Manual abstract:

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.. 74 2 1. SPECIFICATIONS 1-1. Specifications RAS-13UKV-E/RAS-13UAV-E Unit model Indoor Outdoor (kW) (kW) (kW) (kW) Operation mode Running current Power consumption Power factor Operation mode Running current Power consumption Power factor Starting current RAS-13UKV-E RAS-13UAV-E -- 3.5 0.9 4.0 4.2 0.9 6.
0 220 230 240V 1Ph 50/60Hz Cooling Heating 0.15 0.15 30 30 87 87 Cooling Heating 5.07 / 4.84 / 4.
63 5.40 / 5.16 / 4.94 1060 1130 95 95 5.55 / 5.
31 / 5.09 3.21 / 3.62 39 / 39 33 / 34 26 / 28 48 / 50 RAS-13UKV-E 275 790 208 10 30 530 / 620 RAS-13UAV-E 550 780 270 38 750 Twin rotary type with DC-inverter variable speed control DA91A1F-44F 43 2410 / 2410 Flare connection Ø6.35 Ø9.52 Ø6.35 Ø9.52 15 15 10 R410A 0.8 3 Wires : includes earth (Outdoor) 4 Wires : includes earth 21 32 / 0 28 10 43 / 10 24 1 1 1 2 (Ø3.1 x 16L) 1 1 2 6 (Ø4 x 25L) 1 1 1 Current limited Cooling capacity Cooling capacity range Heating capacity Heating capacity range Power supply Electric Indoor characteristics (A) (W) (%) (A) (W) (%) (A) (dB·A) (dB·A) (dB·A) (dB·A) (mm) (mm) (mm) (kg) (W) (m³/h) (mm) (mm) (mm) (kg) (W) Outdoor COP (Cooling/Heating) Operating noise Indoor High (Cooling / Heating) Medium (Cooling / Heating) Low (Cooling / Heating) Outdoor (Cooling / Heating) Indoor unit Unit model Dimension Height Width Depth Net weight Fan motor output Air flow rate (Cooling / Heating) Outdoor unit Unit model Dimension Height Width Depth Net weight Compressor Motor output Type Model Fan motor output Air flow rate (Cooling / Heating) Piping Type connection Indoor unit Liquid side Gas side Outdoor unit Liquid side Gas side Maximum length (Per unit) Maximum chargeless length Maximum height difference Refrigerant Name of refrigerant Weight Wiring connection Power supply Interconnection Usable temperature range Indoor (Cooling / Heating) Outdoor (Cooling / Heating) Accessory Indoor unit Installation plate Wireless remote controller Remote controller holder Flat head wood screw Purifying filter Zeolite filter Batteries Mounting screw Installation manual Owner's manual Outdoor unit Drain nipple (W) (m³/h) (m) (m) (m) (kg) (°C) (°C) · The specifications may be subject to change without notice for purpose of improvement.

3 1-2. Operation Characteristic Curve <Cooling> 7 <Heating> 7 6 6 RAS-13UKV-E 5 5 RAS-13UKV-E Current (A) 4 Current (A) 4 3 3 2 1 · Conditions Indoor : DB 27°C/WB 19°C Outdoor : DB 35°C Air flow : High Pipe length : 5m 230V 0 20 40 60 80 100 2 1 · Conditions Indoor : DB 20°C Outdoor : DB 7°C/WB 6°C Air flow : High Pipe length : 5m 230V 0 20 40 60 80 100 0 0 Compressor speed (rps) Compressor speed (rps) 1-3. Capacity Variation Ratio According to Temperature <Cooling> 105 100 95 90 Current Limited Start <Heating> 120 110 100 90 RAS-13UKV-E Capacity ratio (%) 85 80 75 70 65 60 55 Capacity ratio (%) RAS-13UKV-E 80 70 60 50 40 30 · Conditions Indoor : DB27°C/WB19°C Indoor air flow : High Pipe length 5m 20 10 · Conditions Indoor : DB 20°C Indoor air flow : High Pipe length : 5m 50 32 33 34 35 36 37 38 39 40 41 42 43 Outdoor temp. (°C) 0 10 9 8 7 6 5 4 3 2 1 0 1 2 3 4 5 6 7 8 9 10 Outdoor temp. (°C) * Capacity ratio : 100% = 3.5 kW (RAS-13UKV-E) 4 2. REFRIGERANT R410A This air conditioner adopts the new refrigerant HFC (R410A) which does not damage the ozone layer. The working pressure of the new refrigerant R410A is 1.6 times higher than conventional refrigerant (R22). The refrigerating oil is also changed in accordance with change of refrigerant, so be careful that water, dust, and existing refrigerant or refrigerating oil are not entered in the refrigerant cycle of the air conditioner using the new refrigerant during installation work or servicing time.
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. (6) 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. (7) 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. (8) 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. 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. (1) 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. 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. (1) 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 discolored 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. (2) (3) (4) (5) 5 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 (2) Joints For copper pipes, flare joints or socket joints are used. Prior to use, be sure to remove all contaminants. a) 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 22-6 below. b) 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 other than lubricating oils used in the installed air conditioner 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. (1) Flare Processing Procedures and Precautions a) Cutting the Pipe By means of a pipe cutter, slowly cut the pipe so that it is not deformed.

b) 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. c) Insertion of Flare Nut 6 d) Flare Processing Make certain that a clamp bar and copper pipe have been cleaned. By means of the clamp bar, perform the flare processing 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. ØD A Fig. 2-2-1 Flare processing dimensions Table 2-2-3 Dimensions related to flare processing for R410A Outer diameter (mm) 6.35 9.

52 12.70 15.88 A (mm) Thickness (mm) 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 Nominal diameter 1/4 3/8 1/2 5/8 0.8 0.8 0.8 1.0 Table 2-2-4 Dimensions related to flare processing for R22 Outer diameter (mm) 6.35 9.52 12.70 15.

