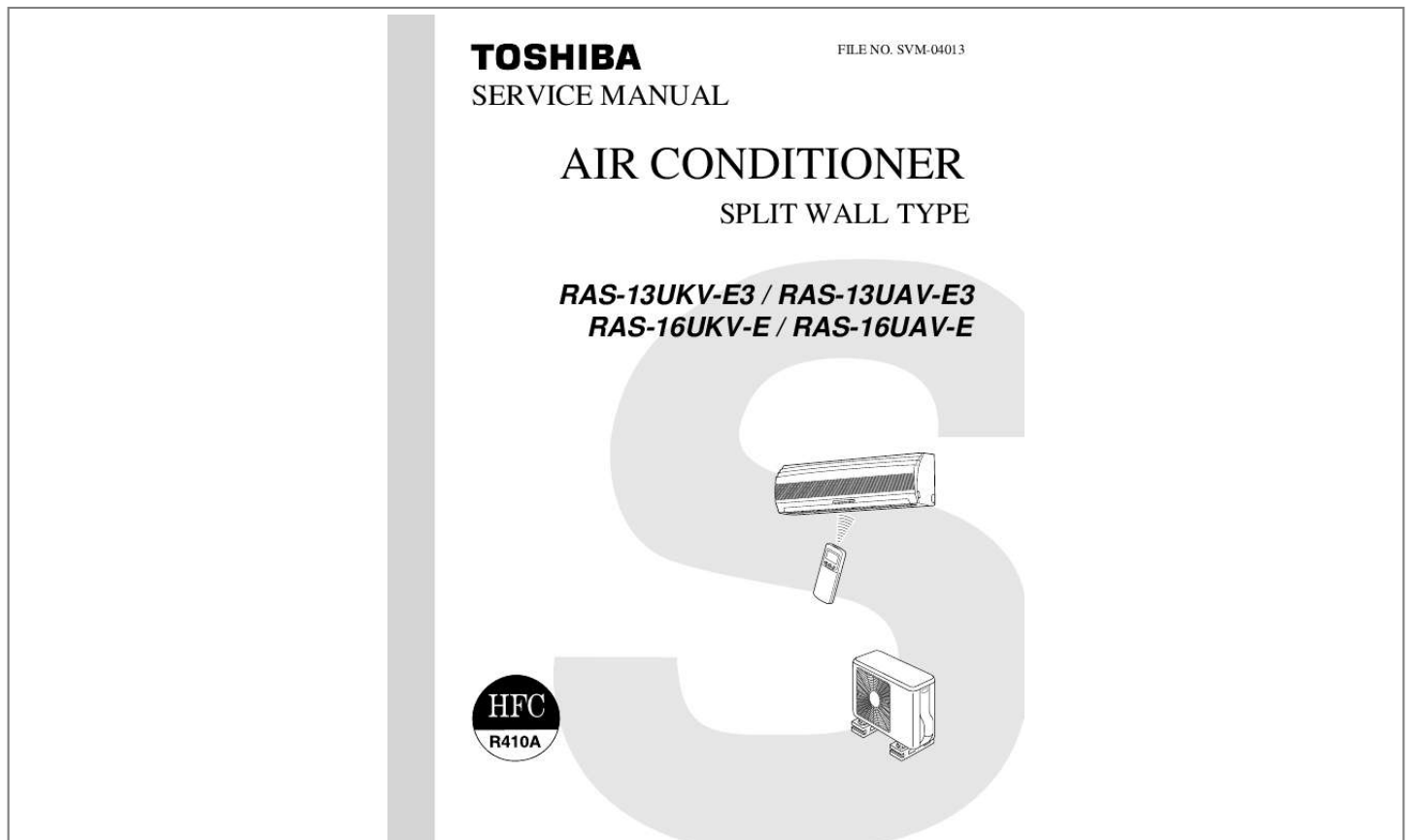




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User manual TOSHIBA RAS-16UKV-E
User guide TOSHIBA RAS-16UKV-E
Operating instructions TOSHIBA RAS-16UKV-E
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Manual abstract:

@@SVM-04013 CONTENTS 1. @@@@SVM-04013 10. @@HOW TO REPLACE THE MAIN PARTS 11-1 Indoor Unit 11-2 Microcomputer 11-3 Outdoor Unit 12. EXPLODED VIEWS AND PARTS LIST 12-1 12-2 12-3 12-4 12-5 Indoor Unit (E-Parts Assy) Indoor Unit Outdoor Unit (RAS-13UAV-E3) Outdoor Unit (RAS-16UAV-E) Outdoor Unit (E-Parts Assy) -2- FILE NO. SVM-04013 1. SPECIFICATIONS 1-1. Specifications Unit model Current limited Cooling capacity Cooling capacity range Heating capacity Heating capacity range Power supply Electric characteristics Indoor Outdoor (kW) (kW) (kW) (kW) Indoor Operation mode Running current Power consumption Power factor Operation mode Running current Power consumption Power factor Starting current High (Cooling / Heating) Medium (Cooling / Heating) Low (Cooling / Heating) (Cooling / Heating) Height Width Depth RAS-13UKV-E3 RAS-13UAV-E3 -- 3.5 0.9 4.0 4.

