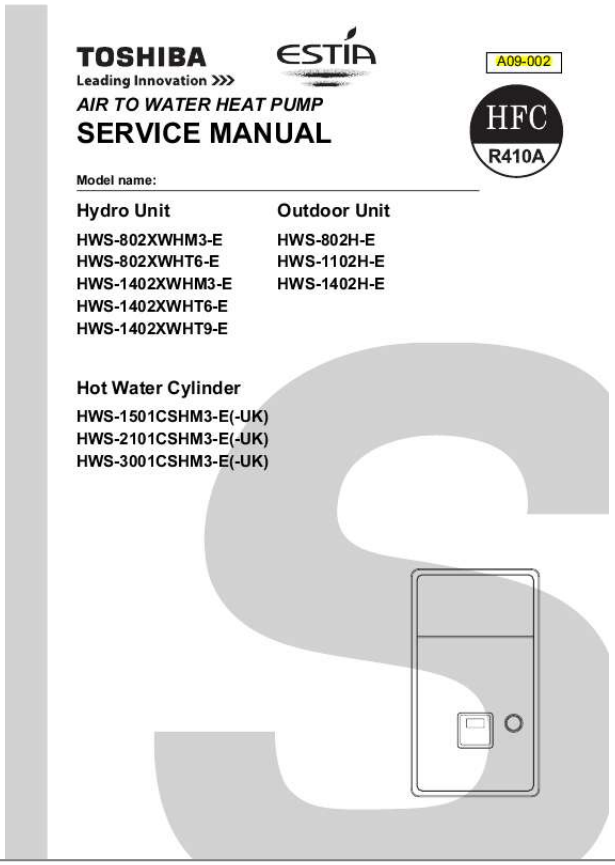

TOSHIBA
Leading Innovation >>>
ESTIA
A09-002
AIR TO WATER HEAT PUMP
SERVICE MANUAL
HFC
R410A
Model name:

Hydro Unit	Outdoor Unit
HWS-802XWHM3-E	HWS-802H-E
HWS-802XWHT6-E	HWS-1102H-E
HWS-1402XWHM3-E	HWS-1402H-E
HWS-1402XWHT6-E	
HWS-1402XWHT9-E	

Hot Water Cylinder
HWS-1501CSHM3-E(-UK)
HWS-2101CSHM3-E(-UK)
HWS-3001CSHM3-E(-UK)

Manual abstract:

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. 3 2 NEW REFRIGERANT (R410A). . .
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6 2-1.Safety During Installation and Service . . . . . .
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@@Understand the following details (indications and symbols) before reading the body text, and follow the instructions. [About indication] Indication Meaning of Indication Indicates that a wrong operation may cause a service engineer and the third persons around to get fatal or serious injuries. Indicates that a wrong operation may cause a service engineer and the third persons around to get fatal or serious injuries, or that unit defective after the operation may cause a user to have a similar serious accident. Indicates that a wrong operation may cause a service engineer and the third persons around to get injuries or may cause property damage, or that unit defective after the operation may cause a user to have a similar accident. DANGER WARNING CAUTION * Property damage indicates extended damage to property, furniture, livestock, or pets. [About symbols] Symbols Meaning of Symbols Indicates a forbidden action. Specific forbidden actions are described in text near the symbol. Indicates a forcible (must do) action. Specific forcible actions are described in text near the symbol. Indicates a caution (including danger and warning).*

Specific cautions are described in picture or text inside or near the symbol. DANGER <Turn off the power breaker> Turn off the power breaker before removing the front panel and cabinet. · Failure to do so may cause a high voltage electric shock, leading to death or injury. @@@@@@@@· A fire, an electric shock, or an injury may occur. <Use specified parts> Use the specified parts () when replacing them. · Using parts other than specified ones may cause a fire or an electric shock. : For details, see the parts price list. <Keep children away from unit> Keep any person (including children) other than service engineers away from a failure diagnosis or repairing place. · A tool or disassembled parts may cause an injury. · Advise the customer to keep the third persons (including children) away from the unit.
<Insulation treatment> After connecting a cut lead with a crimp contact, discharge by facing the closed side upward. · Connect lead wires with crimping terminals and turn the closed end upwards to avoid exposure to water. <Watch out for fire> Observe the following instructions when repairing the refrigerant cycle. (1) Watch out for surrounding fire. Always put out the fire of stove burner or other devices before starting the repair.

