 to 41 43 to 46 44 to 47 2 to 4 2 to 4 2 to 4 1 to 3 1 to 3 Indoor fan mode High High High High High Outdoor fan mode High High High High High Compressor revolution (rps) 35 45 60 85 93 20/ 7/6 NOTE · Measure surface temperature of heat exchanger pipe around centre of heat exchanger path U bent. (Thermistor thermometer) · Connecting piping condition : 5 m 28 High Wall, Heat Pump Type Service Manual 7 CONTROL BLOCK DIAGRAM 7-1. Indoor Unit RAS-07PKVP-E, RAS-10PKVP-E, RAS-13PKVP-E, RAS-16PKVP-E, RAS-18PKVP-E RAS-07PKVP-ND, RAS-10PKVP-ND, RAS-13PKVP-ND, RAS-16PKVP-ND, RAS-18PKVP-ND Humidity Sensor Heat Exchanger Sensor (TCj) M.C.U. Functions · Cold draft preventing Function · 3-minute Delay at Restart for Compressor · Fan Motor Starting Control · Processing (Temperature Processing) Indoor Unit Control Unit Louver Motor Louver Motor Drive Control Indoor Fan Motor Control Indoor Fan Motor Air purifier unit Micro Switch Heat Exchanger Sensor (TC) Room Temperature Sensor (TA) Infrared Rays Signal Receiver and Indication Initializing Circuit Clock Frequency Oscillator Circuit · Timer · Serial Signal Communication · Clean Function Power Supply Circuit Converter (D.C circuit) Noise Filter Serial Signal Transmitter/Receiver From Outdoor Unit 220-240V ~ 50Hz 220-230V ~ 60Hz Serial Signal Communication (Operation Command and Information) Remote Controller Remote Controller Operation (START/STOP) Operation Mode Selection AUTO, COOL, DRY, HEAT Thermo. Setting Fan Speed Selection ON TIMER Setting OFF TIMER Setting Louver AUTO Swing Louver Direction Setting SLEEP MODE Hi POWER Air Purifier 8°C (-ND model only) Infrared Rays, 36.

7kHz 29 For INDOOR UNIT MICRO-COMPUTER BLOCK DIAGRAM 220-240 V ~ 50Hz 220-230 V ~ 60Hz High Wall, Heat Pump Type MCC5070 (P.C.B) OUTDOOR UNIT Indoor unit send/receive circuit Discharge temp. sensor (TD) Current detect Gate drive circuit Current detect Gate drive circuit M.C.U Outdoor air temp. sensor (TO) Suction temp. sensor (TS) 7-2. Outdoor Unit (Inverter Assembly) RAS-07PAVP-E, RAS-10PAVP-E, RAS-13PAVP-E, RAS-16PAVP-E, RAS-18PAVP-E RAS-07PAVP-ND, RAS-10PAVP-ND, RAS-13PAVP-ND, RAS-16PAVP-ND, RAS-18PAVP-ND 30 Clock frequency 7MHz Converter (AC DC) Inverter (DC AC) Relay circuit Driver circuit of P.M.
V. Relay circuit Inverter (DC AC) Freeze prevention heater Heat exchanger temp.sensor (TE) · · · · · · · · · · · PWM synthesis function Input current release control IGBT over-current detect control Outdoor fan control High power factor correction control Inverter output frequency control A/D converter function P.M.V.
control Discharge temp. control 4-way valve control Signal communication to indoor unit High Power factor Correction circuit Noise Filter Input current sensor Outdoor Fan motor Compressor P.M.V. 4-way valve 4-way valve Cooling/heating Comp.
cylinder switching switching P.M.V. : Pulse Motor Valve M.C.U. : Micro Control Unit Service Manual (-ND model only) High Wall, Heat Pump Type Service Manual 8 OPERATION DESCRIPTION · Judgment of inlet indoor heat exchanger temperature by using heat exchanger sensor (TCj sensor)(Super heat control etc.) · Judgment of suction air humidity of the indoor heat exchanger by using humidity sensor. (Hu sensor) · Louver motor control · Indoor fan motor operation control · LED (Light Emitting Diode) display control · Transferring of operation command signal (Serial signal) to the outdoor unit · Reception of information of operation status (Serial signal including outside temp. data) to the outdoor unit and judgment/display of error · Air purifier operation control · Moving panel control 8-1.