2 0.9 6.0 220 240V 1Ph 50/60Hz Cooling Heating 0.15 0.15 30 30 87 87 Cooling Heating 4.
84 5.16 1040 1100 93 94 5.31 3.27/3.72 39/39 33/34 26/28 48/50 RAS-13UKV-E3 275 790 208 10 30 530/620 RAS-13UAV-E3 550 780 270 37 750 Twin rotary type with DC-inverter variable speed control DA91A1F-45F 43 2410/2410 Flare connection 6.
35 9.52 6.35 9.52 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 (3.1 x 16L) 1 1 2 6 (4 x 25L) 1 1 1 (A) (W) (%) (A) (W) (%) (A) (dBA) (dBA) (dBA) (dBA) (mm) (mm) (mm) (kg) (W) (m3/h) (mm) (mm) (mm) (kg) (W) Outdoor COP (Cooling / Heating) Operation noise Indoor Indoor unit Outdoor Unit model Dimension 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 connection Type 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 control Remote controller holder Flat head wood screw Bioenzyme 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 specification may be subject to change without notice for purpose of improvement. 3 FILE NO. SVM-04013 Unit model Current limited Cooling capacity Cooling capacity range Heating capacity Heating capacity range Power supply Electric characteristics Indoor Outdoor (kW) (kW) (kW) (kW) Indoor Operation mode Running current Power consumption Power factor Operation mode Running current Power consumption Power factor Starting current High (Cooling / Heating) Medium (Cooling / Heating) Low (Cooling / Heating) (Cooling / Heating) Height Width Depth (A) (W) (%) (A) (W) (%) (A) (dBA) (dBA) (dBA) (dBA) (mm) (mm) (mm) (kg) (W) (m3/h) (mm) (mm) (mm) (kg) (W) Outdoor COP (Cooling / Heating) Operation noise Indoor Indoor unit Outdoor Unit model Dimension 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 connection Type 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 control 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) RAS-16UKV-E RAS-16UAV-E -- 3.5 0.9 4.

0 4.2 0.9 6.0 220 240V 1Ph 50/60Hz Cooling Heating 0.2 0.2 30 30 65 65 Heating Cooling 7.20 8.32 1590 1620 96 85 8.05 2.85/3.
41 45/44 40/40 34/34 51/53 RAS-16UKV-E 275 790 208 10 30 760/780 RAS-16UAV-E 550 780 720 39 750 Twin rotary type with DC-inverter variable speed control DA130A1F-24F 43 2410/2410 Flare connection 6.35 12.7 6.35 12.7 15 15 10 R410A 0.

95 3 Wires: includes earth (Outdoor) 4 Wires: includes earth 21 32 / 0 28 10 43 / 10 24 1 1 1 2 (3.1 x 16L) 1 1 2 6 (4 x 25L) 1 1 1 The specification may be subject to change without notice for purpose of improvement. 4 FILE NO. SVM-04013 1-2. @@@@((C) * Capacity ratio : 100% = Nominal Capacity 5 FILE NO.

SVM-04013 2. @@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. (5) 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. (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/Service 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. (2) Confirm the used refrigerant name, and use tools and materials exclusive for the refrigerant R410A.



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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 (3) 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. (4) 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 of personal injury may be caused. 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. 6 FILE NO. SVM-04013 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 2-2-6 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 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 ing 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. (1) Tools exclusive for R410A (Those which cannot be used for conventional refrigerant (R22)) (2) Tools exclusive for R410A, but can be also used for conventional refrigerant (R22) (3) 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 conditioner installation No.

Used tool Usage Existence of new equipment for R410A Yes Yes Whether conventional equipment can be used *(Note 1) *(Note 1) *(Note 1) Conventional air conditioner installation Whether new equipment can be used with conventional refrigerant 1 2 Flare tool Pipe flaring Copper pipe gauge Flaring by for adjusting projection conventional flare margin tool Torque wrench (For 12.70) Gauge manifold Charge hose Connection of flare nut Evacuating, refrigerant charge, run check, etc. 3 4 5 6 7 8 9 ! Yes Yes Yes Yes Yes Yes (Note 2) Vacuum pump adapter Vacuum evacuating Electronic balance for refrigerant charging Refrigerant cylinder Leakage detector Charging cylinder 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 gaugeow 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. 12 FILE NO. SVM-04013 (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 800C. 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 Used brazing filler Used flux Do not use Paste flux Vapor flux From Nitrogen cylinder Nitrogen gas cylinder 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.



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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 into 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 (0.2 kgf/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 Stop valve Copper - Copper Phosphor copper Copper - Iron Iron - Iron Silver Silver 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.

Pipe Nitrogen gas Rubber plug Fig. 2-5-1 Prevention of oxidation during brazing 13 FILE NO. SVM-04013 3. CONSTRUCTION VIEWS 3-1. Indoor Unit Front panel Back body Air inlet Air filter 790 Heat exchanger 208 60 275 6 Air outlet Knock out system 48 Knock out system 64 53 120 590 Hanger 80 Drain hose (0.