88 A (mm) Thickness (mm) 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 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 1.0 to 2.0 1.0 to 2.

0 Nominal diameter 1/4 3/8 1/2 5/8 0.8 0.8 0.8 1.0 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 7 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 19.7 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 45° to 4 6° B A C D 43° to 4 5° Fig.

2-2-2 Relations between flare nut and flare seaepare the following equipments for other installation method and run check. (1) Clamp meter (2) Thermometer (3) Insulation resistance tester (4) Electroscope 9 2-4. Recharging of 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. (1) Never charge refrigerant exceeding the specified amount. (2) If the specified amount of refrigerant cannot be charged, charge refrigerant bit by bit in COOL mode. (3) 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. (INDOOR unit) (Liquid side) (OUTDOOR unit) Opened (Gas side) Refrigerant cylinder (With siphon pipe) Check valve Closed Open/Close valve for charging Service port Electronic balance for refrigerant charging Fig. 2-4-1 Configuration of refrigerant charging 10 (1) Be sure to make setting so that liquid can be charged.

(2) 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. [Cylinder with siphon] Gauge manifold OUTDOOR unit [Cylinder without siphon] Gauge manifold OUTDOOR unit Refrigerant cylinder Electronic balance 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 2-5. Brazing of Pipes 2-5-1. Materials for Brazing (1) 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 solderability.

(2) Phosphor bronze brazing filler Phosphor bronze brazing filler is generally used to join copper or copper alloy. (3) 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. (1) 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. (2) When performing brazing again at time of servicing, use the same type of brazing filler. 2-5-2. Flux (1) 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. 11 Refrigerant cylinder Electronic balance Siphon (2) 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. (3) Types of flux · Noncorrosive 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. (4) 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 Vapor flux 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. Never use gas other than Nitrogen gas. (1) 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.

M Flow meter (1) Do not enter flux into the refrigeration cycle. (2) When chlorine contained in the flux remains within the pipe, the lubricating oil deteriorates. Therefore, use a flux which does not contain chlorine. (3) When adding water to the flux, use water which does not contain chlorine (e.g. distilled water or ion-exchange water). (4) Remove the flux after brazing. Stop valve Nitrogen gas cylinder From Nitrogen cylinder Pipe Nitrogen gas Rubber plug Fig. 2-5-1 Prevention of oxidation during brazing 12 3. CONSTRUCTION VIEWS 3-1. Indoor Unit RAS-13UKV-E Air inlet Air filter 790 Heat exchanger 208 275 Air outlet 48 Knock out system 790 120 590 Hanger 80 Front panel Back body 60 Drain hose (0.54m) Hanger 321 Connecting pipe (0.43m) (Flare Ø6.35) Connecting pipe (0.33m) (Flare Ø9.

52) 235 215 48 620 235 215 Minimum distance to ceiling For stud bolt (Ø8 to Ø10) For stud bolt (Ø6) 26 66 or more Hanger 45 275 190 Minimum distance to wall 120 or more Minimum distance to wall 120 or more 45 40 32 Hanger 90 150 160 160 Hanger 150 90 Installation plate outline Center line 13 32 40 6 Knock out system 6 60 3-2. Outdoor Unit RAS-13UAV-E A leg part 115 600 90 50 Ø25 drain hole (Anchor bolt long hole pitch) Ø11 x 17U-shape hole (For Ø8-Ø10 anchor bolt) (ø6 hole pitch) 310 296 270 76 8-Ø6 hole (For fixing outdoor unit) 16 B leg part Ø4.5 embossing (Ø4STS used) (For sunshade roof attaching) 49,5 147 Ø11 x 17 long hole (For Ø8-Ø10 anchor bolt) 21 Fan guard Valve cover 115.5 157 59 Hanger 540 548 21 Z 54 Charging port 8 780 61 322 Earth terminal Connecting pipe port (Pipe dia.Ø6.35) Detailed A leg part 600 50 Connecting pipe port (Pipe dia.Ø9.52) 36 11 R15 Z view Outside line of product 310 296 R5.5 Mounting dimensions of anchor bolt 600 4 x Ø11 x 17U-shape hole (For Ø8-Ø10 anchor bolt) 2-Ø6 hole 50 or more D Intake A 2-Ø6 hole 310 Intake 250 or more 296 11 Outside line of product 310 C 100 or more Outside line of product (Minimum distance from wall) 36 50 R15 R5 200 or more Outlet B 4 x Ø11 × 17 long hole (For Ø8-Ø10 anchor bolt) 600 .

5 Detailed B leg part 14 4.

WIRING DIAGRAM 4-1. Indoor Unit RAS-13UKV-E COLOR IDENTIFICATIONBLU BLK : BLACK RED : RED WHI : WHITE YEL : YELLOW BLU : BLUE GRN & YEL: GREEN & YELLOW CN01 (BLU) BLK 11 BLK 12 BLK WHI 3 RED CN21 2 TERMINAL BLOCK GRN & YEL INDOOR OUTDOOR UNIT UNIT CN24 CN23 22 6 CN10 (WHI) FAN MOTOR RED BLK HEAT EXCHANGER SENSOR (TC) CN03 (WHI) BLK 11 BLK 11 FUSE F01 22 T3.15A AC 250V 3 THERMO SENSOR (TA) CN25 CN13 (WHI) (WHI) BLU 11 11 BLU 22 22 BLU 33 33 BLU 44 44 BLU 55 55 BLU 66 66 BLU 77 77 BLU 88 88 BLU 99 99 BLU 10 10 10 10 WHI INFRARED RAYS RECEIVING AND INDICATING PARTS MCC-861 3 4 5 6 3 WHI 4 YEL 5 BLU 6 DC MOTOR R05 DB01 DC12V POWER SUPPLY CIRCUIT LINE FILTER DC5V 5 CN07 (WHI) R04 C03 11 11 11 11 MAIN P.C. BOARD MCC-867 1 2 3 4 5 1 2 3 4 5 WHI YEL YEL YEL YEL 1 2 3 4 5 1 2 3 4 5 CN08 LOUVER MOTOR 1 4 1234 HA JEM-A Table 4-1-1 Simple check for failure diagnosis Check items Diagnosis result Check to see if the OPERATION indicator goes on and off when the main switch or breaker is turned on.