Should the fire fail to be put out, the oil mixed with refrigerant gas could catch fire. (2) Do no use a welder in a closed room. A room with no ventilation may cause carbon monoxide poisoning. (3) Keep away flammable materials. The materials may catch the fire of a welder.
<Use refrigerant carefully> Check the refrigerant name to use the tools and members appropriate for the refrigerant. · A product using the refrigerant R410A has the refrigerant name prominently displayed on its outdoor unit. In addition, the diameter of the service port is changed from that of the conventional R22 to prevent incorrect filling. Never use refrigerant other than R410A for Air to Water Heat Pump using R410A. Also, never use R410A for Air to Water Heat Pump using other refrigerant (such as R22). · A mixture of R410A with different ones excessively raises the pressure in the refrigerant cycle, leading to an injury due to burst. Do not make additional charge of the refrigerant. · An additional charge when refrigerant gas leaks changes the refrigerant before making a test run. <Check after re-installation> Check that the following are properly performed after re-installation. (1) The ground wire is properly connected.

(2) The installation is stable without any tilt or wobbles. Failure to check them may cause a fire, an electric shock, or an injury. CAUTION <Wear gloves> Wear gloves () when performing repair. · Failure to do so may cause an injury when accidentally contacting the parts. : Thick gloves such as cotton work gloves <Cooling check> Perform service work when the unit becomes cool enough after the operation. minal diameter 3/8 5/8 Outer diameter 9.52 15.88 R410A 0.80 1.00 Joints For the joint of copper pipe, flared joint and socket joint are used.
Remove impurities from a joint before using it. · Flared joint A flared joint cannot be used for the copper pipe whose outer diameter is 20 mm or larger. A socket joint can be used instead in that case. Table 2-2-3 and 2-2-4 show the dimensions of flare pipe, the end of flared joint, and flare nuts. · Socket joint A socket joint is used to connect the thick-walled pipe of mainly 20 mm or larger in diameter.
Table 2-2 shows the wall thickness of socket joints. Table 2-2 The minimum wall thickness of socket joints Nominal diameter 3/8 5/8 Reference of outer diameter of copper pipe connected (mm) 9.52 15.9 Minimum joint wall thickness (mm) 0.80 1.
00 7 2-2-2. Processing of piping materials When installing refrigerant pipe, prevent water or dust from entering the pipe, and do not use oil other than lubricant used for Air to Water Heat Pump. Make sure that no refrigerant leak occurs. If piping needs lubrication, use lubricating oil whose water content is removed. After the oil is put in, be sure to seal the container with airproof cover or other covers. Flare and precautions 1) Cut a pipe. Cut slowly with a pipe cutter so that the pipe is not distorted. 2) Remove burr and flaw. A burr or flaw in a flare part may cause refrigerant leak. Remove carefully all the burrs, and clean up the cut ends before installation.

3) Insert a flare nut. 4) Flare Figure 2-2-1 Check that the clasps and copper pipe are clean. Flare Flare dimension correctly using the clasp. Use a flare tool for R410A or the D conventional one. Flare processing dimension varies A depending on the flare tool type. When using the conventional flare tool, use a gauge for size adjustment to secure the A dimension. Table 2-2-3 Flare processing related dimension for R410A A (mm) Nominal diameter 3/8 5/8 Outer diameter (mm) 9.52 15.9 Wall thickness (mm) 0.8 1.
0 Flare tool for R410A clutch type 0 to 0.5 0 to 0.5 Conventional flare tool Clutch type 1.0 to 1.5 1.
0 to 1.5 Butterfly-nut type 2.0 to 2.5 2.0 to 2.
5 Table 2-2-4 Dimension of flare for R410A and flare nut Nominal diameter 3/8 5/8 Outer diameter (mm) 9.52 15.9 Wall thickness (mm) 0.8 1.0 Dimension (mm) A 13.0 19.1 B 13.2 19.7 C 9.7 15.