54m) Hanger 320 Connecting pipe (0.43m) (Flare 6.35) Connecting pipe (0.33m) Flare 9.52 620 235 215 65 or more Minimum distance to ceiling 235 215 Hanger For stud bolt (8~10) For stud bolt (6) 26 45 45 275 190 Minimum distance to ceiling Minimum distance to ceiling 48 170 or more 170 or more Hanger 90 150 160 160 Hanger 32 40 57 18 90 150 Installation plate outline Center line Wireless remote control 14 160 6 60 FILE NO. SVM-04013 3-2. Outdoor Unit A A Detail drawing (Back Leg) 600 6 Hole 310 302 52 36 32.5 115 125 B Detail drawing (Front Leg) 310 302 36 52 102 310 302 R15 6 Hole 11 x 14 Hole R5.5 30 Drain outlet B 2-11 x 14 Hole (For 8-10 anchor bolt) R15 436 FAN GUARD COVER PV 530 Z 270 265 600 780 90 62 310 330 Electrical part cover Liquid side (Flare 6.35) Gas side (Flare 9.

52) 120 75 Z View Installation dimension 600 or more 320 600 Air inlet 600 or more 54 Service port 100 or more Air outlet 600 or more 4 x 11 x 14 Long holes (For 8 - 10 anchorbolt) 15 FILE NO. SVM-04013 4. WIRING DIAGRAM 4-1. Indoor Unit Table 4-1-1 Simple Check for Failure Diagnosis Check Item 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 1 and 2. (Refer to the name plate.) (Check the primary and secondary voltage of the transformer.) Check the fluctuating voltage between 2 and 3. (DC15 to 60 V) 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 the voltage at the white lead of the lower motor.

(Check the transformer and the power supply circuit of the rated voltage.) Check the voltage at the No. 1 pin on CN10 connector. (Check the DB01, R05 and C03.) 1 2 3 4 5 6 OPERATION INDICATOR TERMINAL BLOCK FUSE 3.

15A DC5V DC12V DC325V (DC310 to 340V) Refer to the service data for the detailed failure diagnosis. 16 FILE NO. SVM-04013 4-2. Outdoor Unit (RAS-13UAV-E3) PULSE MODULATING VALVE TE TD TO TS COIL for 4-WAY VALVE PMV 123456 123456 CN703 CN600 CN601 12 12 123 123 CN602 12 12 123 123 CN603 123 1 2 3 BLK CN701 P06 REACTOR ORN CONVERTER MODULE 11 22 P10 G E A P07 P08 P09 CT POEWR RELAY ELECTRONIC STARTER SURGE ABSORBER RELAY VARISTOR F01 FUSE T25A P01 BLK P03 ORN WHI P02 WHI YEL ORN BLU RED GRY C12 C13 C14 F04 FUSE T3.15A Q300 P11 P12 P13 P14 N L 3 2 1 POWER SUPPLY 220-240V~ 50/60Hz TO INDOOR UNIT 11 22 DB01 BRW BU EU BV EV BW EW BX BY BZ REACTOR P19 P20 PUR FAN MOTER IGBT MODULE CN300 1 1 RED 2 2 WHI 3 3 BLK P.C. BOARD (MCC-813) FM Q200 BLU P18 P17 1 CN301 2 3 4 5 1 YEL 2 3 PNK 4 GRY 5 P21 RED 1 1 P22 WHI 2 2 P23 BLK 3 3 CM IGBT : Insulated Gate Bipolar Transistor COMPRESSOR 17 FILE NO. SVM-04013 4-3. Outdoor Unit (RAS-16UAV-E) PULSE MODULATING VALVE TE TD TO TS COIL for 4-WAY VALVE PMV THERMOSTAT 1 2 1 2 3 1 2 1 2 3 1 2 3 123456 FOR 1 2 1 2 3 1 2 1 2 3 1 2 3 BLK 123456 COMPRESSOR CN600 CN601 CN602 CN603 CN703 CN701 P06 1 1 CN500 22 SURGE ABSORBER P07 1 1 P08 POWER 22 N SUPPLY RELAY 220-240V~ REACTOR F01 VARISTOR P01 BLK L 50/60Hz CT FUSE P03 ORN 3 P09 ORN T25A WHI TO 2 P10 P02 INDOOR 1 UNIT POEWR RELAY C12 C13 C14 G E A P11 1 1 ELECTRONIC F04 STARTER FUSE P12 2 2 REACTOR T3.15A P13 DB01 PUR Q300 P19 P14 BRW P20 FAN MOTER CN300 1 1 RED BU 2 2 WHI FM EU 3 3 BLK BV EV BW 1 1 YEL EW P.

C. BOARD CN301 2 2 BX (MCC-813) 3 3 PNK BY 4 4 GRY BZ 55 Q200 P21 RED 1 1 IGBT : Insulated Gate Bipolar Transistor P22 WHI 2 2 CM BLU P18 P23 BLK 3 3 P17 COMPRESSOR IGBT MODULE CONVERTER MODULE 18 WHI YEL ORN BLU RED GRY FILE NO. SVM-04013 5. SPECIFICATION OF ELECTRICAL PARTS 5-1. Indoor Unit 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 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 PD780024AGK ----- SS11V-06270 D3SBA60 KMH450VNSN120M25C FCU250V, 3.15A STR-L472 15G561K RF-5TK4R7 MP24GA 560 V 4.7, 5 W Specifications DC 340 V, 30 W 10 k at 25C DC 390 V, Secondary DC 15 V, 12 V, 7 V 10 k at 25C 27mH, AC 0.6A 4A, 600 V 120F, 450 V T3.