Outline of Air Conditioner Control This air conditioner is a capacity-variable type air conditioner, which uses DC motor for the indoor fan motor and the outdoor fan motor. And the Variable Cylinder Management Compressor (VCM Comp.) which can change the motor speed in the range from 10 to 100 rps at 2 cylinder operation and the range from 10 to 50 rps at 1 cylinder operation is mounted. The DC motor drive circuit is mounted to the indoor unit. The compressor and the inverter to control fan motor are mounted to the outdoor unit. The entire air conditioner is mainly controlled by the indoor unit controller. The indoor unit controller drives the indoor fan motor based upon command sent from the remote controller, and transfers the operation command to the outdoor unit controller. The outdoor unit controller receives operation command from the indoor unit side, and controls the outdoor fan and the pulse motor valve. (P.M.
V) Besides, detecting revolution position of the compressor motor, the outdoor unit controller controls speed of the compressor motor by controlling output voltage of the inverter and switching timing of the supply power (current transfer timing) so that motors drive according to the operation command. And then, the outdoor unit controller transfers reversely the operating status information of the outdoor unit to control the indoor unit controller. NOTE As the compressor adopts four-pole brushless DC motor, the frequency of the supply power from inverter to compressor is two-times cycles of the actual number of revolution. 8-1-2. Role of outdoor unit controller Receiving the operation command signal (Serial signal) from the indoor unit controller, the outdoor unit performs its role.
· Compressor operation control Operations followed · Operation control of outdoor to judgment of serial signal from indoor fan motor side. · P.M.V. control · 4-way valve control · Detection of inverter input current and current release operation · Over-current detection and prevention operation to IGBT module (Compressor stop function) · Compressor and outdoor fan stop function when serial signal is off (when the serial signal does not reach the board assembly of outdoor control by trouble of the signal system) · Transferring of operation information (Serial signal) from outdoor unit controller to indoor unit controller · Detection of outdoor temperature and operation revolution control · Defrost control in heating operation (Temp.

measurement by outdoor heat exchanger and control for 4-way valve and outdoor fan) 8-1-1. Role of Indoor Unit Controller The indoor unit controller judges the operation commands from the remote controller and assumes the following functions. · Judgment of suction air temperature of the indoor heat exchanger by using the indoor temp. sensor. (TA sensor) · Judgment of the indoor heat exchanger temperature by using heat exchanger sensor (TC sensor) (Prevent-freezing control and super heat control, etc.) 31 High Wall, Heat Pump Type Service Manual 8-1-3. Contents of Operation Command Signal (Serial Signal) From indoor unit controller to outdoor unit controller The following three types of signals are sent from the indoor unit controller. · Operation mode set on the remote controller · Compressor revolution command signal defined by indoor temperature and set temperature (Correction along with variation of room temperature and correction of indoor heat exchanger temperature are added.) · Temperature of indoor heat exchanger · For these signals ([Operation mode] and [Compressor revolution] indoor heat exchanger temperature), the outdoor unit controller monitors the input current to the inverter, and performs the followed operation within the range that current does not exceed the allowable value. 8-2.

