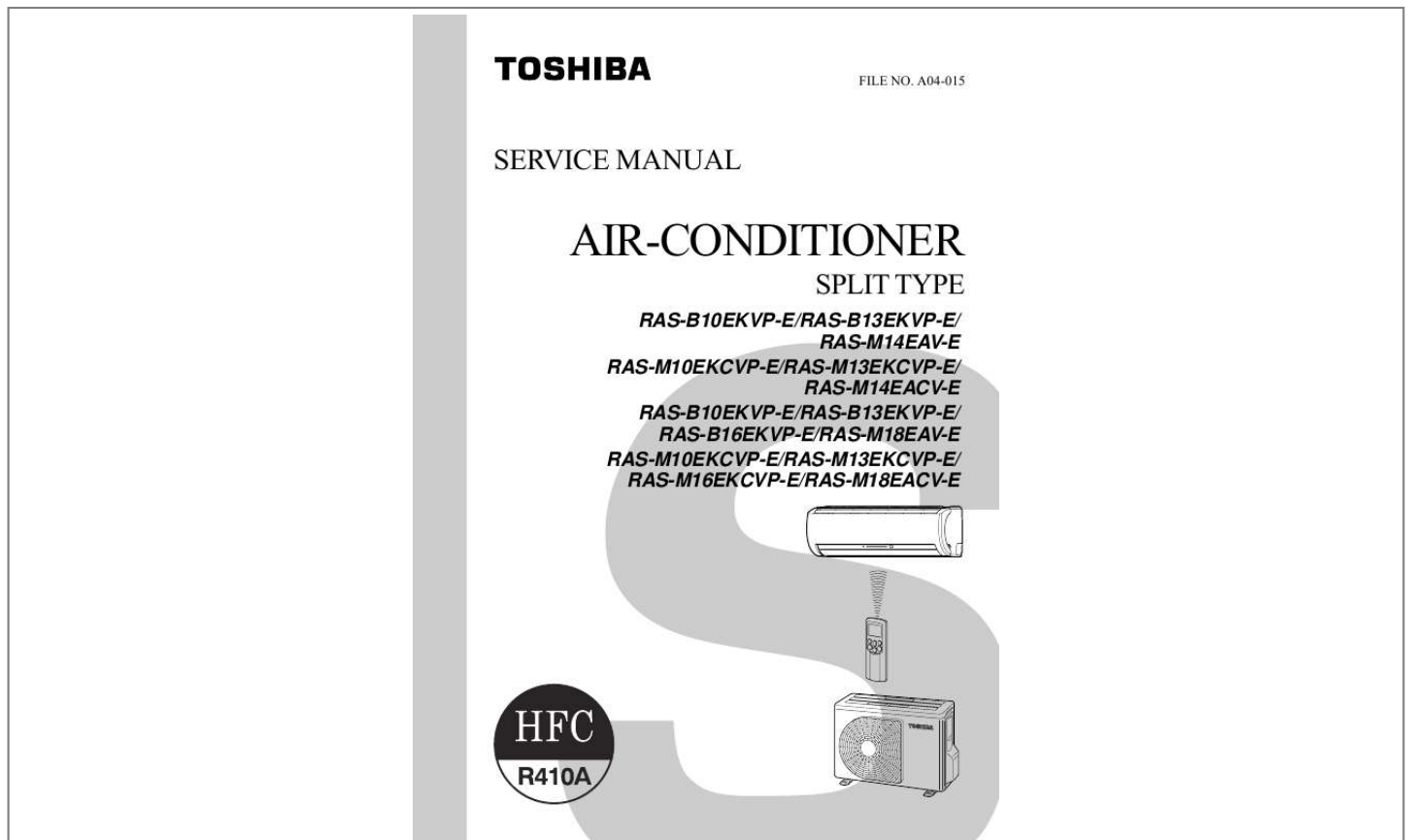




# Your PDF Guides

You can read the recommendations in the user guide, the technical guide or the installation guide for TOSHIBA RAS-M13EKCVP-E. You'll find the answers to all your questions on the TOSHIBA RAS-M13EKCVP-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-M13EKCVP-E  
User guide TOSHIBA RAS-M13EKCVP-E  
Operating instructions TOSHIBA RAS-M13EKCVP-E  
Instructions for use TOSHIBA RAS-M13EKCVP-E  
Instruction manual TOSHIBA RAS-M13EKCVP-E



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.... Appendix-1 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 245IEC66) 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. The installation fuse (25A D type ) must be used for the power supply line of this air conditioner. **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.C. board by hand. · 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. · 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. 3 WARNING · Never modify this unit by removing any of the safety guards or by-pass 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 anti freeze heater locally for a safety installation of the air conditioner. For details, contact the dealer.

4 2. SPECIFICATIONS The indoor and outdoor units that can be used in combination are shown in the tables below. Table of models that can be connected Type Outdoor unit RAS-M14EAVE Heat pump RAS-M18EAVE RAS-B10EKVPE RAS-M10UKVE3 RAS-M10YDVE RAS-B10EKVPE RAS-M10UKVE3 RAS-M10YDVE RAS-M10EKCVPPE RAS-M10UKCVPPE RAS-M10YDCVPE RAS-M10EKCVPPE RAS-M10UKCVPPE RAS-M10YDCVPE Indoor unit RAS-B13EKVPE RAS-M13UKVE3 RAS-M13YDVE RAS-B13EKVPE RAS-M13UKVE3 RAS-M13YDVE RAS-M13EKCVPPE RAS-M13UKCVPPE RAS-M13YDCVPE RAS-M13EKCVPPE RAS-M13UKCVPPE RAS-M13YDCVPE RAS-B16EKVPE RAS-M16UKVE3 RAS-M16YDVE RAS-M14EACVE Cooling-only RAS-M18EACVE RAS-M16EKCVPPE RAS-M16UKCVPPE RAS-M16YDCVPE Table of models that can be used in combination Type Heat pump Cooling-only Outdoor unit RAS-M14EAVE RAS-M18EAVE RAS-M14EACVE RAS-M18EACVE Combinations of indoor unit models that can be connected 10+10, 10+13 10+10, 10+13, 10+16, 13+13 NOTES A 1-room connection is not an option for the indoor units (you cannot connect only one indoor unit).



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A 2-room connection must always be used for the indoor units (you must connect two indoor units). With the RAS-M14EAV-E and RAS-M14EACV-E outdoor unit models, the 13 + 13 combination is not an option. With the RAS-M18EAV-E and RAS-M18EACV-E outdoor unit models, the 13 + 16 or 16 + 16 combination is not an option. The contents noted in this service manual limit the indoor units to the RAS-B10EKVP-E, RAS-B13EKVP-E, RAS-B16EKVP-E, RAS-M10EKCV-E, RAS-M13EKCV-E and RAS-M16EKCV-E. For other indoor units that can also be used in combination, see the service manual of each indoor unit.