15A, 250 V Output (Rated) 1 W, 16 poles, 1 phase, DC 12 V 5-2. Outdoor Unit (RAS-13UAV-E3) No. 1 Parts name SC coil (Noise filter) L01 L03 Model name ADR2516-0R6TB ADR2520-R15TB SWT-78 CH-57-Z-T ICF-140-43-1 (Inverter attached) (Inverter attached) (Inverter attached) (Inverter attached) 20A, 150H 15A, 0.6mH Rating 2 3 4 5 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 Electrolytic capacitor Transistor module Primary side DC280V, Secondary side 7.5 V x 1, 13 V x 1, 26.5V x 3, 16 V x 1, 15 V x 1 L=10mH, 16A x 2 DC140 V, 43 W 10 k (25C) 62 k (20C) 10 k (25C) 10 k (25C) 6 7 8 9 10 11 12 JXO-6B For protection of switching power source For protection of inverter input overcurrent LLQ2G501KHUATF, 400LISN500K35F 6MBI25GS-060-01 or 6MBI25GS-060-01A 30A, 600 VAC 3.



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15A, AC 250 V 25A, AC 250 V 500F, DC 400 V x 3 pieces 25A, 600 V 13 15 Compressor Convertor module DA91A1F-45F MP 7003 3-phases 4-poles 750 W Diode: 25A, 600 V, IG BT 40 A, 600V : 19 FILE NO. SVM-04013 5-3. Outdoor Unit (RAS-16UAV-E) No. 1 Parts name SC coil (Noise filter) L01 L03 Model name ADR2516-0R6TB ADR2520-R15TB SWT-78 CH-57-Z-T ICF-140-43-1 (Inverter attached) (Inverter attached) (Inverter attached) (Inverter attached) 20A, 150H 15A, 0.6mH Rating 2 3 4 5 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 Electrolytic capacitor Transistor module Primary side DC280V, Secondary side 7.5 V x 1, 13 V x 1, 26.

5V x 3, 16 V x 1, 15 V x 1 L=10mH, 16A x 2 DC140 V, 43 W 10 k (25C) 62 k (20C) 10 k (25C) 10 k (25C) 6 7 8 9 10 11 12 JXO-6B For protection of switching power source For protection of inverter input overcurrent LLQ2G501KHUATF, 400LISN500K35F 6MBI25GS-060-01 or 6MBI25GS-060-01A 30A, 600 VAC 3.15A, AC 250 V 25A, AC 250 V 500F, DC 400 V x 3 pieces 25A, 600 V 13 15 Compressor Convertor module DA130A1F-24F MP 7003 3-phases 4-poles 1100 W Diode: 25A, 600 V, IG BT 40 A, 600V : 20 FILE NO. SVM-04013 6. REFRIGERANT CYCLE DIAGRAM 6-1. Refrigerant Cycle Diagram RAS-13UKV-E3 / RAS-13UAV-E3 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 Strainer NOTE : Deoxidized copper pipe Outer dia. : 6.35 mm Thickness : 0.8 mm Sectional shape of heat insulator Max. : 15 m Deoxidized copper pipe Outer dia. : 9.52 mm Thickness : 0.8 mm Muffler 4-way valve (CHV-0213) Muffler TD Pulse modulating valve at liquid side (SEV16RC3) Compressor DA91A1F-45F TS

TO Outdoor heat exchanger Split capillary 1.5 x 200s 1.5 x 200s TE Temp.

measurement T2 Propeller fan Refrigerant amount : 0.8 kg Gas leak check position Refrigerant flow (Cooling) Refrigerant flow (Heating) OUTDOOR UNIT Note : The maximum length of the pipe for this air conditioner is 15 m. The additional charging of refrigerant is unnecessary because this air conditioner is designed with charge-less specification. 21 FILE NO. SVM-04013 RAS-16UKV-E / RAS-16UAV-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 Strainer NOTE : Deoxidized copper pipe Outer dia. : 6.35 mm Thickness : 0.8 mm Sectional shape of heat insulator Max. : 15 m Deoxidized copper pipe Outer dia. : 12.7 mm Thickness : 0.8 mm Muffler 4-way valve (CHV-0213) Muffler TD Pulse modulating valve at liquid side (SEV16RC3) Compressor DA130A1F-24F TS TO Outdoor heat exchanger Split capillary 1.5 x 200s 1.5 x 200s TE Temp.

measurement T2 Propeller fan Refrigerant amount : 0.95 kg Gas leak check position Refrigerant flow (Cooling) Refrigerant flow (Heating) OUTDOOR UNIT Note : The maximum length of the pipe for this air conditioner is 15 m. The additional charging of refrigerant is unnecessary because this air conditioner is designed with charge-less specification. 22 FILE NO. SVM-04013 RAS-13UKV-E3 / RAS-13UAV-E3 <Cooling> Temperature condition (C) Indoor 27/19 <Heating> Temperature condition (C) Indoor 20/- Outdoor 7/6 Model name Standard pressure P (MPa) Heat exchanger pipe temp. T1 (C) 42 to 44 T2 (C) 0 to 3 Indoor fan mode High Outdoor Compressor fan revolution mode (rps) High 80 Outdoor 35/- Model name Standard pressure P (MPa) Heat exchanger pipe temp. T1 (C) 9 to 11 T2 (C) 49 to 45 Indoor fan mode High Outdoor Compressor fan revolution mode (rps) High 77 6-2. Operation Data 13UKV-E3 0.8 to 1.0 13UKV-E3 2.