9 D 20 24.5 Flare nut width (mm) 18 26 Figure 2-2-2 Relationship between flare nut and flare surface 45° 46° BA C D 43° - 45 ° 8 Flare connecting procedure and precautions 1) Make sure that the flare and connecting portions do not have any flaw and dust. 2) Correctly align the flared surface and the connecting axis. 3) Tighten the flare with designated torque by means of a torque wrench. The tightening torque for R410A is the same as that for the conventional R22. If the torque is weak, gas leakage may occur. If it is too strong, the flare nut may crack and may be made non-removable. When choosing the tightening toque, comply with values designated by products. Table 2-2-5 shows reference values. NOTE When applying oil to the flare surface, be sure to use oil designated by the product.
Using any other oil deteriorates the lubricating oil, possibly causing the compressor to burn out. Table 2-2-5 Tightening torque of flare for R410A (Reference values) Nominal diameter 3/8 5/8 Outer diameter (mm) 9.52 15.9 Tightening torque N·m (kgf·m) 33 to 42 (3.3 to 14.
2) 66 to 82 (6.8 to 8.2) 9 2-3. Tools 2-3-1. Necessary tools In Air to Water Heat Pump using R410A, the service port diameter of packed valve of the outdoor unit is changed to prevent mixing of other refrigerant.
*To reinforce the pressure resistance, flare dimensions and opposite side dimensions of flare nut (For Ø 12.7 copper pipe) of the refrigerant piping are lengthened. Because the refrigerating machine oil is changed, mixing of oil may generate sludge, clog capillary, or cause other problems. Accordingly, the tools to be used include: · tools dedicated for R410A (Those that cannot be used for the conventional refrigerant, R22) · tools dedicated for R410A, but can be also used for the conventional refrigerant, R22 · tools that can be used for the conventional refrigerant, R22. The following table shows the tools dedicated for R410A and their interchangeability. Tools dedicated for R410A (The following tools must be for R410A) Tools whose specifications are changed for R410A and their interchangeability R410A Air to Water Hear Pump installation No. Tool to be used Usage For R410A Existence of new equipment Yes Yes Yes Yes Yes Yes Yes Yes *(Note 2) Conventional equipment can be used *(Note 1) *(Note 1) No No No No No No No Conventional refrigerant Air to Water Heat Pump installation New equipment can be used with conventional refrigerant Yes *(Note 1) No No Yes Yes No Yes No 1 2 3 4 5 6 7 8 9 10 Flare tool Copper pipe gauge for adjusting projection margin Torque wrench (For Ø15.9) Gauge manifold Charge hose Vacuum pump adapter Electrical 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 * (Note 1) Flaring for R410A by using the conventional flare tool requires projection margin adjustment.*

This adjustment requires copper pipe gauge or other instrument.

** (Note 2) A charging cylinder for R410A is currently under development. General tools (Conventional tools are available) In addition to the above dedicated tools, the following equipment also available for R22 is necessary as the general tools. 1. Vacuum pump Use this by attaching vacuum pump adapter. 2. Torque wrench (For Ø6.35) 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 equipment for other work methods or run check. 1. Clamp meter 2. Thermometer 3. Insulation resistance meter 4. Electroscope 10 2-4. Recharging of refrigerant Recharge, if necessary, the specified amount of new refrigerant according to the following procedure. Recover the refrigerant, and check that no refrigerant remains in the refrigerant cycle. Open fully the handle of gauge manifold Lo, turn on the vacuum pump, and then perform vacuum evacuating. Connect the charge hose to packed valve service port on the outdoor unit's gas side. When the compound gauge's pointer indicates -0.1 MPa (-76cmHg), close fully the handle Lo and turn off the vacuum pump. Connect the charge hose to the vacuum pump adapter. Let the equipment stay as it is for one to two minutes and check that the compound gauge pointer does not return.*

