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You can read the recommendations in the user guide, the technical guide or the installation guide for TOSHIBA RAS-M16SKV-E. You'll find the answers to all your questions on the TOSHIBA RAS-M16SKV-E in the user manual (information, specifications, safety advice, size, accessories, etc.). Detailed instructions for use are in the User's Guide.

User manual TOSHIBA RAS-M16SKV-E
User guide TOSHIBA RAS-M16SKV-E
Operating instructions TOSHIBA RAS-M16SKV-E
Instructions for use TOSHIBA RAS-M16SKV-E
Instruction manual TOSHIBA RAS-M16SKV-E

TOSHIBA FILE NO. SVM-07034-2

SERVICE MANUAL

AIR-CONDITIONER
SPLIT TYPE

Indoor Unit
<High Wall, Heat Pump Type>
RAS-M07SKV-E
RAS-M10SKV-E
RAS-M13SKV-E
RAS-M16SKV-E

<High Wall, Cooling Type>
RAS-M10SKCV-E
RAS-M13SKCV-E
RAS-M16SKCV-E

HFC
R410A

Revised May, 2009



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SAFETY PRECAUTIONS For general public use Power supply cord of outdoor unit shall be more than 1.5 mm² (H07RN-F or 60245IEC66) polychloroprene sheathed flexible cord. . . . Read this "SAFETY PRECAUTIONS" carefully before servicing. The precautions described below include the important items regarding safety. Observe them without fail.

After the servicing work, perform a trial operation to check for any problem. Turn off the main power supply switch (or breaker) before the unit maintenance.

CAUTION New Refrigerant Air Conditioner Installation · THIS AIR CONDITIONER ADOPTS THE NEW HFC REFRIGERANT (R410A) WHICH DOES NOT DESTROY OZONE LAYER. R410A refrigerant is apt to be affected by impurities such as water, oxidizing membrane, and oils because the working pressure of R410A refrigerant is approx. 1.6 times of refrigerant R22. Accompanied with the adoption of the new refrigerant, the refrigeration machine oil has also been changed. Therefore, during installation work, be sure that water, dust, former refrigerant, or refrigeration machine oil does not enter into the new type refrigerant R410A air conditioner circuit. To prevent mixing of refrigerant or refrigerating machine oil, the sizes of connecting sections of charging port on main unit and installation tools are different from those used for the conventional refrigerant units. Accordingly, special tools are required for the new refrigerant (R410A) units.

For connecting pipes, use new and clean piping materials with high pressure fittings made for R410A only, so that water and/or dust does not enter. Moreover, do not use the existing piping because there are some problems with pressure fittings and possible impurities in existing piping. **CAUTION TO DISCONNECT THE APPLIANCE FROM THE MAIN POWER SUPPLY** This appliance must be connected to the main power supply by a circuit breaker or a switch with a contact separation of at least 3 mm. **DANGER · ASK AN AUTHORIZED DEALER OR QUALIFIED INSTALLATION PROFESSIONAL TO INSTALL/MAINTAIN THE AIR CONDITIONER.** INAPPROPRIATE SERVICING MAY RESULT IN WATER LEAKAGE, ELECTRIC SHOCK OR FIRE. · **TURN OFF MAIN POWER SUPPLY BEFORE ATTEMPTING ANY ELECTRICAL WORK. MAKE SURE ALL POWER SWITCHES ARE OFF. FAILURE TO DO SO MAY CAUSE ELECTRIC SHOCK. DANGER: HIGH VOLTAGE** The high voltage circuit is incorporated. Be careful to do the check service, as the electric shock may be caused in case of touching parts on the P board by hand.

C. · CORRECTLY CONNECT THE CONNECTING CABLE. IF THE CONNECTING CABLE IS INCORRECTLY CONNECTED, ELECTRIC PARTS MAY BE DAMAGED. · CHECK THAT THE EARTH WIRE IS NOT BROKEN OR DISCONNECTED BEFORE SERVICE AND INSTALLATION.

FAILURE TO DO SO MAY CAUSE ELECTRIC SHOCK. 3 · DO NOT INSTALL NEAR CONCENTRATIONS OF COMBUSTIBLE GAS OR GAS VAPORS. FAILURE TO FOLLOW THIS INSTRUCTION CAN RESULT IN FIRE OR EXPLOSION. · TO PREVENT THE INDOOR UNIT FROM OVERHEATING AND CAUSING A FIRE HAZARD, PLACE THE UNIT WELL AWAY (MORE THAN 2 M) FROM HEAT SOURCES SUCH AS RADIATORS, HEAT REGISTORS, FURNACE, STOVES, ETC. · WHEN MOVING THE AIR-CONDITIONER FOR INSTALLATION IN ANOTHER PLACE, BE VERY CAREFUL NOT TO ALLOW THE SPECIFIED REFRIGERANT (R410A) TO BECOME MIXED WITH ANY OTHER GASEOUS BODY INTO THE REFRIGERATION CIRCUIT.

IF AIR OR ANY OTHER GAS IS MIXED IN THE REFRIGERANT, THE GAS PRESSURE IN THE REFRIGERATION CIRCUIT WILL BECOME ABNORMALLY HIGH AND IT MAY RESULT IN THE PIPE BURSTING AND POSSIBLE PERSONNEL INJURIES. · IN THE EVENT THAT THE REFRIGERANT GAS LEAKS OUT OF THE PIPE DURING THE SERVICE WORK AND THE INSTALLATION WORK, IMMEDIATELY LET FRESH AIR

INTO THE ROOM. IF THE REFRIGERANT GAS IS HEATED, SUCH AS BY FIRE, GENERATION OF POISONOUS GAS MAY RESULT. WARNING · Never modify this unit by removing any of the safety guards or bypass any of the safety interlock switches. · Do not install in a place which cannot bear the weight of the unit. Personal injury and property damage can result if the unit falls. · After the installation work, confirm that refrigerant gas does not leak. If refrigerant gas leaks into the room and flows near a fire source, such as a cooking range, noxious gas may generate. · The electrical work must be performed by a qualified electrician in accordance with the Installation Manual. Make sure the air conditioner uses an exclusive circuit.