Basic Operation 8-2-1. Operation Control Receiving the user's operation condition setup, the operation statuses of indoor/outdoor units are controlled. 1) The operation conditions are selected by the remote controller as shown in the below. 2) A signal is sent by ON button of the remote controller. 3) The signal is received by a sensor of the indoor unit and processed by the indoor controllers as shown in the below. 4) The indoor controller controls the indoor fan motor and louver motor. 5) The indoor controller sends the operation command to the outdoor controller, and sends/ receives the control status with a serial signal. 6) The outdoor controller controls the operation as shown in the below, and also controls the compressor, outdoor fan motor, 4-way valve and pulse motor valve. From outdoor unit controller to indoor unit controller The following signals are sent from the outdoor unit controller. · The current operation mode · The current compressor revolution · Outdoor temperature · Existence of protective circuit operation For transferring of these signals, the indoor unit controller monitors the contents of signals, and judges existence of trouble occurrence.
Contents of judgment are described below. · Whether distinction of the current operation status meets to the operation command signal · Whether protective circuit operates When no signal is received from the outdoor unit controller, it is assumed as a trouble. 32 High Wall, Heat Pump Type Service Manual Remote controller Selection of operation conditions ON/OFF Control contents of remote controller · ON/OFF (Air conditioner/Air purifier) · Operation select (COOL/HEAT/AUTO/DRY) · Temperature setup · AIr direction · Swing · Air volume select (AUTO/LOW/LOW+/MED/MED+/HIGH) · Sleep mode · ON timer setup · OFF timer setup · High power · 8°C heat operation (-ND model only) 8-2-2. Cooling/Heating Operation The operations are performed in the following parts by controls according to cooling/heating conditions. 1) Receiving the operation ON signal of the remote controller, the cooling or heating operation signal starts being transferred from the indoor controller to the outdoor unit.
2) At the indoor unit side, the indoor fan is operated according to the contents of "8-3. Indoor fan motor control" and the louver according to the contents of "8-9. Louver control", respectively. 3) The outdoor unit controls the outdoor fan motor, compressor, pulse motor valve and 4way valve according to the operation signal sent from the indoor unit. Operation ON Indoor unit control Sending of operation command signal Compressor revolution control / Outdoor fan motor control / Pulse motor valve control / 4-way valve control (After energization of the coil for 1 second,the 4-way valve is switched to the cooling or heating position.
*) Setup of remote controller Indoor fan motor control / Louver control Indoor unit Signal receiving Indoor unit control Operation command Serial signal send/receive Indoor unit control · Command signal generating function of indoor unit operation · Calculating function (temperature calculation) · Activation compensation function of indoor fan · Cold draft preventive function · Timer function · Indoor heat exchanger release control · Moving panel motor · Louver motor · Indoor fan motor · Air purifier Outdoor unit Serial signal send/receive Outdoor unit control · Compressor speed control of inverter output · Waveform composite function Outdoor unit · Calculation function control (Temperature calculation) · AD conversion function · Quick heating function · Delay function of compressor reactivation · Current release function · GTr over-current preventive function · Defrost operation function Inverter · 4-way valve (Switch between · Compressor Cooling and Heating) · Outdoor fan motor · 4-way valve · Pulse motor valve (Switch between (P.M.V.) 2 cylinder operation · Freeze prevention and heater 1 cylinder operation) (-ND model only) Outdoor unit control ~ 8-2-3. AUTO Operation Selection of operation mode As shown in the following figure, the operation starts by selecting automatically the status of room temperature (TA) when starting AUTO operation. * 1. When reselecting the operation mode, the fan speed is controlled by the previous operation mode. TA Cooling operation Ts + 1 Monitoring (Fan) Ts 1 Heating operation 1) Detects the room temperature (TA) when the operation started. 2) Selects an operation mode from TA in the above figure. 3) Fan operation continues until an operation mode is selected.*

33 High Wall, Heat Pump Type Service Manual 4) When AUTO operation has started within 2 hours after heating operation stopped and if the room temperature is 20°C or more, the fan operation is performed with "Super Ultra LOW" mode for 3 minutes. Then, select an operation mode. 5) If the status of compressor-OFF continues for 15 minutes the room temperature after selecting an operation mode (COOL/HEAT), reselect an operation mode. 8-3. Indoor Fan Motor Control 8-3-1. In Cooling Operation (This operation controls the fan speed at indoor unit side.) The indoor fan (cross flow fan) is operated by the phase control induction motor. The fan rotates in 5 stages in MANUAL mode, and in 5 stages in AUTO mode, respectively.

(Table 1) UH H M+ M L+ L LUL SUL COOL ON Fan speed setup AUTO MANUAL (Fig. 1) 8-2-4.

DRY Operation DRY operation is performed according to the difference between room temperature and the setup temperature as shown below. In DRY operation, fan speed is controlled in order to prevent lowering of the room temperature. TA-Tsc [°C] +4.5 +4.0 +3.

5 +3.0 +2.5 +2.0 +1.5 +1.