5 to 2.7 RAS-16UKV-E / RAS-16UAV-E <Cooling> Temperature condition (C) Indoor 27/19 <Heating> Temperature condition (C) Indoor 20/- Outdoor 7/6 Model name Standard pressure P (MPa) Heat exchanger pipe temp. T1 (C) 42 to 46 T2 (C) 0 to 3 Indoor fan mode High Outdoor Compressor fan revolution mode (rps) High 82 Outdoor 35/- Model name Standard pressure P (MPa) Heat exchanger pipe temp. T1 (C) 7 to 10 T2 (C) 50 to 45 Indoor fan mode High Outdoor Compressor fan revolution mode (rps) High 77 16UKV-E 0.9 to 1.

2 16UKV-E 2.7 to 2.9 Note : (1) Measure surface temperature of heat exchanger pipe around center of heat exchanger path U bent. (Thermistor thermometer) (2) Connecting piping condition : 5m - 23 - FILE NO. SVM-04013 7.

CONTROL BLOCK DIAGRAM 7-1. Indoor Unit Indoor Unit Control Panel M.C.U Heat Exchanger Sensor Functions Louver Control 3-minute Delay at Restart for Compressor Motor Revolution Control Operation Display Timer Display Filter Sign Display PRE DEF. Sign Display Indoor Fan Motor Louver Motor Temperature Sensor Infrared Rays Signal Receiver Initiallizing Circuit Infrared Rays 36.7KHz Processing (Temperature Processing) Timer Serial Signal Communication Clock Frequency Oscillator Circuit Remote Control Power Supply Circuit Louver ON/OFF Signal Noise Filter Louver Driver Louver Motor Serial Signal Transmitter/Receiver From Outdoor Unit Serial Signal Communication REMOTE CONTROL Infrared Rays Remote Control Operation (START/STOP) Operation Mode Selection AUTO, COOL, DRY, HEAT, FAN ONLY Temperature Setting Fan Speed Selection ON TIMER Setting OFF TIMER Setting Louver Auto Swing Louver Direction Setting ECO Hi power Filter Reset 24 For INDOOR UNIT MICRO-COMPUTER BLOCK DIAGRAM 220 - 240 V 50/60 Hz MCC813 (P.C.B) M.C.U Rotor position detect circuit Gate drive circuit Gate drive circuit Over current detect circuit Over current sensor Rotor position detect circuit OUTDOOR UNIT Indoor unit send/receive circuit 7-2.

Outdoor Unit (Inverter Assembly) Discharge temp. sensor Outdoor air temp. sensor 25 High Power factor Correction circuit Clock frequency 16MHz Input current sensor Converter (AC DC) Over current sensor Driver circuit of P.M.V. Relay circuit Over current sensor Suction temp. sensor Heat exchanger temp. sensor 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 Noise Filter Inverter (DC AC) Outdoor Fan motor Inverter (DC AC) Compressor P.M.V. : Pulse Modulating Valve M.C.

U : Micro Control Unit 4-way valve FILE NO. SVM-04013 P.M.V. FILE NO.

SVM-04013 8. OPERATION DESCRIPTION 8-1. Outlined 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.



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And the capacity proportional 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 control, 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. (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 (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 to judgment of serial control signal from indoor Operation control of side. outdoor fan motor 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 4-way valve and outdoor fan) 26 FILE NO.

SVM-04013 (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) (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. 8-1-1. Capacity control The cooling and heating capacity is varied by changing compressor motor speed. The inverter changes compressor motor speed by changing AC 220-240 V 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 HEAT COOL HEAT Model name 13UKV-E3 16UKV-E Compressor revolution (rps) 13 to 88 16 to 110 13 to 91 13 to 106 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. 27 - FILE NO. SVM-04013 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 preventfreezing 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.



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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 () and 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 pressed during running operation, vertical air flow louvers start swinging. When the [FIX] button is pushed, swinging stops. Operation mode 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+ = LOW+MED 2 MED+ = MED+HIGH 2 Table 8-1-2 Fan mode H COOL DRY HEAT M L -- H M L RAS-13UKV-E3 Motor speed Air flow rate (rpm) (m3/h) 1210 1010 810 780 1290 1110 930 530 420 330 320 620 470 380 Operation mode Fan mode H RAS-16UKV-E Motor speed Air flow rate (rpm) (m3/h) 1560 1330 1130 1030 1600 1430 1230 760 630 520 470 780 680 570 COOL DRY HEAT M L -- H M L 28 FILE NO.