(Check the primary and secondary voltage of the transformer.) Check the power supply voltage between and . (Refer to the name plate.) (Check the primary and secondary voltage of the transformer.) Check the fluctuating voltage between and .

(DC 15 to 60V) Check to see if the fuse blows out. (Check the R04 of the varistor.) Check the voltage at the No.4 pin on CN13 connector of the infrared receiver. (Check the transformer and the power supply circuit of the rated voltage.) Check for voltage at the white lead of the louver motor. (Check the transformer and the power supply circuit of the rated voltage.) Check for voltage at the No.1 pin on CN10 connector. (Check the DB01, R05 and C03.

) 1 2 OPERATION indicator Terminal block 3 4 Fuse 3.15A DC 5V DC 12V DC 325V (DC310 to 340V) 5 6 Refer to the service data for the detailed failure diagnosis. 15 4-2. Outdoor Unit RAS-13UAV-E PULSE MODULATING VALVE COIL for 4-WAY VALVE TE TD TO TS PMV THERMOSTAT 1 2 FOR 12 COMPRESSOR CN600 11 CN500 123 123 CN601 12 12 CN602 123 123 CN603 123 123 CN701 BLK P06 22 11 22 REACTOR P07 P08 RELAY CT P09 SURGE ABSORBER WHI YEL ORN BLU RED GRY 123456 123456 CN703 VARISTOR F01 FUSE T25A ORN P10 P01 BLK P03 ORN WHI P02 N L 3 2 1 POWER SUPPLY 220-240V~ 50/60Hz CONVERTER MODULE G E A POEWR RELAY TO INDOOR UNIT C12 C13 C14 ELECTRONIC STARTER F04 FUSE T3.15A Q300 P11 P12 P13 P14 11 22 REACTOR PUR FAN MOTER DB01 BRW P19 P20 CN300 BU EU BV EV BW EW BX BY BZ RED 11 WHI 22 BLK FM 33 IGBT MODULE P.C. BOARD (MCC-813) 1 CN301 2 3 4 5 1 2 3 PNK 4 GRY 5 YEL Q200 BLU P18 P17 P21 RED 11 P22 WHI 22 P23 BLK IGBT : Insulated Gate Bipolar Transistor CM COLOR IDENTIFICATIONBLU RED : RED WHI : WHITE BLK : BLACK BLU : BLUE BRW : BROWN ORN PUR YEL GRY PNK : ORANGE : PURPUL : YELLOW : GRY : PINK 33 COMPRESSOR 16 5. SPECIFICATIONS OF ELECTRICAL PARTS 5-1. Indoor Unit RAS-13UKV-E No. 1 2 3 4 5 6 7 8 9 10 11 12 13 Parts name Fan motor (for indoor) Thermo.

sensor (TA-sensor) DC-DC transformer (T01) Microcomputer Heat exchanger temp. sensor (TC-sensor) Line filter (L01) Diode (DB01) Capacitor (C03) Fuse (F01) Power supply IC (IC01) Varistor (R21, R109) Resistor (R01) Louver motor Type ICF-340-30-2 () SWT-70 µPD780024AGK () SS11V-06270 D3SBA60 KMH450VNSN120M25C FCU 250V, 3.15A STR-L472 15G561K RF-5TK4R7 MP24GA 560V 4.7, 5W Output (Rated) 1W, 16poles, 1phase DC12V 10k at 25°C 27mH, AC0.6A 4A, 600V 120µF, 450V T3.

15A, 250V DC340V, 30W 10k at 25°C DC390V, Secondary DC15V, 12V, 7V Specifications 5-2. Outdoor Unit RAS-13UAV-E No. 1 Parts name SC coil (Noise filter) DC-DC transformer Reactor Outside fan motor 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) Fuse For protection of inverter input overcurrent 25A, AC250V 11 12 13 14 15 Electrolytic capacitor Transistor module Compressor Compressor thermo. Converter module LLQ2G501KHUATF, 400LISN500K35F 500µF, DC400V X 3 pieces L03 L01 Model name ADR2520-R15TB ADR2516-0R6TB SWT-43 CH-38 ICF-140-43-1 (Inverter attached) (Inverter attached) (Inverter attached) (Inverter attached) ---- For protection of switching power source 10 15A, 0.6mH 20A, 150µH Primary side DC280V, Secondary side 7.5V x 1, 13V x 1, 26.5V x 3, 16V x 1, 15V x 1 L=10mH, 16A x 2 DC140V, 43W 10k (25°C) 62k (20°C) 10k (25°C) 10k (25°C) 20A, AC250V 3.15A, AC250V Rating 2 3 4 5 6 7 8 9 6MBI25GS-060-01 or 6MBI25GS-060-01A 25A, 600V DA91A1F-44F US-622KXTMQO-SS MP7003 3-phases 4-poles 750W OFF: 125 ± 4°C, ON: 90 ± 5° C Diode: 25A, 600V, IGBT: 40A, 600V 17 6. REFRIGERANT CYCLE DIAGRAM 6-1. Refrigerant Cycle Diagram RAS-13UKV-E/RAS-13UAV-E INDOOR UNIT Indoor heat exchanger T1 Temp. measurement Cross flow fan P Pressure measurement Gauge attaching port Vacuum pump connecting port Allowable pipe length Allowable height difference : 10m Deoxidized copper pipe Outer dia.

: 6.35mm Thickness : 0.8mm Sectional shape of heat insulator Max. : 15m Deoxidized copper pipe Outer dia. : 9.52mm Thickness : 0.8mm Muffler 4-way valve (CHV-0213) Strainer Muffler TD Pulse modulating valve at liquid side (SEV15RC2) Compressor DA91A1F-44F TS TO Outdoor heat exchanger Split capillary Ø1.5 x 200 Ø1.5 x 200 TE Temp. measurement T2 Propeller fan Refrigerant amount : 0.