An insufficient circuit capacity or inappropriate installation may cause fire. · When wiring, use the specified cables and connect the terminals securely to prevent external forces applied to the cable from affecting the terminals. · Be sure to provide grounding. Do not connect ground wires to gas pipes, water pipes, lightning rods or ground wires for telephone cables. · Conform to the regulations of the local electric company when wiring the power supply. Inappropriate grounding may cause electric shock. CAUTION · Exposure of unit to water or other moisture before installation may result in an electrical short. Do not store in a wet basement or expose to rain or water. · Do not install in a place that can increase the vibration of the unit. Do not install in a place that can amplify the noise level of the unit or where noise or discharged air might disturb neighbors. · To avoid personal injury, be careful when handling parts with sharp edges. · Perform the specified installation work to guard against an earthquake. If the air conditioner is not installed appropriately, accidents may occur due to the falling unit. For Reference: If a heating operation would be continuously performed for a long time under the condition that the outdoor temperature is 0°C or lower, drainage of defrosted water may be difficult due to freezing of the bottom plate, resulting in a trouble of the cabinet or fan. It is recommended to procure an antifreeze heater locally for a safe installation of the air conditioner.

For details, contact the dealer. 4 Revised-2 2. Specifications 2-1. Combined Outdoor Unit The outdoor units, which can be combined with M**SKV-E series indoor unit are as described below: 2-2-1. Heatpump type Outdoor unit type 2-room Multi outdoor unit 3-room Multi outdoor unit 4-room Multi outdoor unit Combined outdoor unit model name RAS-M14GAV-E RAS-M18GAV-E RAS-3M18SAV-E RAS-3M26GAV-E1 RAS-4M23SAV-E RAS-4M27GAV-E1 :

Combination available X : Combination unavailable 2-2-2.

Cooling only type Outdoor unit type 2-room Multi outdoor unit 3-room Multi outdoor unit 4-room Multi outdoor unit Combined outdoor unit model name RAS-M14GACV-E RAS-M18GACV-E RAS-3M18SACV-E RAS-3M23GACV-E RAS-4M23SACV-E RAS-4M27GACV-E : Combination available X : Combination unavailable X Indoor unit model name M16SKCV-E M13SKCV-E M10SKCV-E X M16SKV-E X Indoor unit model name M13SKV-E M10SKV-E M07SKV-E X X X This service manual describes about M**SKV-E series indoor units, RAS-M07SKV-E, RAS-M10SKV-E, RAS-M13SKV-E, RAS-M16SKV-E, RAS-M10SKCV-E, RAS-M13SKCV-E and RAS-M16SKCV-E only.



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Carefully remove all burrs and clean the cut surface before installation. c) Insertion of Flare Nut 9 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. 3-2-1 Flare processing dimensions Table 3-2-3 Dimensions related to flare processing for R410A A (mm) Nominal diameter Outer diameter (mm) 6.35 9.52 12.70 15.88 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 1/4 3/8 1/2 5/8 0.8 0.8 0.8 1.

0 Table 3-2-4 Dimensions related to flare processing for R22 A (mm) Nominal diameter Outer diameter (mm) 6.35 9.52 12.70 15.88 Thickness (mm) Flare tool for R22 clutch type 0 to 0.

5 0 to 0.5 0 to 0.5 0 to 0.5 Conventional flare tool Clutch type 0.5 to 1.

0 0.5 to 1.0 0.5 to 1.0 0.5 to 1.0 Wing nut type 1.0 to 1.5 1.0 to 1.

5 1.5 to 2.0 1.5 to 2.0 1/4 3/8 1/2 5/8 0.8 0.8 0.8 1.0 Table 3-2-5 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 10 Table 3-2-6 Flare and flare nut dimensions for R22 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 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 6° Thickness (mm) 0.8 0.

8 0.8 1.0 1.0 Flare nut width (mm) 17 22 24 27 36 45° to 4 B A C D 43° to 4 5° Fig. 3-2-2 Relations between flare nut and flare seal surface 2. Flare Connecting Procedures and Precautions a) Make sure that the flare and union portions do not have any scar or dust, etc. b) Correctly align the processed flare surface with the union axis. c) Tighten the flare with designated torque by means of a torque wrench. The tightening torque for R410A is the same as that for conventional R22. Incidentally, when the torque is weak, the gas leakage may occur.

When it is strong, the flare nut may crack and may be made non-removable. When choosing the tightening torque, comply with values designated by manufacturers. Table 3-2-7 shows reference values. NOTE : When applying oil to the flare surface, be sure to use oil designated by the manufacturer. If any other oil is used, the lubricating oils may deteriorate and cause the compressor to burn out. Table 3-2-7 Tightening torque of flare for R410A [Reference values] Nominal diameter 1/4 3/8 1/2 5/8 Outer diameter (mm) 6.35 9.52 12.70 15.88 Tightening torque N-m (kgf-cm) 14 to 18 (140 to 180) 33 to 42 (330 to 420) 50 to 62 (500 to 620) 63 to 77 (630 to 770) Tightening torque of torque wrenches available on the market N-m (kgf-cm) 16 (160), 18 (180) 42 (420) 55 (550) 65 (650) 11 3-3.

Tools 3-3-1. Required Tools The service port diameter of packed valve of the outdoor unit in the air-water heat pump using R410A is changed to prevent mixing of other refrigerant. To reinforce the pressure-resisting strength, flare processing dimensions and opposite side dimension of flare nut (For Ø12.7 copper pipe) of the refrigerant piping are lengthened. The used refrigerating oil is changed, and mixing of oil may cause a trouble such as generation of sludge, clogging of capillary, etc.

Accordingly, the tools to be used are classified into the following three types. 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-water heat pump installation No. Used tool Usage Existence of new equipment for R410A Yes Yes Yes Whether conventional equipment can be used *(Note 1) *(Note 1) Conventional air-water heat pump installation Whether new equipment can be used with conventional refrigerant 1 2 3 4 5 6 7 8 9 10 Flare tool Copper pipe gauge for adjusting projection margin Torque wrench (For Ø12.7) Gauge manifold Charge hose Vacuum pump adapter Electronic balance for refrigerant charging Refrigerant cylinder Leakage detector Charging cylinder Pipe flaring Flaring by conventional flare tool Connection of flare nut Evacuating, refrigerant charge, run check, etc. Vacuum evacuating Refrigerant charge Refrigerant charge Gas leakage check Refrigerant charge j *(Note 1) x x x x x x x x x j ; Yes Yes Yes Yes Yes (Note 2) x j x (Note 1) When flaring is carried out for R410A using the conventional flare tools, adjustment of projection margin is necessary. For this adjustment, a copper pipe gauge, etc. are necessary. (Note 2) Charging cylinder for R410A is being currently developed. General tools (Conventional tools can be used.) In addition to the above exclusive tools, the following equipments which serve also for R22 are necessary as the general tools.