Indoor Unit RAS-M10UKV-E3 RAS-M13UKV-E3 RAS-M16UKV-E3 RAS-M10YDV-E RAS-M13YDV-E RAS-M16YDV-E RAS-M10UKCV-E3 RAS-M13UKCV-E3 RAS-M16UKCV-E3 RAS-M10YDCV-E RAS-M13YDCV-E RAS-M16YDCV-E File No. SVM-04015 A02-010 5 2-1-1 Specifications Heat pump models Indoor Outdoor Cooling Capacity (kW) Cooling Capacity range (kW) Heating Capacity (kW) Heating Capacity range (kW) Power supply Electric Indoor characteristics (220V/230V/ 240V) Outdoor (220V/230V/ 240V) Unit model RAS-B10EKVP-E, RAS-B13EKVP-E, RAS-B16EKVP-E RAS-M14EAV-E RAS-M18EAV-E 4.0 5.2 1.4 - 4.

5 1.4 - 6.2 4.4 6.7 0.9 - 5.2 0.9 - 8.5 220~240V-1Ph-50Hz / 220V-1Ph-60Hz RAS-B10EKVP-E RAS-B13EKVP-E RAS-B16EKVP-E(\*1) 0.15 0.

15 0.15 30 30 91/87/83 91/87/83 91/87/83 RAS-M14EAV-E RAS-M18EAV-E Cooling Heating Cooling Heating 4.87/4.64/4.44 4.43/4.23/4.04 7.12/6.80/6.50 8.28/7.91/7.57 1020 950 1540 1790 95 97 98 98 5.17/4.94/4.74 7.42/7.10/6.80 3.

70/4.36 3.25/3.62 RAS-B10EKVP-E RAS-B13EKVP-E RAS-B16EKVP-E(\*1) 42/43 43/44 45/45 33/34 34/35 36/36 27/27 27/27 29/29 RAS-M14EAV-E RAS-M18EAV-E 46/48 RAS-B10EKVP-E 250 790 RAS-B13EKVP-E 250 790 48/50 RAS-B16EKVP-E(\*1) 250 790 Unit model Running Current (A) Power Consumption (W) Power factor (%) Unit model Operation mode Running current (A) Power Consumption (W) Power factor (%) Starting current (A) COP(Cooling/Heating) Operating noise Indoor dB(A) (Cooling/Heating) Outdoor (Cooling/Heating) Unit model Dimension (mm) Unit model High Medium Low Unit model 2 indoor units operating Indoor unit Height Width Depth Net weight (kg) Fan motor output (W) Air flow rate (m3/h) (Cooling/Heating) Outdoor unit Unit model Dimension Height (mm) Width Depth Net weight (kg) Compressor Motor output (W) Type Model Fan motor output (W) Air flow rate (m3/h) Type Piping connection Indoor unit Unit model Liquid side Gas side Outdoor unit Unit model Liquid side/gas side Maximum length (per unit) (m) Maximum length (total) (m) Maximum chargeless length(total) (m) Maximum height difference (m) Additional refrigerant Name of refrigerant Weight (kg) Wiring connection Power supply Interconnection Usable temperature range (°C) Indoor (Cooling/Heating) Outdoor (Cooling/Heating) Accessory Indoor unit Unit model Installation plate Wireless remote controller Batteries Remote control holder Zeolite-plus filter Plasma Pure filter Remote controller holder mounting screw Owner's manual Mounting screw Installation manual Outdoor unit Unit model Installation manual Specifications Drain nipple Water-proof rubber cap 215 215 215 9 9 9 30 30 30 550/610 560/640 640/660 RAS-M14EAV-E RAS-M18EAV-E 550 550 780 780 290 290 36 40 750 1100 Twin rotary type with DC-inverter variable speed control DA111A1F-20F1 DA130A1F-25F 43 43 1820 2100 Flare connection Flare connection RAS-B10EKVP-E RAS-B13EKVP-E RAS-B16EKVP-E (\*1) 6.35 6.35 6.35 9.52 9.52 12.7 RAS-M14EAV-E RAS-M18EAV-E 6.

35 / 9.52 6.35 / 9.52 20 20 30 30 20 20 10 10 20g/m (pipe length 21m to 30m) 20g/m (pipe length 21m to 30m) R410A R410A 0.90 1.20 3 Wires : includes earth 4 Wires : includes earth 21 to 32/0 to 27 5 to 43/-10 to 24 RAS-B10EKVP-E RAS-B13EKVP-E RAS-B16EKVP-E(\*1) 1 1 1 1 1 2 2 2 1 1 1 1 1 1 1 2 (3.1x16L) 1 6 (4x25L) 1 RAS-M14EAV-E 1 1 1 2 2 (3.1x16L) 1 6 (4x25L) 1 2 (3.1x16L) 1 6 (4x25L) 2 units 13 10 1 unit Cooling 13 230 10 2 units 13 10 1 unit 13 240 10 2 units 13 10 2.33 1.

67 4.0 (1.4 to 4.5) 4.74 (1.

37 to 5.64) 1080 (230 to 1300) 10 1.95 1.95 3.9 (1.

4 to 4.4) 4.69 (1.37 to 5.60) 1070 (230 to 1290) 3.5 3.5 (1.1 to 3.8) 4.82 (1.

01 to 5.56) 1100 (170 to 1280) 10 2.33 2.5 1.67 4.0 (1.4 to 4.5) 2.5 (1.1 to 3.2) 4.94 (1.43 to 5.89) 2.79 (1.

01 to 3.94) 1080 (230 to 1300) 570 (170 to 880) 10 1.95 1.95 3.9 (1.

4 to 4.4) 4.90 (1.43 to 5.84) 1070 (230 to 1290) 3.5 3.5 (1.1 to 3.8) 5.03 (1.

06 to 5.80) 1100 (170 to 1280) 10 2.33 2.5 1.67 4.0 (1.4 to 4.5) 2.5 (1.1 to 3.2) 5.17 (1.49 to 6.16) 2.92 (1.

06 to 4.11) 1080 (230 to 1300) 570 (170 to 880) 13 10 10 3.5 1.95 1.95 3.

5 (1.1 to 3.8) 3.9 (1.4 to 4.4) 5.26 (1.10 to 6.06) 5.12 (1.

49 to 6.11) 1100 (170 to 1280) 1070 (230 to 1290) Operating indoor unit A 10 B Unit capacity (kW) A 2.5 B Capacity (kW) kW 2.5 (1.1 to 3.2) Running current A 3.05 (1.10 to 4.30) Power Consumption W 570 (170 to 880) <Heating> RAS-M14EAV-E Operation Mode Volts V Operation Status 1 unit 220 2 units 13 10 1 unit Heating 13 230 10 2 units 13 10 1 unit 13 240 10 2 units 13 10 2.50 1.