8kg NOTE : Gas leak check position Refrigerant flow (Cooling) Refrigerant flow (Heating) OUTDOOR UNIT NOTE : · The maximum pipe length of this air conditioner is 15 m. The additional charging of refrigerant is unnecessary because this air conditioner is designed with charge-less specification. 18 6-2. Operation Data <Cooling> Temperature condition (°C) Indoor 27/19 Outdoor 35/ 13UKV-E Model name Standard pressure P (MPa) 0.8 to 1.

0 Heat exchanger pipe temp. T1 (°C) 9 to 11 T2 (°C) 49 to 50 High High Indoor fan mode Outdoor fan mode Compressor revolution (rps) 77 <Heating> Temperature condition (°C) Indoor 20/ Outdoor 7/6 13UKV-E Standard pressure P (MPa) 2.5 to 2.7 Heat exchanger pipe temp. T1 (°C) 42 to 44 T2 (°C) 0 to 3 High High Compressor revolution (rps) 83 Model name Indoor fan mode Outdoor fan mode NOTES : (1) Measure surface temperature of heat exchanger pipe around center of heat exchanger path U bent.

(Thermistor themometer) (2) Connecting piping condition : 5 m 19 7. CONTROL BLOCK DIAGRAM 7-1. Indoor Unit RAS-13UKV-E Heat Exchanger Sensor Temperature Sensor Infrared Rays Signal Receiver Indoor Unit Control Panel M.

C.U Functions · Louver Control · 3-minute Delay at Restart for Compressor Timer Display Powerful Display Operation Display Infrared Rays 36.7kHz Initializing Circuit Clock Frequency Oscillator Circuit · Motor Revolution Control · Processing (Temperature Processing) · Timer · Serial Signal Communication Filter Sign Display PRE DEF. Sign Display Indoor Fan Motor Remote Controller Power Supply Circuit Louver ON/OFF Signal Louver Motor Noise Filter Louver Driver Serial Signal Transmitter/Receiver From Outdoor Unit Serial Signal Communication REMOTE CONTROLLER Remote Controller Operation (START/STOP) Operation Mode Selection AUTO, COOL, DRY, HEAT, FAN ONLY Thermo. Setting Fan Speed Selection ON TIMER Setting OFF TIMER Setting Louver AUTO Swing Louver Direction Setting ECO Hi-POWER Infrared Rays 20 RAS-13UAV-E 7-2. Outdoor Unit (Inverter Assembly) For INDOOR UNIT 220230240 V to 50/60 Hz MICRO-COMPUTER BLOCK DIAGRAM MCC813 (P.C.

B) Inddor unit send/receive circuit OUTDOOR UNIT Rotor position detect circuit Rotor position detect circuit Gate drive circuit Gate drive circuit Over current detect circuit Over current sensor M.C.U · · · · · · · · · · · 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 Discharge temp. sensor Outdoor air temp. sensor 21 Suction temp. sensor Heat exchanger temp. sensor High Power factor Correction circuit Clock frequency 16MHz Noise Filter Input current sensor Converter DC) (AC Over current sensor Inverter (DC AC) Outdoor Fan motor Driver circuit of P.M.V. Relay circuit Over current sensor Inverter (DC AC) Compressor P.M.
V. 4-way valve P.M.V : Pulse Modulating Valve M.C.
U : Micro Control Unit 8. OPERATION DESCRIPTION 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 capacityproportional control compressor which can change the motor speed in the range from 13 to 110 rps 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 modulating 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. 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. (2) Role of outdoor unit controller Receiving the operation command signal (Serial signal) from the indoor controller, the outdoor unit performs its role. · Compressor operation Operations followed control to judgment of serial · Operation control of signal from indoor outdoor fan motor side. · P.M.V. 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 to indoor unit · Detection of outdoor temperature and operation revolution control · Defrost control in heating operation (Temp.
measurement by outdoor heat exchanger and control for four-way valve and outdoor fan) (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 control · 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.) · For these two types of signals ([Operation mode] and [Compressor revolution]), 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. · Temperature of indoor heat exchanger by indoor heat exchanger sensor (Minimum revolution control) (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) · Temperature setting of the indoor heat exchanger by using heat exchanger sensor (TC sensor) (Prevent-freezing control) · 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 22 (4) Contents of operation command signal (Serial signal) 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. 8-1-2. Current Release Control The outdoor main circuit control section (Inverter assembly) detects the input current to the outdoor unit.

If the current value with compressor motor speed instructed from indoor side exceeds the specified value, the outdoor main circuit control section controls compressor motor speed by reducing motor speed so that value becomes closest to the command within the limited value. 8-1-3. Power Factor Improvement Control Power factor improvement control is performed mainly aiming to reduce the current on much power consumption of cooling/heating operation. Controlling starts from the time when input power has reached at a certain point. To be concrete, IGBT of the power factor improvement circuit is used, and the power factor is improved by keeping IGBT on for an arbitrary period to widen electro-angle of the input current. 8-1-1. Capacity Control The cooling and heating capacity is varied by changing compressor motor speed.