SVM-04013 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 38C Outdoor temp. sensor TO TO < 38C TO < 15C TO 38C ECONO. operation TO is abnormal <HEAT> Table 8-1-4 Model name Compressor revolution (rps) Outdoor temp. sensor TO ECONO. operation TO is abnormal TO 5C TO < 5C TO 5C TO < 5C 390 650 390 390 390 RAS-13UAV-E3 / RAS-16UAV-E To 16.8 To 57. 4 650 650 390 650 650 From 58.0 840 840 650 650 840 TO < 38C TO < 15C 700 390 390 390 390 RAS-13UAV-E3 / RAS-16UAV-E To 13.8 To 34.7 840 700 390 700 390 390 700 840 840 700 From 35.3 840 840 29 FILE NO.

SVM-04013 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 control, 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 controller by changing the compressor motor speed according to both the difference between the temperature detected by the room temperature sensor and the temperature set by button and also any change in room TEMP temperature.

When compressor has been activated or reactivated, it operates with Max.41 rps for 2 minutes, with Max.91 rps from 2 minutes 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 5C lower, compressor motor speed is gradually lowered to prevent freezing of the indoor heat exchanger. If temperature is 7C 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). Current value (A) 8-2-1. Cooling operation (The Remote Control 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+ , 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 *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 30 FILE NO. SVM-04013 (4) Limit for maximum compressor motor speed by indoor fan speed When outdoor temperature sensor detected 32C or lower, and indoor heat exchanger sensor detected 17C 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 (6) Control 6 (F zone) : Operation stop zone If TD detect value exceeds 117C during operation, stop the operation immediately. Then, restart the operation when TD detect value becomes 105C or lower. TD Zone (C) F 117 112 E D Operation stop zone Normal down zone of motor speed Slow down of motor speed Release of motor speed Air flow rate HIGH M+ MED.

L, L UL, SUL RAS-13UKV-E3 / RAS-16UKV-E (rps) 77 65 53 30 30 rps : round per second 108 105 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 (5) Louver control The vertical air flow louvers are automatically set to horizontal or cool memory position. When temperature of indoor heat exchanger becomes 5C 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 98C 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 98C or higher, operating motor speed is slowly up. 3) Control 3 (C zone) : Keep zone When TD detect value is 105C or higher, operating motor speed is not changed if raising operation speed.



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4) Control 4 (D zone) : Slow down zone of motor speed When TD detect value is 108C or higher, operating motor speed is slowly down. 5) Control 5 (E zone) : Normal down of motor speed When TD detect value is 112C or higher, operating motor speed is down.

(7) ECO operation control When the ECO button of the remote control 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 0.5C per 1 hour up to +2C starting from the set temperature when ECO mode has been received. TA [C] rps 40 35 31 27 22 18 13 FAN L +4.
0 +3.5 +3.0 +2.5 +2.0 +1.
5 +1.0 +0.5 Tsc -0.5 -1.0 -2.0 L- UL SUL OFF Fig. 8-2-4 - 31 - FILE NO. SVM-04013 8-2-2. DRY operation (The Remote Control MODE Button is Set to the DRY Position) [Basic control] Set 0 LOW temp. -0.

5 Once the setting is made, the operation mode is -1 memorized in the microcomputer so that the same -1.5 *1 operation can be effected thereafter simply by -2 *2 pushing [START/STOP] button. Dry operation signal is transmitted to outdoor unit. M+ The Cooling operation giving priority to dehumidifying, which restrains the indoor fan speed -5.0 and compressor motor speed, is performed. -5.5 The indoor fan motor operates as shown in HIGH [FAN AUTO] Fig. 8-2-5. (Fan speed is AUTO only.) The outdoor fan motor operates as described in *1,*2 : Approximate revolution speed of M+ and L to Table 8-1-3, and the compressor motor speed linear accordingly to temperature.
according to the operation command signal sent from the indoor unit. Fig. 8-2-6 Setting of air flow +2.5 (Room temp.) - (Set temp.)
) [Cold draft preventing control] +2.0 +1.5 *1 +1.0 SUL +0.5 0 -0.

5 L- The upper limit of fan revolution speed is shown below. (Room temp.) - (Set temp.) HIGH 44 43 33 32 Approximate revolution speed of HIGH and SUL linear by Tc. Set temp. 31 30 20 19 A*2 A-8 Starting of FAN Manual 3 SUL* A+4 A-8 FAN AUTO NOTE : *1 : Middle motor speed between L and SUL Fig. 8-2-5 Setting of air flow SUL (NOTE : *1) Stop Fig. 8-2-7 Cold draft preventing control 8-2-3. Heating operation NOTES : Transferring of heat operation signal from indoor unit to *1 : Stops for 2 minutes after thermostat-OFF. outdoor unit starts.

*2 : 24C when the set temp. is 24C or more The indoor fan motor operates by the room Set temp. when the set temp. is below 24C temperature when selecting "AUTO" of "FAN" as shown *3 : SUL : Super ultra low 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. 32 FILE NO. SVM-04013 Outside air temp. (C) [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 3C or lower than set temp. In stability When 12 to 25 minutes passed after operation start and room temp. is higher than (set temp. 3C) When 25 minutes or more passed after operation start TO 16.0 15.
5 11.0 10.5 10.8A 10.3A 9.