*0 +0.5 0.0 -0.5 -1.0 -1.5 -2.0 Time Zone Compressor speed (rps) Fan 07 10 13 16 18 Speed correction PKVP PKVP PKVP PKVP PKVP 50 45 41 35 35 W8 12 42 38 35 30 30 11 W6 35 32 29 25 25 10 +1 zone 27 25 23 20 20 9 20 18 17 15 15 8 12 12 11 10 10 7 10 10 10 10 10 6 5 W5 ±0 4 W4 3 2 -1 zone 1 (min 1) 0 OFF OFF OFF OFF OFF * Symbols : Ultra High : High : Medium+ : Medium : Low+ : Low : Low : Ultra Low : Super Ultra Low Indication Fan speed L L+ M M+ H Fan speed Hi Power M+(WC) *3 *4 *5 L(W7) H(WD) *6 *7 *8 L+(W8) Hi Power W8 (L+M)/2 WC (M+H)/2 WE W7 (L+M)/2 WA (M+H)/2 WD 1) Detects the room temperature (TA) when the DRY operation started. 2) Starts operation under conditions in the above figure according to the temperature difference between the room temperature and the setup temperature (Tsc). Setup temperature (Tsc) = Set temperature on remote controller (Ts) + (-1.5 to 2.*

*0) 3) When the room temperature is lower 2°C or less than the setup temperature, turn off the compressor. 4) The time correction is performed every 8 minutes. (Fig. 2) TA-Tsc [°C] +2.5 +2.0 a +1.5 b +1.0 c +0.5 d Tsc e *3 : Fan speed = (M+L)x3/4+L *4 : Fan speed = (M+L)x2/4+L *5 : Fan speed = (M+L)x1/4+L *6 : Fan speed = (HL+)x3/4+L+ *7 : Fan speed = (HL+)x2/4+L+ *8 : Fan speed = (HL+)x1/4+L+ (Linear approximation from M+ and L) 34 High Wall, Heat Pump Type Service Manual Table 8-3-1 Indoor fan air flow rate (Cooling, Dry) Fan speed level RAS-07PKVP-E RAS-07PKVP-ND Fan speed (rpm) 1170 UH H M+ 1170 1120 1060 1050 M 900 900 L+ L L UL 820 670 670 600 550 SUL 500 500 420 Air flow rate (m3/h) 645 645 610 570 560 455 455 395 290 290 240 205 170 170 110 RAS-10PKVP-E RAS-10PKVP-ND Fan speed (rpm) 1200 1200 1140 1080 1080 930 930 840 690 670 600 550 500 500 420 Air flow rate (m3/h) 665 665 625 580 580 475 475 410 305 290 240 205 170 170 110 RAS-13PKVP-E RAS-13PKVP-ND Fan speed (rpm) 1300 1300 1240 1180 1110 960 960 860 710 670 600 550 500 500 420 Air flow rate (m3/h) 740 740 695 655 605 495 495 425 320 290 240 205 170 170 110 WF WE WD WC WB WA W9 W8 W7 W6 W5 W4 W3 W2 W1 3) When setting the fan speed to AUTO on the remote controller, revolution of the fan motor is controlled to the fan speed level shown in Fig. 2 and Table 8-3-1 according to the setup temperature, room temperature, and heat exchanger temperature. 4) When the fan speed mode is AUTO and the compressor stops, the fan speed is controlled from W2 (20 seconds) to 0 rpm (40 seconds). Fan speed level RAS-16PKVP-E RAS-16PKVP-ND Fan speed (rpm) 1370 Air flow rate (m3/h) 790 790 745 705 640 530 530 475 370 290 240 205 170 170 110 RAS-18PKVP-E RAS-18PKVP-ND Fan speed (rpm) 1450 1450 1390 1330 1220 1070 1070 980 830 700 600 550 500 500 420 Air flow rate (m3/h) 845 845 805 760 680 575 575 510 405 310 240 205 170 170 110 WF WE WD WC WB WA W9 W8 W7 W6 W5 W4 W3 W2 W1 SUL L+ L L UL M UH H M+ 1370 1310 1250 1160 1010 1010 930 780 670 600 550 500 500 420 * The fan speed broadly varies due to position of the louver, etc. The described value indicates one under condition of inclining downward blowing. 1) When setting the fan speed to L, L+, M, M+ or H on the remote controller, the operation is performed with the constant speed shown in Fig. 1.*