The inverter changes compressor motor speed by changing AC 220230240V power to DC once, and controls capacity by changing supply power status to the compressor with transistor module (includes 6 transistors). The outline of the control is as follows: The revolution position and revolution speed of the motor are detected by detecting winding electromotive force of the compressor motor under operation, and the revolution speed is changed so that the motor drives based upon revolution speed of the operation command by changing timing (current transfer timing) to exchange inverter output voltage and supply power winding. Detection of the revolution position for controlling is performed 12 times per 1 revolution of compressor. The range of supply power frequency to the compressor differs according to the operation status (COOL, HEAT, DRY). Table 8-1-1 Compressor revolution range Operation mode COOL 13UKV-E HEAT 16 to 110 Model name Compressor revolution (rps) 13 to 88 8-1-4. Prevent-Freezing Control The indoor heat exchanger sensor detects refrigerant vapor temperature in COOL/DRY operation. If the temperature is below the specified value, compressor motor speed is reduced so that operation is performed in temperature below the specified value to prevent-freezing of indoor heat exchanger. 8-1-5. P. M.
V. (Pulse Modulating Valve) Using P.M.V., refrigerant flow of refrigeration cycle is varied for the optimum temperature.
After the power has been turned on, when a serial operation signal is received from indoor at the first time, or when PMV alarm is detected and the equipment is reactivated, move the valve once until it hits on the stopper for positioning of the valve. In this case, ticktack sound may be heard. 8-1-6. Louver Control (1) Vertical air flow louvers Positions of vertical air flow louvers are automatically controlled according to the operation status (AUTO : A , COOL : , DRY : , HEAT : , FAN ONLY :). Besides, positions of vertical air flow louvers can be arbitrarily set by pushing the [FIX] button.
(2) Swing If the [SWING] button is pushed during running operation, vertical air flow louvers start swinging. When the [FIX] button is pushed, swinging stops. 23 8-1-7. Indoor Fan Control (DC Fan Motor) (1) The indoor fan is operated by the stepless speed change DC motor. (2) For air flow level, speed of the indoor fan motor is controlled in five steps (LOW, LOW+, MED, MED+ and HIGH). If AUTO mode is selected, the fan motor speed is automatically controlled by the difference between the preset temperature and the room temperature. LOW+ = MED + Table 8-1-2 Operation mode Fan mode H COOL M L DRY -- H HEAT M L RAS-13UKV-E Motor speed Air flow rate (rpm) (m³/h) 1210 1010 810 780 1290 1110 930 530 420 330 320 620 470 380 LOW + MED 2 MED + HIGH 2 = 8-1-8. Outdoor Fan Control (DC Fan Motor) Although the outdoor fan motor drives the outdoor fan by non-step variable system of the revolution speed, the revolution speed is restricted to three steps on the convenience of controlling. If a strong wind is lashing outside of the room, the operation may be continued as the outdoor fan stops in order to protect the outdoor fan motor. If a fan lock occurred due to entering of foreign matter, the air conditioner stops and an alarm is displayed.

<COOL, DRY> Table 8-1-3 Model name Compressor revolution (rps) TO 38°C Outdoor temp. sensor TO TO < 38°C TO < 15°C TO 38°C ECONO. operation TO < 38°C TO < 15°C TO is abnormal 700 390 390 To 13.8 390 390 RAS-13UAV-E To 34.7 840 700 390 700 390 390 700 840 840 700 From 35.3 840 840 <HEAT> Table 8-1-4 Model name Compressor revolution (rps) Outdoor temp. sensor TO TO 5°C TO < 5°C TO 5°C TO < 5°C To 16.8 390 650 390 390 390 RAS-13UAV-E To 57.4 650 650 390 650 650 From 58.0 840 840 650 650 840 ECONO.
operation TO is abnormal 24 8-2. Description of Operation Circuit · Turning [ON] the breaker flashes the operation lamp. (1Hz) This is the display of power-ON (or notification of power failure). · When pushing [START/STOP] button of the remote controller, receive sound is issued from the main unit, and the next operations are performed together with opening the vertical air flow louvers. (1) Cooling capacity control · The cooling capacity and room temperature are controlled by changing the compressor motor speed according to both the difference between the temperature detected by the room temperature sensor and the temperature set button and also any change in by TEMP room temperature.
· When compressor has been activated or reactivated, it operates with Max. 41 rps for 2 minutes, with Max. 91 rps from 2 minute to 3 minutes, and with Max. 88 rps after 3 minutes passed. · When room temperature is lower than set temperature, indoor fan motor is operated at fan speed L as shown in Fig. 8-2-1 while the outdoor unit stops. (2) Prevent-freezing control If temperature of indoor heat exchanger detected by the indoor heat exchanger sensor is 5°C or lower, compressor motor speed is gradually lowered to prevent freezing of the indoor heat exchanger. If temperature is 7°C or higher, return the operation to the above item (1). (3) Current release control The input current of compressor and outdoor fan motor (Precisely inverter main circuit control section) which occupy most of air conditioner input is detected by the outdoor current sensor, and compressor motor speed is gradually lowered so that current value does not exceed 9.0A if current value exceeds 9.0A. When the current value lowers to 8.5A, return the operation to the above item (1). 8-2-1. Cooling Operation (The Remote Controller MODE Button is Set to the COOL Position) · Once the setting is made, the operation mode is memorized in the microcomputer so that the same operation can be effected thereafter simply by pushing [START/STOP] button.

· A cooling operation signal is transmitted to outdoor unit. · The outdoor unit controls the outdoor fan relay R01, R02 and R03, and the compressor motor speed according to the operation command signal sent from the indoor unit.

· When [FAN] button is set to AUTO, the indoor fan motor operates as shown in Fig. 8-2-1. When [FAN] button is set to LOW , LOW+ , + MED , MED or HIGH , the motor operates with a constant air flow. (Room temp.) (Set temp.) °C +3 +2.5 +2 +1.5 +1 +0.