90 4.4 (0.9 to 5.2) 4.34 (1.

01 to 5.37) 1010 (170 to 1250) 10 2.15 2.15 4.3 (0.

9 to 5.1) 4.21 (1.01 to 5.28) 980 (170 to 1230) 4.2 4.2 (0.5 to 4.7) 5.37 (0.

77 to 5.80) 1250 (130 to 1350) 10 2.50 3.2 1.90 4.4 (0.9 to 5.2) 3.2 (0.5 to 4.4) 4.53 (1.06 to 5.60) 3.73 (0.

77 to 5.50) 1010 (170 to 1250) 850 (130 to 1280) 10 2.15 2.15 4.3 (0.

9 to 5.1) 4.39 (1.06 to 5.51) 980 (170 to 1230) 4.2 4.2 (0.5 to 4.7) 5.60 (0.

81 to 6.05) 1250 (130 to 1350) 10 2.50 3.2 1.90 4.4 (0.9 to 5.2) 3.2 (0.5 to 4.4) 4.73 (1.10 to 5.86) 3.89 (0.

81 to 5.74) 1010 (170 to 1250) 850 (130 to 1280) 13 10 10 4.2 2.15 2.15 4.

2 (0.5 to 4.7) 4.3 (0.9 to 5.1) 5.86 (0.84 to 6.33) 4.59 (1.

10 to 5.76) 1250 (130 to 1350) 980 (170 to 1230) Operating indoor unit A 10 B Unit capacity (kW) A 3.2 B Capacity (kW) kW 3.2 (0.5 to 4.4) Running current A 4.07 (0.84 to 6.00) Power Consumption W 850 (130 to 1280) The above specification values are those under the conditions Cooling Indoor:

DB/WB=27/19°C Outdoor: DB=35°C Heating Indoor: DB=20°C Outdoor: DB/WB=7/6°C 8 <Cooling> RAS-M18EAV-E , RAS-M18EACV-E Operation mode Volts V Operation Status Operating indoor unit A 10 1 unit 13 16 220 2 units 13 16 10 1 unit 13 16 Cooling 230 2 units 13 16 10 1 unit 13 16 240 2

units 13 16 13 10 2.60 3.

25 2.60 1.95 5.2 (1.4 to 6.

2) 5.2 (1.4 to 6.2) 6.80 (1.

55 to 9.23) 6.80 (1.55 to 9.23) 1600 (260 to 2170) 1600 (260 to 2170) 10 13 13 10 10 10 2.60 3.25 2.7 3.7 4.5 2.

55 2.85 2.60 1.95 2.55 2.35 5.2 (1.4 to 6.2) 5.2 (1.

4 to 6.2) 2.7 (1.1 to 3.2) 3.

7 (1.1 to 4.2) 4.5 (1.1 to 4.

9) 5.1 (1.4 to 6.1) 5.2 (1.4 to 6.2) 7.10 (1.61 to 9.63) 7.

10 (1.61 to 9.63) 2.78 (1.31 to 3.51) 4.68 (1.31 to 5.95) 6.38 (1.

31 to 7.23) 6.59 (1.55 to 9.14) 6.

80 (1.55 to 9.23) 1600 (260 to 2170) 1600 (260 to 2170) 600 (220 to 800) 1100 (220 to 1400) 1500 (220 to 1700) 1550 (260 to 2150) 1600 (260 to 2170) 10

13 13 10 10 10 2.60 3.25 2.

7 3.7 4.5 2.55 2.85 2.60 1.95 2.55 2.35 5.2 (1.

4 to 6.2) 5.2 (1.4 to 6.2) 2.7 (1.1 to 3.2) 3.7 (1.1 to 4.

2) 4.5 (1.1 to 4.9) 5.1 (1.

4 to 6.1) 5.2 (1.4 to 6.



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2) 7.

42 (1.69 to 10.06) 7.42 (1.69 to 10.06) 2.90 (1.37 to 3.66) 4.88 (1.

37 to 6.21) 6.65 (1.37 to 7.54) 6.88 (1.61 to 9.54) 7.10 (1.61 to 9.

63) 1600 (260 to 2170) 1600 (260 to 2170) 600 (220 to 800) 1100 (220 to 1400) 1500 (220 to 1700) 1550 (260 to 2150) 1600 (260 to 2170) 10 13 B 10 10  
Unit capacity (kW) A 2.7 3.7 4.5 2.55 2.

85 B 2.55 2.35 Capacity (kW) kW 2.7 (1.1 to 3.

2) 3.7 (1.1 to 4.2) 4.5 (1.1 to 4.9) 5.1 (1.4 to 6.1) 5.

2 (1.4 to 6.2) Running current A 3.03 (1.43 to 3.83) 5.10 (1.43 to 6.49) 6.96 (1.

43 to 7.88) 7.19 (1.69 to 9.97) 7.

42 (1.69 to 10.06) Power Consumption W 600 (220 to 800) 1100 (220 to 1400) 1500 (220 to 1700) 1550 (260 to 2150) 1600 (260 to 2170) <Heating>RAS-  
M18EAV-E Operation mode Volts V Operation Status Operating indoor unit A 10 1 unit 13 16 220 2 units 13 16 10 1 unit 13 16 Heating 230 2 units 13 16 10

1 unit 13 16 240 2 units 13 16 13 10 3.35 3.88 3.  
35 2.82 6.7 (0.9 to 8.5) 6.7 (0.9 to 8.5) 7.87 (1.19 to 10.

42) 7.87 (1.19 to 10.42) 1850 (200 to 2450) 1850 (200 to 2450) 10 13 13 10 10 10 3.35 3.88 4.0 5.0 5.5 3.25 3.

51 3.35 2.82 3.25 3.19 6.

7 (0.9 to 8.5) 6.7 (0.9 to 8.

5) 4.0 (0.7 to 5.2) 5.0 (0.7 to 6.5) 5.5 (0.7 to 6.9) 6.

5 (0.9 to 8.2) 6.7 (0.9 to 8.5) 8.21 (1.24 to 10.87) 8.21 (1.

24 to 10.87) 5.10 (1.01 to 7.23) 7.

65 (1.01 to 10.76) 8.08 (1.01 to 10.

76) 7.65 (1.19 to 10.16) 7.87 (1.19 to 10.42) 1850 (200 to 2450) 1850 (200 to 2450) 1200 (170 to 1700) 1800 (170 to 2530) 1900 (170 to 2530) 1800 (200 to  
2390) 1850 (200 to 2450) 10 13 13 10 10 10 3.35 3.88 4.0 5.

0 5.5 3.25 3.51 3.35 2.82 3.25 3.19 6.7 (0.9 to 8.

5) 6.7 (0.9 to 8.5) 4.0 (0.

7 to 5.2) 5.0 (0.7 to 6.5) 5.