2) When the fan speed mode is manual and TA<22°C and the compressor stops, the fan speed is controlled from W2 (20 seconds) to 0rpm (40 seconds). 35 High Wall, Heat Pump Type Service Manual 8-3-2. In Heating Operation (This operation controls the fan speed at the indoor unit side.) The indoor fan (cross flow fan) is operated by the phase control induction motor. The fan rotates in 5 stages in MANUAL mode, and in 5 stages in AUTO mode, respectively. (Table 1) HEAT ON Fan speed setup MANUAL (Fig. 3) Indication AUTO Fan speed Hi Power W8 (L+M)/2 WB (M+H)/2 WE W9 (L+M)/2 WD (M+H)/2 WF L L+ M M+ H YES 1) When setting the fan speed to L, L+, M, M+ or H on the remote controller, the operation is performed with the constant speed shown in Fig. 3 and Table 8-3-2. 2) When setting the fan speed to AUTO on the remote controller, revolution of the fan motor is controlled to the fan speed level shown in Fig. 5 according to the set temperature and room temperature. 3) Min. air flow rate is controlled by temperature of the indoor heat exchanger (TC) as shown in Fig. 4. 4) Cold draft prevention, the fan speed is controlled by temperature of the indoor heat exchanger (TC) as shown in Fig. 6.

*In starting and in stability In starting In stability TC NO 42°C Min air flow rate control (Fig. 4) TC 52 51 42 41 Limited to Min WD tap No limit * (Fig. 5) Basic fan control TA - Tsc [°C] * Fan speed = (TC (40 + a)) / 10 x (WD W8) + W8 a : In up operation 1, in down operation 0 Fan speed L+ (W9) · When 12 to 25 minutes · Until 12 minutes passed after operation passed after operation start and the room start. temperature is higher · When 12 to 25 minutes FAN than the set temperature passed after operation AUTO 3°C start and the room temperature is 3°C or · When 25 minutes or more passed after operation more lower than the set start temperature. · Room temperature FAN · Room temperature Manual < Set temperature 4°C Set temperature 3.5°C b c d e f g *4 M+ (WD) Hi Power M(WB) 0.5 1.0 1.5 2.0 2.*

*5 5.0 5.5 *1 *2 *3 *5 *6 *7 Table 8-3-2 Indoor fan air flow rate (Heating) Fan speed level RAS-07PKVP-E RAS-07PKVP-ND Fan speed (rpm) 1170 UH H M+ 1170 1070 980 900 M 880 850 L+ L L UL 750 750 650 650 650 SUL 650 560 420 Air flow rate (m3/h) 645 645 575 510 455 440 420 345 345 275 275 275 275 210 110 RAS-10PKVP-E RAS-10PKVP-ND Fan speed (rpm) 1200 1200 1100 1010 930 880 850 750 750 650 650 650 650 560 420 Air flow rate (m3/h) 665 665 595 530 475 440 420 345 345 275 275 275 275 210 110 RAS-13PKVP-E RAS-13PKVP-ND Fan speed (rpm) 1240 1240 1140 1050 960 880 850 750 750 650 650 650 650 560 420 Air flow rate (m3/h) 695 695 625 560 495 440 420 345 345 275 275 275 275 210 110 *8 H (WE) WF WE WD WC WB WA W9 W8 *1: Fan speed = (M+L+)x1/5+L+ *2: Fan speed = (M+L+)x2/5+L+ *3: Fan speed = (M+L+)x3/5+L+ *4: Fan speed = (M+L+)x4/5+L+ (Calculated with linear approximation from M+ and L+) *5: Fan speed = (HM)x1/5+M *6: Fan speed = (HM)x2/5+M *7: Fan speed = (HM)x3/5+M *8: Fan speed = (HM)x4/5+M (Calculated with linear approximation from H and M) (Fig. 6) Cold draft preventive control 46 45 33 32 *A+4 *A-4 W7 W6 TC 46 45 33 32 *A+4 *A-4 34 33 21 20 *A+4 M+(WD) W5 W4 W3 Line-approximate M+ and SUL with Tc.*