1. Vacuum pump Use vacuum pump by attaching vacuum pump adapter. 2. Torque wrench (For Ø6.35, Ø9.52) 3. Pipe cutter 4. 5. 6. 7.

8. Reamer Pipe bender Level vial Screwdriver (+, -) Spanner or Monkey wrench 9. Hole core drill (Ø65) 10. Hexagon wrench (Opposite side 4mm) 11. Tape measure 12.

Metal saw Also prepare the following equipments for other installation method and run check. 1. Clamp meter 2. Thermometer 3. Insulation resistance tester 4.

Electroscope 12 3-4. 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.



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(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.

(Water heat exchanger unit) (Outdoor unit) Opened Refrigerant cylinder (with siphon) Check valve Opened Opened Open/close valve for charging Closed Service port Electronic balance for refrigerant charging Fig. 3-4-1 Configuration of refrigerant charging 13 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. 3-4-2 3-5. Brazing of Pipes 3-5-1. 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. 3-5-2. 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. 14 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 3-5-3. 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 Stop valve Nitrogen gas cylinder From Nitrogen cylinder 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. 3-5-1 Prevention of oxidation during brazing 15 4. CONSTRUCTION VIEWS RAS-M07SKV-E, RAS-M10SKV-E, RAS-M13SKV-E, RAS-M16SKV-E RAS-M10SKCV-E, RAS-M13SKCV-E, RAS-M16SKCV-E 790 Revised-2 Front panel Air filter Air inlet 205 63 275 48 Heat exchanger 48 7 Knock out system Knock out system 62 116 480 Installation plate hanger 193 69 49 56 Wireless remote controller Installation plate hanger Connecting pipe (0.35m) (For 07,10,13 series; Flare 9.52mm) (For 16 series; Flare 12.7mm) 84.5 Drain hose (0.50m) Connecting pipe (0.40m) (Flare 6.35mm) 235 215 621 235 215 distance to ceiling 84.

5 63 Remote controller holder 65 or more Hanger Minimum distance Minimum Minimum distance 275 170 or more 170 or more 40 84.5 Hanger 150 160.5 Center line 160.5 Hanger 150 84.5 Installation plate outline 16 40 190 to wall to wall 45 125 26 157 19 7 63 Revised-2 5.



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WIRING DIAGRAM 5-1. RAS-M07SKV-E, RAS-M10SKV-E, RAS-M13SKV-E, RAS-M10SKCV-E, RAS-M13SKCV-E 17 Revised-2 5-2. RAS-M16SKV-E RAS-M16SKCV-E 18 Revised-2 6. SPECIFICATIONS OF ELECTRICAL PARTS Indoor Unit No. 1 Fan motor (for indoor) Parts name M07SKV-E, M10SKV-E, M13SKV-E, M10SKCV-E, M13SKCV-E M16SKV-E, M16SKCV-E Type AFS-220-20-4AR ICF-340-30-2B (-) (-) MP24Z3T Specifications AC240V, 20W DC 340V, 30W 10k at 25°C 10k at 25°C Output (Rated) 1W, 16 poles, DC12V 2 3 4 Room temp.

sensor (TA-sensor) Heat exchanger temp. sensor (TC-sensor) Louver motor 19 Revised-2 7. REFRIGERANT CYCLE DIAGRAM INDOOR UNIT Indoor heat exchanger T1 Temp. measurement TCJ TC Cross flow fan P Pressure measurement Gauge attaching port Vacuum pump connecting port TA Allowable pipe length Allowable height difference : 10m Deoxidized copper pipe Outer dia. : 6.

35mm Thickness : 0.8mm Sectional shape of heat insulator Max. : 1 Min. : 1 Chargeless : 1 Charge : 1 Deoxidized copper pipe Outer dia. : 9.
52mm Thickness : 0.8mm M16SKV-E, M16SKCV-E Deoxidized copper pipe Outer dia. : 12.7mm Thickness : 0.8mm 1 : Refer to the service manual of multi outdoor unit to be combined. 20 Revised-2 8. CONTROL BLOCK DIAGRAM 8-1. Indoor Unit RAS-M07SKV-E, RAS-M10SKV-E, RAS-M13SKV-E, RAS-M16SKV-E M.C.U.

Functions · Cold draft preventing Function Room Temperature Sensor (Ta) · 3-minute Delay at Restart for Compressor Infrared Rays Signal Receiver and Indication · Fan Motor Starting Control · Processing (Temperature Processing) · Timer · Serial Signal Communication · Clean Function Power Supply Circuit Indoor Fan Motor Control Indoor Fan Motor Louver Motor Drive Control Indoor Unit Control Unit Louver Motor Heat Exchanger Sensor (Tcj) Heat Exchanger Sensor (Tc) Initializing Circuit Clock Frequency Oscillator Circuit Converter (D.C circuit) Noise Filter Serial Signal Transmitter/Receiver From Outdoor Unit 220-240V ~50Hz 220V ~60Hz Serial Signal Communication (Operation Command and Information) Remote Controller Infrared Rays, 36.7kHz REMOTE CONTROLLER Operation (START/STOP) Operation Mode Selection AUTO, COOL, DRY, HEAT Thermo. Setting Fan Speed Selection ON TIMER Setting OFF TIMER Setting Louver AUTO Swing Louver Direction Setting ECO Hi-POWER COMFORT SLEEP QUIET 21 RAS-M10SKCV-E, RAS-M13SKCV-E, RAS-M16SKCV-E M.C.U. Functions · Cold draft preventing Function Room Temperature Sensor (Ta) · 3-minute Delay at Restart for Compressor Infrared Rays Signal Receiver and Indication · Fan Motor Starting Control · Processing (Temperature Processing) · Timer · Serial Signal Communication · Clean Function Power Supply Circuit Indoor Fan Motor Control Indoor Fan Motor Louver Motor Drive Control Indoor Unit Control Unit Louver Motor Heat Exchanger Sensor (Tcj) Heat Exchanger Sensor (Tc) Initializing Circuit Clock Frequency Oscillator Circuit Converter (D.C circuit) Noise Filter Serial Signal Transmitter/Receiver From Outdoor Unit 220-240V ~50Hz 220V ~60Hz Serial Signal Communication (Operation Command and Information) Remote Controller Infrared Rays, 36.7kHz REMOTE CONTROLLER Operation (START/STOP) Operation Mode Selection AUTO, COOL, DRY, Fan only Thermo. Setting Fan Speed Selection ON TIMER Setting OFF TIMER Setting Louver AUTO Swing Louver Direction Setting ECO Hi-POWER COMFORT SLEEP QUIET 22 - 9.