5 (0.7 to 6.9) 6.5 (0.9 to 8.2) 6.7 (0.9 to 8.5) 8.58 (1.

30 to 11.36) 8.58 (1.30 to 11.36) 5.32 (1.06 to 7.54) 7.99 (1.06 to 11.

22) 8.43 (1.06 to 11.22) 7.99 (1.

24 to 10.60) 8.21 (1.24 to 10.87) 1850 (200 to 2450) 1850 (200 to 2450) 1200 (170 to 1700) 1800 (170 to 2530) 1900 (170 to 2530) 1800 (200 to 2390) 1850  
(200 to 2450) 10 13 B 10 10 Unit capacity (kW) A 4.

0 5.0 5.5 3.25 3.51 B 3.25 3.19 Capacity (kW) kW 4.0 (0.7 to 5.2) 5.

0 (0.7 to 6.5) 5.5 (0.7 to 6.9) 6.5 (0.9 to 8.2) 6.7 (0.

9 to 8.5) Running current A 5.57 (1.10 to 7.88) 8.

35 (1.10 to 11.73) 8.81 (1.10 to 11.

73) 8.35 (1.30 to 11.09) 8.58 (1.30 to 11.36) Power Consumption W 1200 (170 to 1700) 1800 (170 to 2530) 1900 (170 to 2530) 1800 (200 to 2390) 1850 (200  
to 2450) The above specification values are those under the conditions Cooling Indoor: DB/WB=27/19°C Outdoor: DB=35°C Heating Indoor: DB=20°C

Outdoor: DB/WB=7/6°C 9 2-2-1. Operation Characteristic Curve <Cooling> RAS-M14EAV-E, RAS-M14EACV-E 8 <Heating> RAS-M14EAV-E 8 7 7 6 6 5  
5 Current (A) 4 Current (A) 4 · Conditions Indoor : DB 20°C Outdoor : DB 7°C/WB 6°C Air flow : High Pipe length : 7.5m x 2 2 units operating 230V 3 3 2 1

· Conditions Indoor : DB 27°C/WB 19°C Outdoor : DB 35°C Air flow : High Pipe length : 7.5m x 2 2 units operating 230V 0 10 20 30 40 50 60 70 80 90 2 1  
0 0 0 10 20 30 40 50 60 70 80 90 Compressor speed (rps) Compressor speed (rps) 2-2-2.

Capacity Variation Ratio According to Temperature RAS-M14EAV-E, RAS-M14EACV-E <Cooling> 115 · Conditions Indoor : DB 27°C Outdoor : DB 35°C  
Indoor air flow : High Pipe length : 7.5m x 2 2 units operating <Cooling> 105 100 95 90 Capacity ratio (%) 110 105 Capacity ratio (%) 85 80 75 70 65 100  
95 90 · Conditions Indoor : DB 27°C/WB 19°C Indoor air flow : High Pipe length : 7.5m x 2 2 units operating 85 60 55 0 14 16 18 20 22 Indoor air wet bulb  
temp. (°C) 24 50 32 33 34 35 36 37 38 39 40 41 42 43 Outdoor temp. (°C) \* Capacity ratio : 100% = 4.0 kW 10 2-2-3. Operation Characteristic Curve

<Cooling> RAS-M18EAV-E, RAS-M18EACV-E 12 11 10 9 8 <Heating> RAS-M18EAV-E 12 11 Current (A) 6 5 4 3 2 1 0 0 10 20 30 40 50 60 70 80 90  
Current (A) 7 · Conditions Indoor : DB 27°C/WB 19°C Outdoor : DB 35°C Air flow : High Pipe length : 7.5m x 2 2 units operating 230V 10 9 8 7 6 5 4 3 2 1  
0 0 20 40 60 · Conditions Indoor : DB 20°C Outdoor : DB 7°C/WB 6°C Air flow : High Pipe length : 7.5m x 2 2 units operating 230V 80 100 120 140

Compressor speed (rps) Compressor speed (rps) 2-2-4. Capacity Variation Ratio According to Temperature RAS-M18EAV-E, RAS-M18EACV-E <Cooling>  
115 · Conditions Indoor : DB 27°C Outdoor : DB 35°C Indoor air flow : High Pipe length : 7.

5m x 2 2 units operating <Cooling> 105 100 95 90 Capacity ratio (%) 110 105 Capacity ratio (%) 85 80 75 70 65 100 95 90 · Conditions Indoor : DB  
27°C/WB 19°C Indoor air flow : High Pipe length : 7.5m x 2 2 units operating 85 60 55 0 14 16 18 20 22 Indoor air wet bulb temp. (°C) 24 50 32 33 34 35 36  
37 38 39 40 41 42 43 Outdoor temp. (°C) \* Capacity ratio : 100% = 5.2 kW 11 3.

REFRIGERANT R410A This air conditioner adopts the new refrigerant HFC (R410A) which does not damage the ozone layer. The working pressure of the  
new refrigerant R410A is 1.6 times higher than conventional refrigerant (R22). The refrigerating oil is also changed in accordance with change of  
refrigerant, so be careful that water, dust, and existing refrigerant or refrigerating oil are not entered in the refrigerant cycle of the air conditioner using the  
new refrigerant during installation work or servicing time. The next section describes the precautions for air conditioner using the new refrigerant.

Conforming to contents of the next section together with the general cautions included in this manual, perform the correct and safe work. (6) When an air  
conditioning system charged with a large volume of refrigerant is installed in a small room, it is necessary to exercise care so that, even when refrigerant  
leaks, its concentration does not exceed the marginal level. If the refrigerant gas leakage occurs and its concentration exceeds the marginal level, an oxygen

starvation accident may result. (7) Be sure to carry out installation or removal according to the installation manual. Improper installation may cause refrigeration trouble, water leakage, electric shock, fire, etc. (8) Unauthorized modifications to the air conditioner may be dangerous. If a breakdown occurs please call a qualified air conditioner technician or electrician. Improper repair's may result in water leakage, electric shock and fire, etc. 3-1. Safety During Installation/Service As R410A's pressure is about 1.

6 times higher than that of R22, improper installation/service may cause a serious trouble. By using tools and materials exclusive for R410A, it is necessary to carry out installation/service safely while taking the following precautions into consideration. (1) Never use refrigerant other than R410A in an air conditioner which is designed to operate with R410A. If other refrigerant than R410A is mixed, pressure in the refrigeration cycle becomes abnormally high, and it may cause personal injury, etc.



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by a rupture. Confirm the used refrigerant name, and use tools and materials exclusive for the refrigerant R410A. The refrigerant name R410A is indicated on the visible place of the outdoor unit of the air conditioner using R410A as refrigerant. To prevent mischarging, the diameter of the service port differs from that of R22. If a refrigeration gas leakage occurs during installation/servicing, be sure to ventilate fully. If the refrigerant gas comes into contact with fire, a poisonous gas may occur.