8A FAN AUTO 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 20C 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 7C or lower and temperature lowered by 2.5C 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 -5C or lower and temperature lowered by 3.0C 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 control, HEAT (mode), HIGH (Fan), 30C (temp.). 2 Room temp. is 19C to 24C, and outside air temp. is 5C or lower. 3 Defrost operation has been already performed once. FAN Manual Room temp. < Set Room temp.
Set temp. 3.5C temp. 4C 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 4-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 55C or higher, compressor motor speed is gradually lowered to prevent over-temp. rising of compressed pressure. If temperature becomes below 48C, 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 occupies 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). 33 FILE NO. SVM-04013 2) Defrost operation Operation of the compressor is stopped once, turn off power coupler for 4-way valves after 10 seconds, and then exchange the 4-way valves. 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 38C, stop the indoor fan. 3) Defrost reset Resetting operation from defrost to heating is performed when anyone of the following conditions is satisfied. a. Temperature of the outdoor heat exchanger rose to +8C or higher. b.
A status that temperature of the outdoor heat exchanger is +5C 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 item1), 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.



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release control, the vertical air flow louvers close once and then return to the position of previous time. 8-2-4.

Automatic operation (1) As shown in Fig. 8-2-9, the operation mode (COOL, DRY, HEAT) is selected according to the Preset temperature and room temperature when the operation has started. - If room temperature is higher than 1C of preset temperature. "Cooling" operation is performed. - If room temperature is within 1C of preset temperature. "Fan only" operation is performed. (at UL speed). - If room temperature is lower than 1C of preset temperature. "Heating operation is performed. Ta Ts+1 Ts Ts-1 Cool Operation Fan Only Heat Operation Fig.

8-2-9 - 34 - FILE NO. SVM-04013 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. TEMPORARY button 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 8-3-1. Temporary auto operation When the TEMPORARY button is pushed, the Auto operation with set temperature fixed at 25C 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 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. 35 FILE NO.

SVM-04013 8-4. Auto Restart Function The 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 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 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 on standby (Not operating) Operation Push [TEMPORARY] button for more than three seconds. The unit is on standby. Motions The unit starts to operate. 0 3S 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 control to turn it off.

The green lamp is on. After approx. three seconds, The lamp changes from green to orange. When the unit is in operation Operation Push [TEMPORARY] button for more than three seconds. The unit is in operation. Motions The green lamp is on. The unit stops operating. 0 The unit beeps three times. 3S TEMPORARY button If the unit is required to operate at this time, push [TEMPORARY] button once more or use the remote control to turn it on. While the filter check lamp is on, the TEMPORARY button has the function of filter reset button.

The green lamp is turned off. After approx. three seconds, 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.

36 FILE NO. SVM-04013 8-4-2. How to cancel auto restart function To cancel auto restart function, proceed as follows: Repeat the setting procedure: the unit receives the signal and beeps three times. The unit will be required to be turned on with the remote control after the main power supply is turned off. When the system is on standby (Not operating) Operation Push [TEMPORARY] button for more than three seconds.

The unit is on standby. Motions The unit starts to operate. 0 3S 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 control to turn it off. The orange lamp is on. After approx. three seconds, The lamp changes from orange to orange. When the system is operating Operation Push [TEMPORARY] button for more than three seconds. The unit is in operation. Motions The orange lamp is on.

The unit stops operating. 0 The unit beeps three times. 3S TEMPORARY button If the unit is required to operate at this time, push [TEMPORARY] button once more or use the remote control to turn it on. The orange lamp is turned off. After approx. three seconds, While this function is being set, if the unit is in operation, the orange lamp is on. 8-5-1. How to turn off filter check lamp Push [FILTER] button on the remote control. Or push [TEMPORARY] button on the indoor unit. Then we have to clarify it.

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. 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.

NOTE: The Every 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. 37 FILE NO.

SVM-04013 \$ Memory button (MEMO) Keep pushing the MEMO button for 2 seconds 8-6-1. Parts name of remote control from the beginning, or keep pushing the button for 2 seconds after pushing it once for a short time. 1 Infrared signal emitter Then the set data is stored in the memory and Transmits a signal to the indoor unit. is displayed. 2 START/STOP button % Automatic operation button (AUTO) Push the button to start operation. Push this button to operate the air conditioner (A receiving beep is heard.) automatically. Push the button again to stop operation. & ECO timer button (ECO) (A receiving beep is heard.



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) Push this button to start the ECO timer (OFF If no receiving sound is heard from the indoor unit, timer) operation.

push the button twice. You can select the OFF timer from among four 3 Mode select button (MODE) settings (1,3,5 or 9 hours). Push this button to select a mode. (FILTER button Each time you press the button, a mode is Push this button to turn off the filter cleaning lamp selected in a sequence that goes from A : Auto on the indoor unit. changeover control, : Cool, : Dry, : Heat, Push this button after cleaning the air filter. : Fan only, and back to A.) PRESET button (A receiving beep is heard.) Push this button to operate the air conditioner) 4 Temperature button (according to settings memorized by the MEMO ,...

.... The set temperature is increased up to button.

30C. ~ TIMER button 9....

... The set temperature is dropped down to Use this button to change the clock, ON timer, and 17C. OFF timer times. (A receiving beep is heard.) To forward the time, push the "TIMER " button. 5 Fan speed button (FAN) To set back the time, push the "TIMER " button. Push this button to select fan speed. When you select AUTO, the fan speed is automatically adjusted according to the room temperature.