OPERATION DESCRIPTION 9-1. Outline of Air Conditioner Control This air conditioner is a capacity-variable type air conditioner, which uses AC or DC motor for the indoor for motor and the outdoor fan motor. And the capacityproportional control compressor mounted. The DC motor drive circuit is mounted to the indoor unit. The compressor and the inverter to control fan motor are mounted to the outdoor unit.

The entire air conditioner is mainly controlled by the indoor unit controller. The indoor unit controller drives the indoor fan motor based upon command sent from the remote controller, and transfers the operation command to the outdoor unit controller. The outdoor unit controller receives operation command from the indoor unit side, and controls the outdoor fan and the pulse motor valve. (P .M.

V) Besides, detecting revolution position of the compressor motor, the outdoor unit controller controls speed of the compressor motor by controlling output voltage of the inverter and switching timing of the supply power (current transfer timing) so that motors drive according to the operation command. And then, the outdoor unit controller transfers reversely the operating status information of the outdoor unit to control the indoor unit controller. 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. ·

Detection of inverter input current and current release operation · Over-current detection and prevention operation to IGBT module (Compressor stop function) · Compressor and outdoor fan stop function when serial signal is off (when the serial signal does not reach the board assembly of outdoor control by trouble of the signal system) · Transferring of operation information (Serial signal) from outdoor unit controller to indoor unit controller · Detection of outdoor temperature and operation revolution control · Defrost control in heating operation (Temp. measurement by outdoor heat exchanger and control for 4-way valve and outdoor fan) 3. Contents of operation command signal (Serial signal) from indoor unit controller to outdoor unit controller The following three types of signals are sent from the indoor unit controller. · Operation mode set on the remote controller · Compressor revolution command signal defined by indoor temperature and set temperature (Correction along with variation of room temperature and correction of indoor heat exchanger temperature are added.) · Temperature of indoor heat exchanger · For these signals ([Operation mode] and [Compressor revolution] indoor heat exchanger temperature), the outdoor unit controller monitors the input current to the inverter, and performs the followed operation within the range that current does not exceed the allowable value. 1. Role of indoor unit controller The indoor unit controller judges the operation commands from the remote controller and assumes the following functions.

· Judgment of suction air temperature of the indoor heat exchanger by using the indoor temp. sensor. (TA sensor) · Judgment of the indoor heat exchanger temperature by using heat exchanger sensor (TC sensor) (Prevent-freezing control, etc.) · 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.



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data) to the outdoor unit and judgment/display of error 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. 2. Role of outdoor unit controller Receiving the operation command signal (Serial signal) from the indoor unit controller, the outdoor unit performs its role. · Compressor operation control · Operation control of outdoor fan motor Operations followed to judgment of serial signal from indoor side. · P.M.V. control · 4-way valve control (Heat Pump model only) - 23 - 9-2. Operation Description 1. Basic operation ...

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.... 25 1. Operation control

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Operating mode selection when performing 2-room operation

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26 3. Cooling/Heating operation

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..... 26 4. AUTO operation ...

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.. 27 5. DRY operation ..

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. 27 2. Indoor fan motor control

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..... 28 3. Capacity control

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.. 30 4. Release protective control by temperature of indoor heat exchanger

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.. 31 5. Louver control ..

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..... 32 1) Lower position ...

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32 2) Air direction adjustment

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.... 32 3) Swing .

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32 6. ECO operation ...

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..... 33 7. Temporary operation

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34 8. Self-Cleaning function ...

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.. 35 9. Self-Cleaning function release

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. 36 10. Remote-A or B selection ...

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QUIET mode

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COMFORT SLEEP mode

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Short Timer

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..... 45 24 - Item 1. Basic operation Operation flow and applicable data, etc. 1. Operation control Description Receiving the user's operation condition setup, the operation statuses of indoor/outdoor units are controlled. 1) The operation conditions are selected by the remote controller as shown in the below. 2) A signal is sent by ON button of the remote controller. 3) The signal is received by a sensor of the indoor unit and processed by the indoor controllers as shown in the below. 4) The indoor controller controls the indoor fan motor and louver motor. 5) The indoor controller sends the operation command to the outdoor controller, and sends/receives the control status with a serial signal. 6) The outdoor controller controls the operation as shown in the left, and also controls the compressor, outdoor fan motor, 4-way valve and pulse motor valve.

Remote controller Selection of operation conditions ON/OFF Control contents of remote controller · ON/OFF · Operation select · Temperature setup · Air direction · Swing · Air volume select (AUTO/LOW/LOW+/MED/MED+/HIGH) · ECO · COMFORT SLEEP · QUIET · ON timer setup · PRESET · OFF timer setup · ONE-TOUCH · Hi-POWER Indoor unit Signal receiving Indoor unit control Operation command Serial signal send/receive Indoor unit control · Command signal generating function of indoor unit operation · Calculation function (temperature calculation) · Activation compensation function of indoor fan · Cold draft preventive function · Timer function · Indoor heat exchanger release control · Indoor fan motor · Louver motor Outdoor unit Serial signal send/receive Outdoor unit control Outdoor unit control · Frequency control of inverter output · Waveform composite function · Calculation function (Temperature calculation) · AD conversion function · Quick heating function · Delay function of compressor reactivation · Current release function · GTr over-current preventive function · Defrost operation function Inverter ~ · Compressor · Outdoor fan motor · 4-way valve · Pulse motor valve (P.M.V.) 25 Item 1. Basic operation Operation flow and applicable data, etc.