*5 0 0.5 M+ *1 *1 Current value (A) *1 L In normal operation 9.0 Comp. motor speed down Set temp. 8.*

*5 Normal control Comp. motor speed keep NOTE : 1: Calculated from difference in motor speed of M+ and L, and controlled. * Fig. 8-2-1 Setting of air flow [Fan AUTO] Fig. 8-2-2 25 (4) Limit for maximum compressor motor speed by indoor fan speed When outdoor temperature sensor detected 32°C or lower, and indoor heat exchanger sensor detected 17°C or lower, the maximum compressor motor speed is limited by the indoor fan speed.*

For example, the compressor motor speed is limited as described in the table below. Table 8-2-1 Air flow rate HIGH M+ MED. L, L UL, SUL RAS-13UKV-E (rps) 77 65 53 30 30 rps : round per second (5) Louver control The vertical air flow louvers are automatically set to horizontal or cool memory position. When temperature of indoor heat exchanger becomes 5°C or lower by the prevent-freezing control and the compressor is turned off, the vertical air flow louvers close once and then return to the position of previous time. (6) Discharge temperature control (Common control to cooling and heating) The discharge temperature of refrigerant gas from the compressor is detected by the discharge temperature sensor, and controls operating compressor motor speed. 1) Control 1 (A zone) : Normal operation zone When TD detect value is 98°C or lower, the operation is performed with operating motor speed instructed by the serial signal. 2) Control 2 (B zone) : Slow-up zone of motor speed When TD detect value is 98°C or higher, operating motor speed is slowly up. 3) Control 3 (C zone) : Keep zone When TD detect value is 105°C or higher, operating motor speed is not changed if raising operation speed. 4) Control 4 (D zone) : Slow down zone of motor speed When TD detect value is 108°C or higher, operating motor speed is slowly down. 5) Control 5 (E zone) : Normal down of motor speed When TD detect value is 112°C or higher, operating motor speed is down.

6) Control 6 (F zone) : Operation stop zone If TD detect value exceeds 117°C during operation, stop the operation immediately. Then, restart the operation when TD detect value becomes 105°C or lower. TD Zone (°C) F 117 112 108 E D Operation stop zone Normal down zone of motor speed Slow down of motor speed Release of motor speed 105 C Keep zone : Motor speed is not changed. 98 B Slow-up zone of motor speed A Normal operation zone Fig. 8-2-3 Compressor motor speed control (7) ECO operation control When the ECO button of the remote controller is pushed, quiet and mild operation is performed by restraining air flow and operating motor speed. 1) Indoor air flow is controlled between SUL and L. 2) The set temperature increases 0.5°C per 1 hour up to +2°C starting from the set temperature when ECO mode has been received. TA [°C] +4.0 +3.

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

0 +0.5 Tsc 0.5 1.0 2.0 rps 40 35 31 27 22 18 13 FAN L L UL SUL OFF Fig.

8-2-4 26 8-2-2. DRY Operation (The Remote Controller MODE Button Position) is Set to the DRY · Once the setting is made, the operation mode is memorized in the microcomputer so that the same operation can be effected thereafter simply by pushing [START/STOP] button. · Dry operation signal is transmitted to outdoor unit. · The Cooling operation giving priority to dehumidifying, which restrains the indoor fan speed and compressor motor speed, is performed. · The indoor fan motor operates as shown in Fig. 82-5. (Fan speed is AUTO only.) · The outdoor fan motor operates as described in Table 8-1-3, and the compressor motor speed according to the operation command signal sent from the indoor unit. +2.5 (Room temp.

*) (Set temp.) [Basic control] Set temp. (Room temp.) (Set temp.) 0 0.5 1 1.5 2 LOW *1 *2 M+ 5.0 5.5 [FAN AUTO] HIGH *1, *2 : Approximate revolution speed of M+ and L to linear according to temperature. Fig.*

*8-2-6 Setting of air flow +2.0 +1.5 L [Cold draft preventing control] The upper limit of fan revolution speed is shown below. *1 +1.0 SUL +0.*

*5 0 0.5 HIGH 44 43 33 32 Approximate revolution speed of HIGH and SUL linear by Tc. Set temp. 31 30 20 19 A*2 A8 Starting of FAN Manual NOTE : *1 : Middle motor speed between L and SUL Fig. 8-2-5 Setting of air flow 3 SUL* A+4 A8 FAN AUTO SUL (NOTE : *1) Stop 8-2-3.*

Heating Operation Transferring of heating operation signal from indoor unit to outdoor unit starts. The indoor fan motor operates by the room temperature when selecting "AUTO" of "FAN" as shown in Fig. 8-2-6, and operates with a set air flow when selecting "Low " to "High ". However, to prevent cold draft, revolution speed of the fan is restricted by indoor heat exchanger when air flow is AUTO (Fig. 8-2-7) and starting of FAN Manual. Fig. 8-2-7 Cold draft preventing control NOTES : (1) Stops for 2 minutes after thermostat-OFF. (2) 24°C when the set temp. is 24°C or more Set temp. when the set temp.

is below 24°C (3) SUL : Super ultra low [In starting and in stability] In starting · Until 12 minutes passed after operation start · When 12 to 25 minutes passed after operation start and room temp. is 3°C or lower than set temp. · Room temp. < Set temp. 4°C In stability · When 12 to 25 minutes passed after operation start and room temp. is higher than (set temp. 3°C) · When 25 minutes or more passed after operation start · Room temp. Set temp. 3.5°C FAN AUTO FAN Manual 27 The outdoor unit controls the outdoor fan based upon the operation signal sent from the indoor unit, and also controls revolution speed of the compressor motor.

The power coupler (IC20) for four-way valve is turned on, and turned off in defrost operation. (1) Heating capacity control Calculate the difference between temperature detected by room temp. sensor every minute and the set temp. set on "Temp. indicator" and variation amount of room temp.

Then, obtain the correction amount of the command signal, and correct the current frequency command signal. (2) High-temp. release control If temperature of the indoor heat exchanger detected by the indoor heat exchanger sensor is 55°C or higher, compressor motor speed is gradually lowered to prevent over-temp. rising of compressed pressure. If temperature becomes below 48°C, return to above item (1).

(3) Current release control The input current of compressor and outdoor fan motor (Precisely inverter main circuit control section) which occupy most of air conditioner input is detected by the outdoor current sensor.

The compressor motor speed is lowered gradually according to the range of TO (outside air temp.) if the input current exceeds the current value determined in each zone as shown in Fig. 8-2-8 so that the input current does not exceed the set value. In case that the current lowered by approx. 0.5A than each set value, return to above item (1). TO 16.0 15.5 11.

