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You can read the recommendations in the user guide, the technical guide or the installation guide for TOSHIBA RAS-M13SKV-E. You'll find the answers to all your questions on the TOSHIBA RAS-M13SKV-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-M13SKV-E  
User guide TOSHIBA RAS-M13SKV-E  
Operating instructions TOSHIBA RAS-M13SKV-E  
Instructions for use TOSHIBA RAS-M13SKV-E  
Instruction manual TOSHIBA RAS-M13SKV-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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..... 83 2 1. SAFETY PRECAUTIONS For general public use Power supply cord of outdoor unit shall be more than 1.5 mm<sup>2</sup> (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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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 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. Electro-scope 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. (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.



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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 (N<sub>2</sub>) 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 m<sup>3</sup>/Hr or 0.02 MPa (0.2kgf/cm<sup>2</sup>) 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. 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 TI 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.



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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. 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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. 25 2. 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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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.

Lower control .....

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..... 32 1) Louver 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. *Selt-Cleaning function release* .....

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

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. 37 11. *QUIET mode* .....

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. 38 12. *COMFORT SLEEP mode* ...

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*. 38 13. Short Timer ...*

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*.... 38 14. One-Touch Comfort .....*

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*... 39 15. Hi-POWER Mode .*

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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 lower 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 · Lower 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.



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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. 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 tempera- (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.



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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. 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 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.



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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 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 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 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. 3.

Operation The indoor unit on which the remote controller selection has been set to B receives the signal of the remote controller also set to B. (At the factory the remote controller selection is set to A on all the indoor units. There is no A setting display.) - 37 - Item 11. QUIET mode Operation flow and applicable data, etc. When the [QUIET] button is pressed, the fan of the indoor unit will be restricted the revolving speed at speed L - until the [QUIET] button is pressed once again (cancel Quiet mode). Description Quiet mode is the system which, control the revolving speed of indoor fan to work constantly at lower than speed L. In addition, noise level of indoor unit is less than usual. Remarks : 1. Quiet mode is unable to work in dry mode.

2. Quiet mode is appropriate to work with less cooling load and less heating load condition. Because of the fan speed L- may cause not enough the cooling capacity or heating capacity. 12. COMFORT SLEEP Cooling mode · The preset temperature will increase as show on ECO operation (Item No.

@@Repeat pressing to select the hours. @@@@Repeat pressing to select the hours. @@@@ · The air condition can shut down by itself automatically.

Remarks: 1. @@@@maintenance of the unit.

@@@@Press [ ] button to turn the unit ON. @@One-Touch Comfort Operation flow and applicable data, etc. One touch comfort is the fully automated operation that is set according to the preferable condition in a region. Description Operation condition for model to Europe market When an indoor unit receives "One Touch Comfort Signal" from the remote controller, the indoor unit operates as following. 1) Air conditioner starts to operation when the signal is received, even if the air conditioner was OFF. @ (3) Target temperature is 24°C. 4) Lower position is set as stored position of the operating mode.

@@@@@. @@@@The Hi-POWER mode can not be set in Dry operation . 16.

@@After cleaning the filters, turn off the FILTER indicator. @@(See page 34) - 39 - 9-3. @@@@This function is not set to work when shipped from the factory. Therefore it is necessary to set it to work. 9-3-1. @@@@The unit receives the signal and beeps three times. @@(Less than 10 seconds) The unit is on standby. The unit starts to operate. The green indicator is on. After approx.

three seconds, The green indicator flashes for 5 seconds. @@(Less than 10 seconds) The unit is in operation. The unit stops operating. The green indicator is turned off. After approx.

three seconds, The green indicator flashes for 5 seconds. @@@@@ (Less than 10 seconds) The unit is on standby. The unit starts to operate. The green indicator is on. After approx.

@@ (Less than 10 seconds) The unit is in operation. The unit stops operating. The green indicator is turned off. After approx. @@@@@ Remote control 9-4-1. Remote control and its functions 2 3 4 5 6 7 8 9 18 10 19 11 12 20 13 14 15 16 17 18 19 20 21 1 Infrared signal emitter Start/Stop button Mode select button (MODE) Temperature button (TEMP) Fan speed button (FAN) Swing louver button (SWING) Set louver button (FIX) On timer button (ON) Off timer button (OFF) Sleep timer button (SLEEP) Setup button (SET) Clear button (CLR) Memory and Preset button (PRESET) One Touch button (ONE-TOUCH) High power button (Hi-POWER) Economy button (ECO) Quiet button (QUIET) Comfort sleep button (COMFORT SLEEP) Filter reset button (FILTER)

Clock Reset button (CLOCK) Check button (CHK) 1 PRESET FAN TEMP 13 ONE-TOUCH 5 4 3 18 15 16 12 9 11 20 MODE 14 2 17 SWING FIX Hi-POWER ECO QUIET COMFORT SLEEP 6 7 8 10 21 19 TIMER ON SLEEP CLR OFF SET CHK FILTER CLOCK 9-4-2. Operation of remote control 1. ONE-TOUCH Press the "ONE-TOUCH" button for fully automated operation that is customised to the typical consumer preferences in your region of the world. The customised settings control temperature air flow strength, air flow direction and other settings to provide you alternate contact with "ONE-TOUCH" OF THE BUTTON. If you prefer other settings you can select from the many other operation functions of your Toshiba unit Press ONE-TOUCH : Start the operation.

2. AUTOMATIC OPERATION To automatically select cooling, heating, or fan only operation. 1. Press 2. Press MODE : Select A. MODE : Select A. 3.

COOLING / HEATING / FAN ONLY OPERATION To automatically select cooling, heating, or fan only operation. 1. Press 2.

Press 3. Press HIGH MODE : Select Cool , Heat , or Fan only . MODE : Set the desired temperature. FAN : Select AUTO, LOW , LOW+ . , MED , MED+ , or Cooling: Min.

17°C, Heating : Max, 30°C, Fan Only: No temperature indication - 42 - 4. DRY OPERATION (COOLING ONLY) For dehumidification, a moderate cooling performance is controlled automatically. 1. Press 2. Press MODE : Select Dry .

MODE : Set the desired temperature. 5. Hi-POWER OPERATION To automatically control room temperature and airflow for faster cooling or heating operation (except in DRY and FAN ONLY mode) Press HI-POWER : Start and stop the operation. 6. ECO OPERATION To automatically control room to save energy (except in DRY and FAN ONLY mode) Press ECO : Start and stop the operation.



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