Description 2. Operating mode selection when performing 2-room operation 1) The outdoor unit operation mode conforms to the instructions of the indoor unit that was pressed first. 2) When combined operation consisting of cooling (dry) and heating, fan and heating, or cleaning operation and heating is performed, operation conforms to the instructions of the indoor unit that was pressed first as shown in the following table. 3) The indoor fan stops for the indoor unit that was pressed last and which instructions are ignored. 4) When three or four indoor units are operated concurrently, the priority is also given to operating mode of the indoor unit which was pressed first as same as the case when two indoor units are operated concurrently. No. Indoor unit Set operating mode Actual indoor unit operation Actual outdoor unit operation

No.	Indoor unit Set operating mode	Actual indoor unit operation	Actual outdoor unit operation
1	Pressed first	Pressed first	Pressed first
2	Pressed last	Pressed last	Pressed last
3	Pressed first	Pressed first	Pressed last
4	Pressed last	Pressed last	Pressed first
5	Pressed first	Pressed first	Pressed last
6	Pressed last	Pressed last	Pressed first
7	Pressed first	Pressed first	Pressed last
8	Pressed last	Pressed last	Pressed first
9	Pressed first	Pressed first	Pressed last
10	Pressed last	Pressed last	Pressed first
11	Pressed first	Pressed first	Pressed last
12	Pressed last	Pressed last	Pressed first
13	Pressed first	Pressed first	Pressed last
14	Pressed last	Pressed last	Pressed first
15	Pressed first	Pressed first	Pressed last
16	Pressed last	Pressed last	Pressed first
17	Pressed first	Pressed first	Pressed last
18	Pressed last	Pressed last	Pressed first
19	Pressed first	Pressed first	Pressed last
20	Pressed last	Pressed last	Pressed first
21	Pressed first	Pressed first	Pressed last
22	Pressed last	Pressed last	Pressed first
23	Pressed first	Pressed first	Pressed last
24	Pressed last	Pressed last	Pressed first
25	Pressed first	Pressed first	Pressed last
26	Pressed last	Pressed last	Pressed first
27	Pressed first	Pressed first	Pressed last
28	Pressed last	Pressed last	Pressed first
29	Pressed first	Pressed first	Pressed last
30	Pressed last	Pressed last	Pressed first
31	Pressed first	Pressed first	Pressed last
32	Pressed last	Pressed last	Pressed first
33	Pressed first	Pressed first	Pressed last
34	Pressed last	Pressed last	Pressed first
35	Pressed first	Pressed first	Pressed last
36	Pressed last	Pressed last	Pressed first
37	Pressed first	Pressed first	Pressed last
38	Pressed last	Pressed last	Pressed first
39	Pressed first	Pressed first	Pressed last
40	Pressed last	Pressed last	Pressed first
41	Pressed first	Pressed first	Pressed last
42	Pressed last	Pressed last	Pressed first
43	Pressed first	Pressed first	Pressed last
44	Pressed last	Pressed last	Pressed first
45	Pressed first	Pressed first	Pressed last
46	Pressed last	Pressed last	Pressed first
47	Pressed first	Pressed first	Pressed last
48	Pressed last	Pressed last	Pressed first
49	Pressed first	Pressed first	Pressed last
50	Pressed last	Pressed last	Pressed first
51	Pressed first	Pressed first	Pressed last
52	Pressed last	Pressed last	Pressed first
53	Pressed first	Pressed first	Pressed last
54	Pressed last	Pressed last	Pressed first
55	Pressed first	Pressed first	Pressed last
56	Pressed last	Pressed last	Pressed first
57	Pressed first	Pressed first	Pressed last
58	Pressed last	Pressed last	Pressed first
59	Pressed first	Pressed first	Pressed last
60	Pressed last	Pressed last	Pressed first
61	Pressed first	Pressed first	Pressed last
62	Pressed last	Pressed last	Pressed first
63	Pressed first	Pressed first	Pressed last
64	Pressed last	Pressed last	Pressed first
65	Pressed first	Pressed first	Pressed last
66	Pressed last	Pressed last	Pressed first
67	Pressed first	Pressed first	Pressed last
68	Pressed last	Pressed last	Pressed first
69	Pressed first	Pressed first	Pressed last
70	Pressed last	Pressed last	Pressed first
71	Pressed first	Pressed first	Pressed last
72	Pressed last	Pressed last	Pressed first
73	Pressed first	Pressed first	Pressed last
74	Pressed last	Pressed last	Pressed first
75	Pressed first	Pressed first	Pressed last
76	Pressed last	Pressed last	Pressed first
77	Pressed first	Pressed first	Pressed last
78	Pressed last	Pressed last	Pressed first
79	Pressed first	Pressed first	Pressed last
80	Pressed last	Pressed last	Pressed first
81	Pressed first	Pressed first	Pressed last
82	Pressed last	Pressed last	Pressed first
83	Pressed first	Pressed first	Pressed last
84	Pressed last	Pressed last	Pressed first
85	Pressed first	Pressed first	Pressed last
86	Pressed last	Pressed last	Pressed first
87	Pressed first	Pressed first	Pressed last
88	Pressed last	Pressed last	Pressed first
89	Pressed first	Pressed first	Pressed last
90	Pressed last	Pressed last	Pressed first
91	Pressed first	Pressed first	Pressed last
92	Pressed last	Pressed last	Pressed first
93	Pressed first	Pressed first	Pressed last
94	Pressed last	Pressed last	Pressed first
95	Pressed first	Pressed first	Pressed last
96	Pressed last	Pressed last	Pressed first
97	Pressed first	Pressed first	Pressed last
98	Pressed last	Pressed last	Pressed first
99	Pressed first	Pressed first	Pressed last
100	Pressed last	Pressed last	Pressed first

Cooling (dry) Cooling (dry) Heating Heating Fan only Fan only Fan only Cooling (dry) Cooling (dry) Fan only Cooling (dry) Heating Heating Cooling (dry) Cleaning operation Cleaning operation Heating Heating Cleaning operation Cooling (dry) Cooling (dry) Heating Heating Fan only Fan only Fan only Cooling (dry) Cooling (dry) Fan only Cooling (dry) Fan stopped Heating Fan stopped Cleaning operation Cleaning operation Cleaning operation Cooling (dry) Cooling (dry) Cleaning operation Cleaning operation Fan only Fan only Cleaning operation Cleaning operation Fan stopped Heating Fan stopped Cooling Heating Stopped Cooling Cooling Cooling Heating Stopped Cooling Cooling Stopped Stopped Stopped Heating 3. Cooling/Heating operation The operations are performed in the following parts by controls according to cooling/heating conditions. 1) Receiving the operation ON signal of the remote controller, the cooling or heating operation signal starts being transferred from the indoor controller to the outdoor unit.



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2) At the indoor unit side, the indoor fan is operated according to the contents of "2.