When installing or removing an air conditioner, do not allow air or moisture to remain in the refrigeration cycle. Otherwise, pressure in the refrigeration cycle may become abnormally high so that a rupture or personal injury may be caused. After completion of installation work, check to make sure that there is no refrigeration gas leakage. If the refrigerant gas leaks into the room, coming into contact with fire in the fan-driven heater, space heater, etc., a poisonous gas may occur.

3-2. Refrigerant Piping Installation 3-2-1. Piping Materials and Joints Used For the refrigerant piping installation, copper pipes and joints are mainly used. Copper pipes and joints suitable for the refrigerant must be chosen and installed. Furthermore, it is necessary to use clean copper pipes and joints whose interior surfaces are less affected by contaminants.

(1) Copper Pipes It is necessary to use seamless copper pipes which are made of either copper or copper alloy and it is desirable that the amount of residual oil is less than 40 mg/10 m. Do not use copper pipes having a collapsed, deformed or discolored portion (especially on the interior surface). Otherwise, the expansion valve or capillary tube may become blocked with contaminants. As an air conditioner using R410A incurs pressure higher than when using R22, it is necessary to choose adequate materials. Thicknesses of copper pipes used with R410A are as shown in Table 3-2-1. Never use copper pipes thinner than 0.8 mm even when it is available on the market. (2) (3) (4) (5) 12 Table 3-2-1 Thicknesses of annealed copper pipes Thickness (mm) Nominal diameter 1/4 3/8 1/2 5/8 Outer diameter (mm) 6.35 9.52 12.

70 15.88 R410A 0.80 0.80 0.80 1.00 R22 0.80 0.80 0.80 1.00 (2) Joints For copper pipes, flare joints or socket joints are used.

Prior to use, be sure to remove all contaminants. a) Flare Joints Flare joints used to connect the copper pipes cannot be used for pipings whose outer diameter exceeds 20 mm. In such a case, socket joints can be used. Sizes of flare pipe ends, flare joint ends and flare nuts are as shown in Tables 3-2-3 to 3-2-6 below. b) Socket Joints Socket joints are such that they are brazed for connections, and used mainly for thick pipings whose diameter is larger than 20 mm. Thicknesses of socket joints are as shown in Table 3-2-2. Table 3-2-2 Minimum thicknesses of socket joints Nominal diameter 1/4 3/8 1/2 5/8 Reference outer diameter of copper pipe jointed (mm) 6.35 9.52 12.70 15.

88 Minimum joint thickness (mm) 0.50 0.60 0.70 0.80 3-2-2. Processing of Piping Materials When performing the refrigerant piping installation, care should be taken to ensure that water or dust does not enter the pipe interior, that no other oil other than lubricating oils used in the installed air conditioner is used, and that refrigerant does not leak. When using lubricating oils in the piping processing, use such lubricating oils whose water content has been removed.

When stored, be sure to seal the container with an airtight cap or any other cover. (1) Flare Processing Procedures and Precautions a) Cutting the Pipe By means of a pipe cutter, slowly cut the pipe so that it is not deformed. b) Removing Burrs and Chips If the flared section has chips or burrs, refrigerant leakage may occur.

Carefully remove all burrs and clean the cut surface before installation. c) Insertion of Flare Nut 13 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 Outer diameter (mm) 6.35 9.52 12.

70 15.88 A (mm) Thickness (mm) Flare tool for R410A clutch type 0 to 0.5 0 to 0.5 0 to 0.5 0 to 0.5  
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  
0 to 1.5 1.0 to 1.5 Wing nut type 1.5 to 2.0 1.5 to 2.0 2.0 to 2.5 2.

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

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 Nominal diameter 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 14 Table 3-2-6 Flare and flare nut dimensions for R22 Nominal diameter 1/4 3/8 1/2 5/8 3/4 Outer diameter (mm) 6.35 9.52 12.70 15.88 19.05 Thickness (mm) 0.8 0.

8 0.8 1.0 1.0 Dimension (mm) A 9.0 13.0 16.2 19.7 23.3 B 9.2 13.

5 16.0 19.0 24.0 C 6.5 9.

7 12.9 16.0 19.2 D 13 20 20 23 34 Flare nut width (mm) 17 22 24 27 36 45° to 4 6° B A C D 43° to 4 5° Fig. 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) 15 3-3.



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**Tools 3-3-1. Required Tools** The service port diameter of packed valve of the outdoor unit in the air conditioner 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 conditioner installation No. Used tool Usage Whether Existence of conventional new equipment equipment for R410A can be used Yes Yes Conventional air conditioner installation Whether new equipment can be used with conventional refrigerant 1 2 Flare tool Pipe flaring \*(Note 1) \*(Note 1) X X X X X X X X ! Copper pipe gauge for Flaring by adjusting projection conventional flare margin tool Torque wrench (For Ø12.7) Gauge manifold Charge hose Connection of flare nut Evacuating, refrigerant charge, run check, etc.

\*(Note 1) X X 3 4 5 6 7 8 9 10 Yes Yes Yes Yes Yes (Note 2) Vacuum pump adapter Vacuum evacuating Electronic balance for refrigerant charging Refrigerant cylinder Leakage detector Charging cylinder Refrigerant charge Refrigerant charge Gas leakage check Refrigerant charge ! X ! 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) Reamer (5) (6) (7) (8) (9) Pipe bender Level vial Screwdriver (+, ) Spanner or Monkey wrench 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 16 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. (INDOOR unit) (Liquid side) (OUTDOOR unit) Opened (Gas side) Refrigerant cylinder (With siphon pipe) Check valve Opened Open/Close valve for charging Service port Electronic balance for refrigerant charging Fig. 3-4-1 Configuration of refrigerant charging 17 (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. 18 Refrigerant cylinder Electronic balance Siphon (2) Characteristics required for flux · Activated temperature of flux coincides with the brazing temperature.



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· 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 (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 (1) Do not enter flux into the refrigeration cycle.

(2) When chlorine contained in the flux remains within the pipe, the lubricating oil deteriorates. Therefore, use a flux which does not contain chlorine. (3) When adding water to the flux, use water which does not contain chlorine (e.g. distilled water or ion-exchange water). (4) Remove the flux after brazing. Stop valve Nitrogen gas cylinder From Nitrogen cylinder Pipe Nitrogen gas Rubber plug Fig. 3-5-1 Prevention of oxidation during brazing 19 4.

CONSTRUCTION VIEWS 4-1. Indoor Unit RAS-B10EKVP-E RAS-B13EKVP-E RAS-B16EKVP-E RAS-M10EKCV-E RAS-M13EKCV-E RAS-M16EKCV-E Parts name of remote control WH-H03JE (Heat pump model) WC-H03JE (Cooling-only model) 20 4-2.