0 10.5 10.8A 10.3A 9.8A Fig. 8-2-8 (4) Defrost control 1) Detection of frost In heating operation, time duration while the compressor operates is counted, and defrost operation starts by any condition described below. a. The counted time is 28 minutes or more, and status that temperature of the outdoor heat exchanger detected by the outdoor heat exchanger is 20°C or lower continued for 2 minutes or more. b. The counted time is 28 minutes or more, and status that temperature of the outdoor heat exchanger detected by the outdoor heat exchanger is 7°C or lower and temperature lowered by 2.
5 °C than the minimum value of the outdoor heat exchanger during 10 to 15 minutes count time continued for 2 minutes or more. c. The counted time is 34 minutes or more, and status that temperature of the outdoor heat exchanger detected by the outdoor heat exchanger is 5°C or lower and temperature lowered by 3.0 °C than the minimum value of the outdoor heat exchanger during 10 to 15 minutes count time continued for 2 minutes or more. d.
If the following three conditions are satisfied, defrost operation (Timer defrost) starts after heating operation for 37 minutes. 1) Setting on remote controller, HEAT (mode), HIGH (Fan), 30°C (temp.). 2) Room temp. is 19°C to 24°C, and outside air temp.
is 5°C or lower. 3) Defrost operation has been already performed once. 2) Defrost operation Operation of the compressor is stopped once, turn off power coupler for four-way valve after 10 seconds, and then exchange the four-way valve. After 20 seconds, restart operation of the compressor. Turn off the outdoor fan just when the compressor stopped. If temperature of the indoor heat exchanger lowered than 38°C, stop the indoor fan. 3) Defrost reset Resetting operation from defrost to heating is performed when any one of the following conditions is satisfied. a. Temperature of the outdoor heat exchanger rose to +8°C or higher. b.

A status that temperature of the outdoor heat exchanger is +5°C or higher continued for 80 seconds. c. Defrost operation continued for 15 minutes. In resetting defrost operation, the compressor stops for 50 seconds if defrost has started under condition a. to c. in item 1), but the compressor is reset to heating operation keeping operated if defrost has started under condition d. in item 1). (5) Louver control When the compressor is turned off by high-temp. release control, the vertical air flow louvers close once and then return to the position of previous time. Outside air temp.
(°C) 28 8-2-4. Automatic Operation (1) As shown in Fig. 8-2-9, the operation mode (COOL, DRY, HEAT) is selected according to the outside temperature and room temperature when the operation has started. The operation in Fan mode continues until an operation mode is selected. If the room temperature is 20°C or higher when "AUTO" operation started within 2 hours after "HEAT" operation had stopped, select an operation mode after Fan operation of ultra low fan.
In AUTO operation, the set temperature of each operation can be corrected by the remote controller in the range of 17 to 30°C. TA 28 26 24 23 Heating with setting on remote controller Ts = 25°C 5 2 15 18 1 24 (2) After selecting the operation mode (COOL, DRY, HEAT), select an operation mode again when a status that the compressor was turned off by the room temperature or outside air temperature continues for 15 minutes. (3) Powerful Cool mode control When the outside temperature is above 32°C and indoor temperature is above 28°C, select Cool mode control. In Cool mode, the air flow louver directs downward. When the room temperature gains access to the set temperature, it becomes cool memory position.
Powerful Cooling/Drying with setting on remote controller Ts = 25°C Cooling/Drying with setting on remote controller Ts = 25°C Monitoring (Follow to the Fan control in previous mode when being selected again.) 20 Ts correction by outside temperature (To) 32 0 +1 To Fig. 8-2-9 8-3. Temporary Operation · Temporary Auto operation, existence of Auto Restart, and Temporary Cooling operation can be set by the TEMPORARY button of the indoor controller.
8-3-1. Temporary Auto Operation · When the TEMPORARY button is pushed, the Auto operation with set temperature fixed at 25°C starts. Controlling is same as that of Auto operation by the remote controller. · When the TEMPORARY button is pushed again, the operation stops. · During Temporary Auto operation, operation by the remote controller is accepted. · Using the Auto Restart function, the Temporary Auto operation starts when power failure is reset.

8-3-2. Temporary Cooling Operation TEMPORARY button Fig. 8-3-1 Table 8-3-1 TEMPORARY button OFF ON After pushing button for 3 seconds After pushing button for 10 seconds Control Temporary Auto operation start Auto Restart control select Temporary Cooling operation start · When the TEMPORARY operation button keeps pushed for 10 seconds, Cooling operation of which compressor motor speed and the indoor fan speed are fixed starts. Compressor motor speed : 13 : 30 rps Indoor fan speed : Low · When the TEMPORARY operation button is pushed again, the operation stops. · Auto Restart function is unavailable. 29 8-4. Auto Restart Function This indoor unit is equipped with an automatic restarting function which allows the unit to restart operating with the set operating conditions in the event of a power supply being accidentally shut down. The operation will resume without warning three minutes after power is restored. This function is not set to work when shipped from the factory. Therefore it is necessary to set it to work.
8-4-1. How to Set the Auto Restart Function To set the auto restart function, proceed as follows: The power supply to the unit must be on ; the function will not set if the power is off. Push the [TEMPORARY] button located in the center of the front panel continuously for three seconds. The unit receives the signal and beeps three times. The unit then restarts operating automatically in the event of power supply being accidentally shut down.
· When the unit is standby (Not operating) Operation Push [TEMPORARY] button for more than three seconds. The unit is on standby. The unit starts to operate. 0 3S Motions The green lamp is on. After approx.
three seconds, The lamp changes from green to orange. The unit beeps three times and continues to operate. TEMPORARY button If the unit is not required to operate at this time, push [TEMPORARY] button once more or use the remote controller to turn it off.

· When the unit is in operation Operation Push [TEMPORARY] button for more than three seconds. The unit is in operation. The unit stops operating. 0 3S Motions The green lamp is on. The green lamp is turned off. After approx. three seconds, The unit beeps three times.