Indoor fan motor control and the louver according to the contents of "9. Louver control", respectively. 3) The outdoor unit controls the outdoor fan motor, compressor, pulse motor valve and 4-way valve according to the operation signal sent from the indoor unit. *1. The power coupler of 4-way valve is usually turned off, and it is turned on during defrost operation. (Only in heating) Operation On Indoor unit control Setup of remote controller Indoor fan motor control / Louver control Sending of operation command signal Compressor revolution control / Outdoor fan motor control / 4-way valve control [In cooling operation: OFF, In heating operation: ON] Pulse motor valve control Outdoor unit control 26 Item 1. Basic operation Operation flow and applicable data, etc. 4. AUTO operation Selection of operation mode As shown in the following figure, the operation starts by selecting automatically the status of room temperature (Ta) when starting AUTO operation. *1.

When reselecting the operation mode, the fan speed is controlled by the previous operation mode. Description 1) Detects the room temperature (Ta) when the operation started. 2) Selects an operation mode from Ta in the left figure. 3) Fan operation continues until an operation mode is selected. 4) When AUTO operation has started within 2 hours after heating operation stopped and if the room temperature is 20°C or more, the fan operation is performed with "Super Ultra LOW" mode for 3 minutes.

Then, select an operation mode. 5) If the status of compressor-OFF continues for 15 minutes the room temperature after selecting an operation mode (COOL/HEAT), reselect an operation mode. 1) Detects the room temperature (Ta) when the DRY operation started. 2) Starts operation under conditions in the left figure according to the temperature difference between the room temperature and the setup temperature (Tsc). Setup temperature (Tsc) = Set temperature on remote controller (Ts) + (0.

0 to 1.0) 3) When the room temperature is lower 1°C or less than the setup temperature, turn off the compressor. Ta Cooling operation Ts + 1 Monitoring (Fan) Ts 1 Heating operation (Heatpump) Monitoring (Fan)(Cooling Only) 5. DRY operation DRY operation is performed according to the difference between room temperature and the setup temperature as shown below. In DRY operation, fan speed is controlled in order to prevent lowering of the room temperature and to avoid air flow from blowing directly to persons. [°C] Ta +1.0 +0.5 L (W5) (W5+W3) / 2 SUL (W3) Tsc Fan speed - 27 - Revised-2 Item 2. Indoor fan motor control Operation flow and applicable data, etc. <In cooling operation> (This operation controls the fan speed at indoor unit side.

) The indoor fan (cross flow fan) is operated by the phasecontrol induction motor. The fan rotates in 5 stages in MANUAL mode, and in 5 stages in AUTO mode, respectively. (Table 1) Description COOL ON UH H M+ M L+ L LUL SUL * Symbols : Ultra High : High : Medium+ : Medium : Low+ : Low : Low : Ultra Low : Super Ultra Low Fan speed setup MANUAL (Fig. 1) AUTO Indication L L+ M M+ H Fan speed W6 (L + M) / 2 W9 (M + H) / 2 WC (Fig. 2) Air volume AUTO Ta [°C] +2.5 +2.0 +1.5 +1.0 +0.5 Tsc a b c d e M+(WB) *3 *4 *5 L(W6) *3 : Fan speed = (M + L) x 3/4 + L *4 : Fan speed = (M + L) x 2/4 + L *5 : Fan speed = (M + L) x 1/4 + L (Linear approximation from M+ and L) * The fan speed broadly varies due to position of the louver, etc.

The described value indicates one under condition of inclining downward blowing. 1) When setting the fan speed to L, L+, M, M+ or H on the remote controller, the operation is performed with the constant speed shown in Fig. 1. 2) When setting the fan speed to AUTO on the remote controller, revolution of the fan motor is controlled to the fan speed level shown in Fig. 2 and Table 1 according to the setup temperature, room temperature, and heat exchanger temperature.

(Table 1) Indoor fan air flow rate Fan speed level RAS-M07SKV-E COOL HEAT DRY Fan speed (rpm) WF WE WD WC WB WA W9 W8 W7 W6 W5 W4 W3 W2 W1 L+ L LUL SUL SUL UL M L+ L LL+ L LUL SUL UH H M+ M+ UH H M+ UH H M+ M 1240 1170 1140 1100 1000 1000 960 870 850 760 700 650 500 500 Air flow rate (m3/h) 630 582 563 536 469 469 443 383 369 309 309 269 236 135 135 RAS-M10SKV-E RAS-M10SKCV-E Fan speed (rpm) 1240 1170 1140 1100 1000 960 870 850 760 760 700 650 500 500 Air flow rate (m3/h) 630 582 563 536 469 469 443 383 369 309 309 269 236 135 135 RAS-M13SKV-E RAS-M13SKCV-E Fan speed (rpm) 1240 1240 1190 1140 1040 100 960 870 850 760 760 700 650 500 500 Air flow rate (m3/h) 630 630 596 563 496 469 443 383 369 309 309 269 236 135 135 RAS-M16SKV-E RAS-M16SKCV-E Fan speed (rpm) 1470 1470 1440 1390 1250 1190 1120 970 950 890 870 810 750 600 500 Air flow rate (m3/h) 743 743 723 691 601 563 518 421 408 370 357 318 280 183 119 28 Item 2. Indoor fan motor control HEAT ON Operation flow and applicable data, etc. <In heating operation> Description 1) When setting the fan speed to L, L+, M, M+ or H on the remote controller, the operation is performed with the constant speed shown in Fig. 3 and Table 1. 2) When setting the fan speed to AUTO on the remote controller, revolution of the fan motor is controlled to the fan speed level shown in Fig.

5 according to the set temperature and room temperature. 3) Min air flow rate is controlled by temperature of the indoor heat exchanger (Tc) as shown in Fig. 4. 4) Cold draft prevention, the fan speed is controlled by temperature of the indoor heat exchanger (Tc) as shown in Fig. 6. 5) In order to prevent Cold draft when compressor stop during heating operation. Then louver will move to upper position and fan speed will reduce or off. Fan speed setup MANUAL (Fig. 3) Fan speed W8 (L + M) / 2 WA (M + H) / 2 WE Indication L L+ AUTO M M+ H TC 42°C NO YES Min air flow rate control Tc 52 51 42 41 (Fig. 4) Limited to Min WD tap No limit * * Fan speed = (TC W8) + W8 Cold draft preventive control Basic fan control TA [°C] TSC 0.