Outdoor Unit RAS-M14EAV-E, RAS-M18EAV-E (Heat pump models) RAS-M14EACV-E, RAS-M18EACV-E (Cooling-only models) 21 To outdoor unit BLK BLK 5-1. Indoor Unit Color Identification Air purifier Electrode High-voltage Power supply RED : RED WHI : WHITE BLK : BLACK BLU : BLUE BRW : BROWN ORN : ORANGE PUR : PURPUL YEL : YELLOW GRN : GRAY PNK : PINK GRN & GREEN & YEL : YELLOW 1234 1234 Heat exchanger GRN & YEL CN21 Ion electrode BLK WHI RED 1 2 3 4 5 6 1 2 3 4 5 6 INDOOR TERMINAL 1 2 3 BLOCK 1234 1234 3 CN22 CN23 BRW BRW BRW RED 1 11 BRW Micro SW BLU CN10 (WHI) FAN MOTOR CN01 (BLU) BLK 11 BLK CN33 (WHI) FUSE F01 AC 250V 22 CN34 2 2 (RED) 5. WIRING DIAGRAM RAS-B10EKVP-E, RAS-B13EKVP-E, RAS-B16EKVP-E (Heat pump models) RAS-M10EKCV-E, RAS-M13EKCV-E, RAS-M16EKCV-E (Cooling-only models) 22 T3.15A HEAT EXCHANGER SENSOR (TC) CN03 (WHI) BLK 11 BLK 11 RED BLK 22 THERMO SENSOR (TA) DC MOTOR CN100 (WHI) LINE FILTER CN13 (WHI) DC5V DB01 DC12V TNR 3 4 5 6 3 WHI 4 YEL 5 BLU 6 CN07 (WHI) 11 22 33 44 55 66 77 88 99 MCC-899 10 10 CN08 (WHI)

Wireless Unit Assembly BLU BLU BLU BLU BLU BLU BLU BLU WHI POWER SUPPLY CIRCUIT 9 8 7 6 5 4 3 2 1 1234 9 8 7 6 5 4 3 2 MAIN P.C. BOARD 1 (MCC-5020) 1 2 3 4 5 1 2 3 4 5 WHI YEL YEL YEL YEL 1 2 3 4 5 1 2 3 4 5 LOUVER MOTOR 5-2. Outdoor Unit RAS-M14EAV-E, RAS-M18EAV-E (Heat pump models) RAS-M14EACV-E, RAS-M18EACV-E (Cooling-only models) 23 6. SPECIFICATIONS OF ELECTRICAL PARTS 6-1. Indoor Unit RAS-B16EKVP-E, RAS-B13EKVP-E, RAS-B10EKVP-E RAS-M16EKCV-E, RAS-M13EKCV-E, RAS-M10EKCV-E No. 1 2 Parts name Fan motor (for indoor) Room temp.

sensor (TA-sensor) Heat exchanger temp. sensor (TC-sensor) Louver motor Type MF-280-30-5 () Specifications DC280340V, 30W 10k at 25°C 3 4 () MP24GA 10k at 25°C Output (Rated) 1W, 16poles, 1phase DC12V 24 6-2. Outdoor Unit RAS-M14EAV-E, RAS-M14EACV-E, RAS-M18EAV-E, RAS-M18EACV-E No. Parts name SC coil (Noise filter) (L03) 1 SC coil (Noise filter) (L01) 2 3 \*1 Model name ADR2520-R15TB or SC-20-01J-A ADR25H-200R8TB SWT-72 or SWT-83 Rating AC 250V, 20A, 0.15mH AC 250V, 20A, 0.88mH Primary side DC 280V Secondary side: 7.5V x 1, 13V x 126.5V x 3, 16V x 1, 15V x 1 DC 140V, 43W Coil: DC 12V, Contact: 2A, AC250V Coil: DC 12V, Contact: 20A, AC250V 64k (20°C) 10k (25°C) DC-DC transformer Outside fan motor Relay (4-way valve) Relay (Power relay) ICF-140-43-4 G5N-1A D112D1-O or G4A-1A-PE 4 5 6 7 8 9 10 11 Discharge temp. sensor (TD-sensor) (Inverter attached) Outside air temp. sensor (TO-sensor) TGA-sensor (Heat pump models) TGB-sensor (Heat pump models) TGA-sensor (Cooling-only models) TGB-sensor (Cooling-only models) Evaporator temp.

sensor (TE-sensor) Suction temp. sensor (TS-sensor) Terminal block (9P) (Inverter attached) (Inverter attached) (Inverter attached) (Inverter attached) (Inverter attached) (Inverter attached) 64k (25°C) 64k (25°C) 10k (25°C) 10k (25°C) 10k (25°C) \*1 12 13 14 (Inverter attached) -- 10k (25°C) 20A, AC 250V For protection of switching power source (F03) 3.15A, AC 250V 15 Fuse For protection of inverter input overcurrent For protection of power source 16 17 18 19 20 21 22 23 24 Electrolytic capacitor IGBT (Q200~Q205) Compressor (M18) Compressor (M14) Compressor thermo. Rectifier (DB01, DB02) IGBT (Q404) Reactor (Main) Reactor (Sub) LLQ2G761KHU GT20J321 DA130A1F-25F DA111A1F-20F1 US622KXTMQO D25 X B60 GT40Q321 or GT30J121 CH-57 CH-43-Z-K 25A, AC 25V 6.3A, AC 250V DC 400V, 760µF 600V, 20A 3 phases, 4 poles, 1,100W 3 phases, 4 poles, 750W OFF: 125±4°C, ON: 90±5°C Diode: 600V, 25A IGBT: 600V, 40A L = 10mH, 16A L = 10mH, 1A NOTE: \*1 Heat pump models only. 25 7. REFRIGERANT CYCLE DIAGRAM 7-1.



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Refrigerant Cycle Diagram RAS-B13EKVP-E, RAS-B10EKVP-E RAS-M14EAV-E \*1 Tca INDOOR UNIT Indoor heat exchanger T1 Temp. measurement To B room To B room Allowable pipe length Indoor fan P Pressure measurement Ta Gauge attaching port Vacuum pump connecting port Deoxidized copper pipe Both A and B rooms Outer dia. : 9.

52mm Thickness : 0.8mm Deoxidized copper pipe Both A and B rooms Outer dia. : 6.35mm Thickness : 0.8mm Sectional shape of heat insulator Muffler TgB TgA Capillary Ø2.

2 x 200 4-way valve (STF-0108Z) Muffler Td Strainer Pulse motor valve at liquid side (CAM-B22YGTF-2) Capillary Ø2.2 x 200 Compressor DA111A1F-20F1 TS Outdoor heat exchanger Temp. measurement T2 Propeller fan TO TE Refrigerant amount : 0.90kg NOTE : Gas leak check position Refrigerant flow (Cooling) Refrigerant flow (Heating) OUTDOOR UNIT \*1 The TC sensor is at the center of the indoor unit's heat exchanger. NOTE : The maximum pipe length of this air conditioner is 30m.