If the unit is required to operate at this time, push [TEMPORARY] button once more or use the remote controller to turn it on. TEMPORARY button · While this function is being set, if the unit is in operation, the orange lamp is on. · This function can not be set if the timer operation has been selected. · When the unit is turned on by this function, the louver will not swing even though it was swinging automatically before shutting down. · While the filter check lamp is on, the TEMPORARY button has the function of filter reset button. 30 8-4-2. How to Cancel the Auto Restart Function To cancel auto restart function, proceed as follows : Repeat the setting procedure : the unit receives the signal and beeps three times. · When the system is on stand-by (not operating) Operation Push [TEMPORARY] button for more than three seconds. The unit will be required to be turned on with the remote controller after the main power supply is turned off. Motions The unit is on standby.
The unit starts to operate. 0 3S The orange lamp is on. After approx. three seconds, The lamp changes from orange to green. The unit beeps three times and continues to operate.
TEMPORARY button If the unit is not required to operate at this time, push [TEMPORARY] button once more or use the remote controller to turn it off. · When the system is operating Operation Push [TEMPORARY] button for more than three seconds. The unit is in operation. The unit stops operating. 0 3S Motions The orange lamp is on.
The orange lamp is turned off. After approx. three seconds, The unit beeps three times. If the unit is required to operate at this time, push [TEMPORARY] button once more or use the remote controller to turn it on. TEMPORARY button · While this function is being set, if the unit is in operation, the orange lamp is on. 8-4-3. Power Failure During Timer Operation When the unit is in timer operation, if it is turned off because of power failure, the timer operation is cancelled. Therefore, set the timer operation again. 8-5-1. How to Turn Off Filter Check Lamp Push [FILTER] button on the remote controller.

Or push [TEMPORARY] button on the indoor unit. Then we have to clarify it. NOTE : The Everyday Timer is reset while a command signal can be received from the remote controller even if it stopped due to a power failure. 8-5. Filter Check Lamp When the elapsed time reaches 1000 hours, the filter check lamp indicates. After cleaning the filters, turn off the filter check lamp. NOTE : If [TEMPORARY] button is pushed while the filter check lamp is not indicating, the indoor unit will start the automatic operation. When you want a temporary operation while the filter lamp lights, put out the lamp once, and then push the TEMPORARY button. 31 8-6. Remote Controller and its Fuctions 8-6-1.
Parts Name of Remote Controller 11 12 13 Cancel button (CLR) Push this button to cancel ON timer and OFF timer. (A receiving beep is heard.) High power button (Hi-POWER) Push this button to start the high power operation. Memory button (MEMO) Keep pushing the MEMO button for 2 seconds from the beginning, or keep pushing the button for 2 seconds after pushing it once for a short time. Then the set data is stored in the memory and P is displayed. Automatic operation button (AUTO) Push this button to operate the air conditioner automatically. ECO timer button (ECO) Push this button to start the ECO timer (OFF timer) operation. You can select the OFF timer from among four settings (1, 3, 5 or 9 hours). FILTER button Push this button to turn off the filter cleaning lamp on the indoor unit. Push this button after cleaning the air filter.
PRESET button Push this button to operate the air conditioner according to settings memorized by the MEMO button. Use this button to change the clock, ON timer, and OFF timer times. To forward the time, push the "TIMER " button. To set back the time, push the "TIMER " button. 1 2 Infrared signal emitter Transmits a signal to the indoor unit. START/STOP button Push the button to start operation. (A receiving beep is heard.) Push the button again to stop operation. (A receiving beep is heard.) If no receiving sound is heard from the indoor unit, push the button twice.

Mode select button (MODE) Push this button to select a mode. Each time you push the button, a mode is selected in a sequence that goes from A : Auto changeover control, : Cool, : Dry, : Heat, : Fan only, and back to A. (A receiving beep is heard.) Temperature button ..... The set temperature is increased up to 30°C. .
.... The set temperature is dropped down to 17°C.
(A receiving beep is heard.) Fan speed button (FAN) Push this button to select fan speed. When you select AUTO, the fan speed is automatically adjusted according to the room temperature. You can also manually select the desired fan speed from among five settings. , MED , MED+ , (LOW , LOW+ HIGH) (A receiving beep is heard.
) Auto louver button (SWING) Push this button to swing the louver. (A receiving beep is heard.) Push the FIX button to stop the louver swinging. (A receiving beep is heard.) Set louver button (FIX) Push this button to adjust the air flow direction. (A receiving beep is heard.) Off timer button (OFF) Push this button to set the OFF timer. On timer button (ON) Push this button to set the ON timer. Reserve button (SET) Push this button to reserve time settings. (A receiving beep is heard.

) 3 14 15 4 16 5 17 18 TIMER button 6 7 8 9 10 1 AUTOA AM PM : ON OFF P HiPOWER °C AM PM : 4 2 5 6 7 9 16 32 CHK AUT UTO PRESET 17 3 15 13 10 11 18 14 12 START/STOP FAN SWING FIX ON OFF FILTER RESET CLOCK CHECK MODE ECO TIMER AUTO Hi-POWER MEMO SET CLR 8 8-6-2. Name and Functions of Indications on Remote Controller [Display] All indications, except for clock time indication, are indicated by pushing the START/STOP button. 1 Transmission mark This transmission mark indicates when the remote controller transmits signals to the indoor unit. Mode display Indicates the current operation mode. (AUTO : Automatic control, A : Auto changeover control, : Cool, : Dry, : Heat, : Fan only) Temperature display Indicates the temperature setting (17°C to 30°C). When you set the operating mode to : Fan only, no temperature setting is indicated. Louver operation display Indicates the louver positioning and operation. Five selectable positions , , , , Automatic Swing . FAN speed display Indicates the selected fan speed. AUTO or one of five fan speed levels (LOW , LOW+ , + , MED , HIGH) can be MED indicated.