5 1.0 1.5 2.0 2.5 5.0 5.5 b c d e f g Fan speed AUTO L+ (W9) 46 45 33 32 *A+4 Tc 46 45 33 32 *A+4 *A-4 34 33 21 20 *A+4 H (WE) *1 *2 Line-approximate H and SUL with Tc. SUL (W2) *3 *A-4 *A-4 Stop M+ (WD) Fan speed MANUAL in starting Fan speed AUTO in stability Fan speed AUTO in starting H (WE) *1: Fan speed = (M + -L+) x 1 4 + L+ *2: Fan speed = (M + -L+) x 2 4 + L+ *3: Fan speed = (M + -L+) x 3 4 + L+ (Calculated with linear approximation from M+ and L+) * No limitation while fan speed MANUAL mode is in stability. *A: When Tsc 24, A is 24, and when Tsc < 24, A is Tsc Tsc: Set value (Fig. 5) [In starting and in stability] In starting FAN AUTO (Fig.



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6) In stability · Until 12 minutes passed after operation start · When 12 to 25 minutes passed after operation start and room temp. is higher than (set temp. - 3°C) · When 12 to 25 minutes passed after operation start and room temp. is 3°C or lower than set temp. · When 25 minutes or more passed after operation start · Room temp.

Set temp. 3.5°C FAN Manual · Room temp. < Set temp. 4°C 29 Item 3.

Capacity control Operation flow and applicable data, etc. The cooling or heating capacity depending on the load is adjusted. According to difference between the setup value of temperature and the room temperature, the capacity is adjusted by the compressor revolution. Indoor unit Room temp. (Ta) Description 1) The difference between set temperature on remote controller (Ts) and room temperature (Ta) is calculated. 2) According to the temperature difference, the correction value of Hz signal which determines the compressor speed is set up. 3) The rotating position and speed of the motor are detected by the electromotive force occurred on the motor winding with operation of the compressor. 4) According to the difference resulted from comparison of the correction value of Hz signal with the present operation Hz, the inverter output and the commutation timing are varied. 5) Change the compressor motor speed by outputting power to the compressor. * The contents of control operation are same in cooling operation and heating operation Remote controller Set temp.

(Ts) Ts Ta Correction of Hz signal Detection of electromotive force of compressor motor winding Detection of motor speed and rotor position Correction value of Hz signal Operating Hz Inverter output change Commutation timing change Change of compressor speed Current release control About "Current release control", Please refer to a service manual of connected Multi outdoor unit. 30 Item Operation flow and applicable data, etc. Description 1) When temperature of the indoor heat exchanger drops below 5°C, the compressor speed is reduced. (P zone) 2) When temperature of the indoor heat exchanger rises in the range from 6°C to under 7°C, the compressor speed is kept. (Q zone) 3) When temperature of the indoor heat exchanger rises to 7°C or higher, the capacity control operation returns to the usual control in cooling operation. (R zone) 4. Release protective <In cooling/dry operation> control by temperature (Prevent-freezing control for indoor heat exchanger) ture of indoor heat In cooling/dry operation, the sensor of indoor heat exchanger detects evaporation temperature and controls the compressor speed so that temperature of the heat exchanger does not exceed the specified value. Indoor heat exchanger temperature Usual cooling capacity control R 7°C Q 6°C 5°C P When the value is in Q zone, the compressor speed is kept. Reduction of compressor speed <In heating operation> (Prevent-overpressure control for refrigerating cycle) In heating operation, the sensor of indoor heat exchanger detects condensation temperature and controls the compressor speed so that temperature of the heat exchanger does not exceed the specified value. Indoor heat exchanger temperature Reduction of compressor speed P 55°C 52°C When the value is in Q zone, the compressor speed is kept. Q 48°C R Usual heating capacity control 1) When temperature of the indoor heat exchanger rises in the range from 50°C to 55°C, the compressor speed is kept. (Q zone) When temperature of the indoor heat exchanger drops in the range from 46°C to under 55°C, the compressor speed is kept. (Q zone) 2) When temperature of the indoor heat exchanger rises to 55°C or higher, the compressor speed is reduced. (P zone) 3) When temperature of the indoor heat exchanger does not rise to 50°C, or when it drops below to 46°C, the capacity control operation returns to the usual control in heating operation. (R zone) 31 Item Operation flow and applicable data, etc.

Description 5. Louver control This function controls the air direction of the indoor unit. 1) Louver · The position is automatically controlled according to the operation position mode (COOL/HEAT). · The set louver position is stored in memory by the microcomputer, and the louver returns to the stored position when the next operation is performed. (Cooling/Heating memory position) The angle of the louver is indicated as the louver closes fully is 0°.

1) Louver position in cooling operation Initial setting of "Cooling storage position" Louver : Directs downward (35.3°) 2) Louver position in heating operation Heating operation/ AUTO (HEAT) Initial setting of "Heating storage position" Louver : Directs downward (80.5°) 2) Air direction adjustment Air direction Horizontal blowing Inclined blowing Blowing downward Inclined blowing Horizontal blowing · The louver position can be arbitrarily set up by pressing [FIX] button. 3) Swing · Swing operation is performed in width 35° with the stop position as the center. · If the stop position exceeds either upper or lower limit position, swing operation is performed in width 35° from the limit which the stop position exceeded. · Swing When pressing [SWING] button during operation, the louver starts swinging. 32 Revised-2 Item 6. ECO operation Operation flow and applicable data, etc. When pressing [ECO] button on the remote controller, a Economic operation is performed. <Cooling operation> This function operates the air conditioner with the difference between the set and the room temperature as shown in the following figure.

Description <Cooling operation> 1) The control target temperature increase 0.5°C per hour up to 2°C starting from the set temperature when ECONO has been received. 2) The indoor fan speed is depend on presetting and can change every speed after setting ECO operation. 3) The compressor speed is controlled as shown in the left figure. TA +6.5 +6.0 +5.5 +5.0 +4.5 +4.

0 Zone Frequency 12 11 10 9 8 7 6 5 4 3 2 1 Dry Max *12 *11 *10 *9 *8 FAN Fan speed depend on presetting and can change every speed. +3.5 +3.0 +2.5 +2.

0 +1.5 +1.0 +0.5 TSC -0.5 -1.

0 -2.0 Min Hz OFF 1H 2H 3H 4H Time * 12 (DRY max - COOL min) /6 x 5 + COOL min * 11 (DRY max - COOL min) /6 x 4 + COOL min * 10 (DRY max - COOL min) /6 x 3 + COOL min * 9 (DRY max - COOL min) /6 x 2 + COOL min * 8 (DRY max - COOL min) /6 x 1 + COOL min Hz Cool min DRY max M07SKV-E 20 35 M10SKCV-E M10SKV-E 20 35 M13SKV-E 20 37 M13SKCV-E 13 31 M16SKV-E M16SKCV-E 13 35 <Heating operation> 30 minutes 0 0.5 1.0 1.5 2.0 2.5 3.0 4.0 5.0 6.