When the pipe length exceeds 20m, the additional charge of refrigerant, 20g per 1m for the part of pipe exceeded 20m is required (Max. 200g) 26 Allowable height difference : 10m Per 1 unit Max.: 20m Total: 30m Chargeless = 20m Charge = 20g/m (21 to 30m) RAS-M13EKVP-E, RAS-M10EKVP-E RAS-M14EACV-E \*1 Tca INDOOR UNIT Indoor heat exchanger T1 Temp. measurement To B room To B room Allowable pipe length Indoor fan P Pressure measurement Ta Gauge attaching port Vacuum pump connecting port Deoxidized copper pipe Both A and B rooms Outer dia. : 9.52mm Thickness : 0.8mm Deoxidized copper pipe Both A and B rooms Outer dia. : 6.35mm Thickness : 0.8mm Sectional shape of heat insulator Capillary Ø2.

2 x 200 TgB TgA Strainer Pulse motor valve at liquid side (CAM-B22YGTF-2) Capillary Ø2.2 x 200 Muffler Td Compressor DA111A1F-20F1 TS Outdoor heat exchanger Temp. measurement T2 Propeller fan TO Refrigerant amount : 0.90kg NOTE : Gas leak check position Refrigerant flow OUTDOOR UNIT \*1 The TC sensor is at the center of the indoor unit's heat exchanger. NOTE : The maximum pipe length of this air conditioner is 30m. When the pipe length exceeds 20m, the additional charge of refrigerant, 20g per 1m for the part of pipe exceeded 20m is required (Max. 200g) 27 Allowable height difference :

10m Per 1 unit Max.: 20m Total: 30m Chargeless = 20m Charge = 20g/m (21 to 30m) RAS-B16EKVP-E, RAS-B13EKVP-E, RAS-B10KVP-E RAS-M18EAV-E \*1 Tca INDOOR UNIT Indoor heat exchanger T1 Temp. measurement To B room To B room Allowable pipe length Indoor fan P Pressure measurement Ta Gauge attaching port Vacuum pump connecting port Deoxidized copper pipe Both A and B rooms Outer dia. : 9.

52mm (10,13) : 12.7mm (16) Thickness : 0.8mm Deoxidized copper pipe Both A and B rooms Outer dia. : 6.35mm Thickness : 0.

8mm Sectional shape of heat insulator Muffler TgB TgA Capillary Ø2.2 x 200 4-way valve (STF-0108Z) Muffler Td Strainer Pulse motor valve at liquid side (CAM-B22YGTF-2) Capillary Ø2.2 x 200 Compressor DA130A1F-25F TS Outdoor heat exchanger Temp. measurement T2 Propeller fan TO TE Refrigerant amount : 1.20kg NOTE : Gas leak check position Refrigerant flow (Cooling) Refrigerant flow (Heating) OUTDOOR UNIT \*1 The TC sensor is at the center of the indoor unit's heat exchanger.

NOTE : The maximum pipe length of this air conditioner is 30m. When the pipe length exceeds 20m, the additional charge of refrigerant, 20g per 1m for the part of pipe exceeded 20m is required (Max. 200g) 28 Allowable height difference : 10m Per 1 unit Max.: 20m Total: 30m Chargeless = 20m Charge = 20g/m (21 to 30m) RAS-M16EKVP-E, RAS-M13EKVP-E, RAS-M10EKVP-E RAS-M18EACV-E \*1 Tca INDOOR UNIT Indoor heat exchanger T1 Temp. measurement To B room To B room Allowable pipe length Indoor fan P Pressure measurement Ta Gauge attaching port Vacuum pump connecting port Deoxidized copper pipe Both A and B rooms Outer dia. : 9.52mm (10,13) : 12.7mm (16) Thickness : 0.8mm Deoxidized copper pipe Both A and B rooms Outer dia. : 6.

35mm Thickness : 0.8mm Sectional shape of heat insulator Capillary Ø2.2 x 200 TgB TgA Strainer Pulse motor valve at liquid side (CAM-B22YGTF-2) Capillary Ø2.2 x 200 Muffler Td Compressor DA130A1F-25F TS Outdoor heat exchanger Temp. measurement T2 Propeller fan TO Refrigerant amount : 1.20kg NOTE : Gas leak check position Refrigerant flow OUTDOOR UNIT \*1 The TC sensor is at the center of the indoor unit's heat exchanger. NOTE : The maximum pipe length of this air conditioner is 30m. When the pipe length exceeds 20m, the additional charge of refrigerant, 20g per 1m for the part of pipe exceeded 20m is required (Max. 200g) 29 Allowable height difference : 10m Per 1 unit Max.: 20m Total: 30m Chargeless = 20m Charge = 20g/m (21 to 30m) 7-2.

Operation Data <Cooling> RAS-M14EAV-E, RAS-M14EACV-E Temperature condition indoor outdoor No.of operating units Operating combination (Unit) A 10 13 10 13 10 10 B Standard pressure P (Mpa) 0.7 to 0.9 0.9 to 1. 1 0.9 to 1.1 0.9 to 1.1 Heat exchanger pipe temp.

T1 (°C) 11 to 13 8 to 11 14 to 16 14 to 16 T2 (°C) 43 to 45 47 to 49 47 to 49 47 to 49 Indoor fan High High High High Outdoor fan 700rpm 750rpm 750rpm 750rpm compressor revolution (rps) 39 66 64 65 1 unit 27 / 19 35 / 2 units <Heating> RAS-M14EAV-E Temperature condition indoor outdoor No.of operating units Operating combination (Unit) A 10 13 10 13 10 10 B Standard pressure P (Mpa) 2.2 to 2.4 2.5 to 2.7 1.9 to 2.1 1.9 to 2.1 Heat exchanger pipe temp.

T1 (°C) 36 to 38 41 to 43 30 to 32 30 to 32 T2 (°C) 0 to 2 -1 to 1 -1 to 1 -1 to 1 Indoor fan High High High High Outdoor fan 750rpm 750rpm 750rpm 750rpm compressor revolution (rps) 60 76 78 80 1 unit 20/ 7/6 2 units <Cooling> RAS-M18EAV-E, RAS-M18EACV-E Temperature condition indoor outdoor No.of operating units Operating combination (Unit) A 10 13 16 B Standard pressure P (Mpa) 0.9 to 1.1 0.8 to 1.0 0.8 to 1.0 10 10 13 10 0.9 to 1.1 0.9 to 1.1 0.9 to 1.1.