1 You can also manually select the desired fan speed from among five settings. , , MED , MED+ (LOW , LOW+ HIGH) (A receiving beep is heard.) 6 Auto louver button (SWING) Push this button to swing the louver. AUTOA A B (A receiving beep is heard.) Push the FIX button to stop the louver swinging. (A receiving beep is heard.) 4 7 Set louver button (FIX) PRESET Push this button to adjust the air flow direction. 13 17 (A receiving beep is heard.)

START/STOP 2 8 Off timer button (OFF) 3 Push this button to set the OFF timer. AUTO FAN MODE 5 14 9 On timer button (ON) 15 SWING ECO Hi-POWER 6 Push this button to set the ON timer.

12 TIMER ! Reserve button (SET) MEMO FIX 7 13 17 Push this button to reserve time settings. 9 ON OFF SET CLR (A receiving beep is heard.) 11 8 FILTER " Cancel button (CLR) 10 Push this button to cancel ON timer and OFF 16 18 timer. (A receiving beep is heard.) # High power button (Hi-POWER)

Push this button to start the high power operation.

8-6. Remote Control and its Functions RESET CLOCK CHECK 38 FILE NO. SVM-04013 8-6-2. Names and functions of indications on remote control [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.

2 Mode display Indicates the current operation mode. (AUTO : Automatic control, A : Auto changeover control, : Cool, : Dry, : Heat, : Fan only) 3 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. 4 Louver operation display Indicates the louver positioning and operation. Five selectable positions , , , Automatic Swing 5 FAN speed display Indicates the selected fan speed. AUTO or one of , five fan speed levels (LOW , LOW+ MED , MED+ , HIGH) can be indicated. Indicates AUTO when the operating mode is either AUTO or : Dry. 6 TIMER and clock time display The time set for timer operation or clock time is indicated. The present time is always indicated except for TIMER operation. 7 Hi-POWER display Indicates when the Hi-POWER operation starts.

Push the Hi-POWER button to start and push it again to stop the operation. (MEMORY) display 8 Flashes for 4 seconds when the MEMO button is pushed during operation. mark is indicated when keeping the button depressed for more than 4 seconds while the mark is flashing. Push another button to turn off the mark. 9 ECO TIMER display Indicates when the ECO TIMER is in operation. Each time you push the ECO button, the display changes in the sequence of 1,3,5 or 9h. 3 1 28 4 AUTOA A B A A B 9 7 5 6 In the illustration, all indications are indicated for explanation. During operation, only the relevant indications will be indicated on the remote control. 39 FILE NO. SVM-04013 8-7.

Hi POWER Mode ([Hi POWER] button on the remote control is pushed.) When [Hi POWER] button is pushed while the indoor unit is in Auto, Cooling or Heating operation, Hi POWER mark is indicated on the display of the remote control and the unit operates as follows. (1) Automatic operation The indoor unit operates in according to the current operation. (2) Cooling operation The preset temperature drops 1C. (The value of the preset temperature on the remote controller does not change.

) If the difference between the preset temperature and the room temperature is big, the horizontal louver moves to the Hi POWER position automatically. Then when the difference between them gets smaller, the horizontal louver returns automatically. (3) Heating operation The preset temperature increases 2C. (The value of the preset temperature on the remote control does not change.) If the difference between the preset temperature and the room temperature is big, the horizontal louver moves to the Hi POWER position automatically.

Then when the difference between them gets smaller, the horizontal louver returns automatically. (4) The Hi POWER mode can not be set in Dry or Fan only operation. 40 FILE NO. SVM-04013 9. INSTALLATION PROCEDURE 9-1. Safety Cautions For general public use Power supply cord of parts of appliance for outdoor use shall be at least polychloroprene sheathed flexible cord (design H07RN-F), or cord designation 245 IEC66. (1.5 mm² or more) CAUTION New Refrigerant Air conditioner Installation THIS AIR CONDITIONER USES THE NEW HFC REFRGERANT (R410A), WHICH DOES NOT DESTROY THE OZONE LAYER. R410A refrigerant is apt to be affected by impurity such as water, oxidizing membranes, and oils because the pressure of R410A refrigerant is approx. 1.

6 times of refrigerant R22. As well as the adoption of this new refrigerant, refrigerating machine oil has also been changed. Therefore, during installation work, be sure that water, dust, former refrigerant, or refrigerating machine oil does not enter into the refrigerating cycle of a new-refrigerant air conditioner. To avoid mixing refrigerant and refrigerating machine oil, the sizes of charging port connecting sections on the main unit are different from those for the conventional refrigerant, and different size tools are also required. Accordingly, special tools are required for the new refrigerant (R410A) as shown below. For connecting pipes, use new and clean piping materials with high-pressure withstand capabilities, designed for R410A only, and ensure that water or dust does not enter. Moreover, do not use any existing piping as its pressure withstand may be insufficient, and may contain impurities. CAUTION To Disconnect the Appliance from the Main Power Supply This appliance must be connected to the main power supply by means of a circuit breaker or a switch with a contact separation of at least 3 mm.



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