0 7.0 8.0 9.0 10.0 11.0 Time Compressor speed 0Hz <Heating operation> 1) Setting the compressor speed to Max.



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aHz, the temperature zone in which the operation can be performed with Max. cHz is gradually widened after 30 minutes passed when starting ECO operation. 2) The indoor fan speed is depend on presetting and can change every speed after setting ECO operation. A B (Room temp. Set temp.) A A zone aHz C B B zone a to cHz C M10SKCV-E M13SKV-E 20 50 C zone cHz M13SKCV-E 13 43 M16SKV-E M16SKCV-E 13 50 Hz a b M07SKV-E 20 50 33 Item 7. Temporary operation Operation flow and applicable data, etc. Pressing [RESET] button starts the temporary operation of [AUTO] operation. When keeping [RESET] button pressed for 10 seconds or more, the temporary [COOL] operation is performed.

Description 1) When pressing [RESET] button, the temporary [AUTO] operation starts. 2) When keeping [RESET] button pressed for 3 seconds or more, Pi, Pi, Pi sound is heard and [AUTO RESTART] control is changed. 3) When keeping [RESET] button pressed for 10 seconds or more, "Pi" sound is heard and the temporary [COOL] operation starts. 4) If the filter lamp goes on, press [RESET] button to go off the filter lamp, and then press [RESET] button again. 5) To stop the temporary operation, press the button again.

Filter lamp ON NO Did you press [RESET] button for 3 seconds or more? YES Did you press [RESET] button for 10 seconds or more? NO Switch to [AUTO RESTART] control. YES Press RESET button. NO Temporary [AUTO] operation YES Temporary [COOL] Operation 34 Item 8. Self-Cleaning function Operation flow and applicable data, etc. Description 1. Purpose The Self-Cleaning operation is to minimize the growth of mold, bacteria etc. by running the fan and drying so as to keep the inside of the air conditioner clean. Self-Cleaning operation When the cooling or dry operation shuts down, the unit automatically starts the Self-Cleaning operation which is then performed for the specified period based on duration of the operation which was performed prior to the shutdown, after which the Self-Cleaning operation stops. (The Self-Cleaning operation is not performed after a heating operation.) 2.

Operation 1) When the stop signal from the remote controller or timer-off function is received, only the timer indicator light. 2) The period of the Self-Cleaning operation is determined by the duration of the operation performed prior to the reception of the stop code. 3) After the Self-Cleaning operation has been performed for the specified period, the unit stops operating. Unit now performing cooling or dry operation Press "STOP" button Only timer indicator lights, and Self-Cleaning operation starts Time set now elapses Operation stops · During Self-Cleaning operations: The louver opens slightly. The indoor fan operates continuously at a speed of 500 rpm. Self-Cleaning operation times Operation time Up to 10 minutes Cooling: Auto (cooling) Dry 10 minutes or longer Self-Cleaning operation time No Self-Cleaning operation performed (0 minutes) 30 mins. Heating: Auto (heating) Auto (fan only) Shutdown No Self-Cleaning operation performed · To stop an ongoing Self-Cleaning operation at any time Press the start/stop button on the remote controller twice during the Self-Cleaning operation. (After pressing the button for the first time, press it for the second time without delay (within 10 minutes).) 35 Item 8. Self-Cleaning function Operation display FCU fan FCU louver Timer display Compressor CDU fan Operation flow and applicable data, etc.

· Self-Cleaning diagram Description ON ON rpm is depend on presetting. OPEN ON or OFF depend on presetting of timer function. ON or OFF depend on presetting per room temperature. ON or OFF depend on presetting per room temperature. OFF ON (500RPM) OPEN (12. 7) ON OFF OFF OFF CLOSE ON or OFF depend on presetting of timer function. OFF OFF Operation time Cool mode or dry mode operation more than 10 mins. Self-Cleaning mode operate 30 mins. Automatically turn-off. Turn off by remote controller or timer-off function.

9. Self-Cleaning function release How to cancel Self-Cleaning function To cancel the Self-Cleaning function, proceed as follows: · Press [RESET] button one time or use remote control to turn on air conditioner. Display will show in green color. · Hold down the [RESET] button for more than 20 seconds. (The air conditioner will stop suddenly when the [RESET] is pressed but keep holding it continue. The will beep 3 times in the first 3 seconds but it is not related to Self-Cleaning function) · After holding about 20 seconds, the air conditioner will beep 5 times without any blinking of display. · The Self-Cleaning Operation had been cancelled. Remark Presetting of Self-Cleaning function above, AUTORESTART function had been cancelled. To set AUTO-RESTART again, please follow item 9-3-1 How to set Self-Cleaning function Hi POWER FILTER PAP TIMER OPERATION To set the Self-Cleaning function, proceed as follows. · Press [RESET] button one time or use remote control to turn on air conditioner.

Display will show in green color. · Hold down the [RESET] button for more than 20 seconds. (The air conditioner will stop suddenly when the [RESET] is pressed but keep holding it continue. Then will beep 3 times is the first 3 seconds but it is not related to Self-Cleaning function) · After holding about 20 seconds, the air conditioner will beep 5 times and OPERATION display blinks 5 times. · The Self-Cleaning function had been set. Remark Presetting of Self-Cleaning function above, AUTORESTART function had been cancelled. To set AUTO-RESTART again, please follow item 9-3-1 RESET - 36 - Item 10.

Remote-A or B selection Operation flow and applicable data, etc. Setting the remote controller To separate using of remote control for each indoor unit in case of 2 air conditioner are installed nearby. Remote Control B Setup.

1) Press RESET button on the indoor unit to turn the air conditioner ON. 2) Point the remote control at the indoor unit. 3) Push and hold CHK · button on the Remote Control by the tip of the pencil. "00" will be shown shown on the display. 4) Press MODE · during pushing CHK · . "B" will show on the display and "00" will disappear and the air conditioner will turn OFF. The Remote Control B is memorized. Note : 1. Repeat above step to reset Remote Control to be A. 2.

Remote Control A has not "A" display. 3. Default setting of Remote Control from factory is A. Description 1. Purpose This operation is to operate only one indoor unit using one remote controller. 2. Description When operating one indoor unit in a situation where two indoor units have been installed in the same room or nearby rooms, this operation prevents the remote controller signal from being received simultaneously by both units, thus preventing both units from operating.



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