1 Heat exchanger pipe temp. T1 (°C) 11 to 13 8 to 10 7 to 9 11 to 13 11 to 13 11 to 13 T2 (°C) 41 to 43 45 to 47 47 to 49 48 to 50 48 to 50 48 to 50 Indoor fan High High High High High High High High Outdoor fan 700rpm 750rpm 750rpm 750rpm 750rpm 750rpm 750rpm compressor revolution (rps) 35 58 75 71 71 71 1 unit 27/19 35// 2 units 10 13 13 16 <Heating> RAS-M18EAV-E Temperature condition indoor outdoor No.of operating units Operating combination (Unit) A 10 13 16 B Standard pressure P (Mpa) 3.2 to 3.4 3. 4 to 3.6 3.4 to 3.6 10 10 13 10 2.6 to 2.8 2.6 to 2.8 2.6 to 2.8 2.

6 to 2.8 Heat exchanger pipe temp. T1 (°C) 44 to 46 50 to 53 51 to 53 37 to 39 38 to 40 38 to 40 38 to 40 T2 (°C) 0 to 2 0 to 2 0 to 2 -1 to 1 -1 to 1 -1 to 1 -1 to 1 Indoor fan High High High High High High High High Outdoor fan 750rpm 750rpm 750rpm 750rpm 750rpm 750rpm 750rpm compressor revolution (rps) 62 81 85 93 101 101 101 1 unit 20/ 7/6 2 units 10 13 13 16 NOTES : (1) Measure surface temperature of heat exchanger pipe around center of heat exchanger path U bent.



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(Thermistor thermometer) (2) Connecting piping condition : 7.5meters × 2 units 30 8. CONTROL BLOCK DIAGRAM 8-1. Indoor Unit RAS-B10EKVP-E, RAS-B13EKVP-E, RAS-B16EKVP-E M.C.U Heat Exchanger Sensor(Tc) 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 Air purifier unit Indoor Fan Motor Control Indoor Fan Motor Functions · Cold draft preventing Function Louver Motor Drive Control Indoor Unit Control Unit Louver Motor Initializing Circuit Clock Frequency Oscillator Circuit Converter (D.C circuit) Micro Switch 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 Air Purifier SLEEP 31 RAS-M10EKCV-P-E, RAS-M13EKCV-P-E, RAS-M16EKCV-P-E M.C.U Heat Exchanger Sensor(Tc) Room Temperature Sensor(Ta) · Fan Motor Starting Control Infrared Rays Signal Receiver and Indication · Processing (Temperature Processing) · Timer · Serial Signal Communication · Clean Function Indoor Fan Motor Functions · 3-minute Delay at Restart for Compressor Louver Motor Drive Control Indoor Fan Motor Control Indoor Unit Control Unit Louver Motor Initializing Circuit Clock Frequency Oscillator Circuit Power Supply Circuit Air purifier unit Converter (D.C circuit) Micro Switch 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 Thermo. Setting Fan Speed Selection ON TIMER Setting OFF TIMER Setting Lower AUTO Swing Louver Direction Setting ECO Hi-POWER Air Purifier SLEEP 32 RAS-M14EAV-E, RAS-M18EAV-E (Heat pump models) RAS-M14EACV-E, RAS-M18EACV-E (Cooling-only models) 8-2. Outdoor Unit (Inverter Assembly) CONTROL BLOK DIAGRAM (Outdoor unit) 220/240 V ~50Hz 220 V ~60Hz MCC-5015 (SUB P.C.B) Unit A send/receive circuit Unit B send/receive circuit MCC-5009 (SUB P. C.B) M.C.U · PWM synthesis function · Input current release control · IGBT over-current detect control · Outdoor fan control · High power factor correction control · Signal communication to MCU Current detect Current detect Gas side pipe temp. sensor (unit A) (TGA) Gas side pipe temp. sensor (unit B) (TGB) \*1 Outdoor Heatexchanger temp. sensor (TE) Discharge temp. sensor (TD) Suction temp. sensor (TS) Outdoor air temp. sensor (TO) Driver circuit of P.

M.V. Gate drive circuit M.C.U · Inverter output frequency control · A/D converter function · P.M.V. control · Discharge temp. control · Error display · Signal communication to MCU Noise filter Input current sensor Converter (AC DC) Inverter (DC AC) High power factor correction circuit Gate drive circuit 33 Outdoor fan motor Relay RY701 A unit P.M. V. B unit P.M.V. Inverter (DC AC) Compressor P.

M.V PWM IGBT \*1 : Pulse Motor Valve : Pules Width Modulation : Insulated Gate Bipolar Transistor : Heat Pump Model Only \*1 4-way valve 9. OPERATION DESCRIPTION 9-1. Outline of Air Conditioner Control This air conditioner is a capacity-variable type air conditioner, which uses DC motor for the indoor fan motor and the outdoor fan motor. And the capacityproportional control compressor which can change the motor speed in the range from 9 to 120 rps is mounted.

The DC motor drive circuit is mounted to the indoor unit. The compressor and the inverter to control fan motor are mounted to the outdoor unit. The entire air conditioner is mainly controlled by the indoor unit controller. The indoor unit controller drives the indoor fan motor based upon command sent from the remote controller, and transfers the operation command to the outdoor unit controller. The outdoor unit controller receives operation command from the indoor unit side, and controls the outdoor fan and the pulse 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 four-way valve and outdoor fan) (3) Contents of operation command signal (Serial signal) from indoor unit controller to outdoor unit controller The following three types of signals are sent from the indoor unit controller. · Operation mode set on the remote control · Compressor revolution command signal defined by indoor temperature and set temperature (Correction along with variation of room temperature and correction of indoor heat exchanger temperature are added.) · 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. (4) Contents of operation command signal (Serial · Judgment of suction air temperature of the signal) from outdoor unit controller to indoor unit indoor heat exchanger by using the indoor controller temp.



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sensor. (TA sensor) The following signals are sent from the outdoor · Judgment of the indoor heat exchanger unit controller. temperature by using heat exchanger sensor (TC sensor) (Prevent-freezing control, etc.) · The current operation mode · Louver motor control · The current compressor revolution · Indoor fan motor operation control · Outdoor temperature · LED (Light Emitting Diode) display control · Existence of protective circuit operation · Transferring of operation command signal For transferring of these signals, the indoor (Serial signal) to the outdoor unit unit controller monitors the contents of signals, · Reception of information of operation status and judges existence of trouble occurrence.

(Serial signal including outside temp. data) to Contents of judgment are described below. the outdoor unit and judgment/display of error · Whether distinction of the current operation · Air purifier operation control status meets to the operation command signal (2) Role of outdoor unit controller · Whether protective circuit operates Receiving the operation command signal (Serial When no signal is received from the outdoor signal) from the indoor unit controller, the outdoor unit controller, it is assumed as a trouble. door unit performs its role. · Compressor operation control · Operation control of outdoor Operations followed to fan motor judgment of serial signal · P.

M.V. control from indoor side. · 4-way valve control 34 9-2. Operation Description No.  
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