Open fully both packed valves on the liquid and gas sides. Place the refrigerant cylinder to the electronic balance, connect the connecting hose to the cylinder and the connecting port of the electronic balance, and then charge liquid refrigerant. (For refrigerant charging, see the figure below) NOTE · Never charge refrigerant exceeding the specified amount. · If the specified amount of refrigerant cannot be charged, charge it a little at a time while running refrigerant recovery (pump down). · Do not make additional charging. An additional charge when refrigerant leaks changes the refrigerant composition in the refrigerant cycle, causing the characteristics change of the Air to Water Heat Pump or excessive high pressure in the refrigerant cycle with more than the specified amount of refrigerant charged. This may cause burst or an injury. Fig. 2-4-1 Configuration of refrigerant charging (Hydro unit) (Outdoor unit) Open Refrigerant cylinder (with siphon) Check valve Open Close Open Open/close valve for charging Service port Electronic balance for refrigerant charging 11 NOTE · Make sure that the setting is appropriate so that liquid can be charged. · A cylinder with siphon enables liquid to be charged without the cylinder turned upside down.

[Cylinder with siphon] Gauge manifold Outdoor unit [Cylinder without siphon] Gauge manifold Outdoor unit Siphon pipe Refrigerant cylinder Refrigerant cylinder Electronic balance Electronic balance NOTE · Because R410A is HFC mixed refrigerant, charging with gas changes the charged refrigerant composition, causing the equipment characteristics to change. 12 2-5. Brazing of pipes 2-5-1. Materials of brazing Silver brazing metal Silver brazing metal is an alloy mainly composed of silver and copper. It uses iron, copper, or copper alloy, and is relatively expensive though it excels in soldering.

Type of flux · Non-corrosive flux It is generally a compound of borax and boric acid. It is effective when brazing temperature is higher than 800 °C. · Active solvent Most of this type of flux is generally used for silver brazing. It features the increase of oxide film while moving the capability to the borax-boric acid compound to add compounds such as potassium fluoride, potassium chloride, or sodium fluoride. Phosphor bronze brazing metal Phosphor bronze brazing metal is generally used to join copper or copper alloy.

Low temperature brazing metal Low temperature brazing metal is generally called solder, and is an alloy of tin and lead. Do not use it for refrigerant piping because its adhesive capacity is low. NOTE · Phosphor bronze brazing metal tends to react with sulfur, producing a fragile compound water solution. This may cause gas leakage. Therefore, use other type of brazing metal at a hot spring resort or similar place, and coat the surface with coatings. · To braze the pipe again while performing service work, use the same type of brazing metal. Piping materials for brazing and brazing metal / flux Piping material Copper - Copper Copper - Iron Iron - Iron Brazing metal to be Flux to be used used Phosphor copper Silver Silver Do not use Paste flux Vapour flux NOTE · Do not enter flux into the refrigerant cycle. · If chlorine contained in the flux remains within the pipe, the lubricating oil deteriorates. Because of this, use a flux that does not contain chlorine. · When adding water to the flux, use water that does not contains chlorine.

(e.g. distilled water or ionexchange water) · Remove the flux after brazing. 2-5-2. Flux Why flux is necessary · Removing all the oxide film and any foreign matter on the metal surface assists the flow of brazing metal. · Flux prevents the metal surface from being oxidized in the course of brazing. · Reducing the brazing metal's surface tension enables the brazing metal to adhere for better metal processing. 2-5-3. Brazing Brazing must be performed by a person qualified and experienced with theoretical knowledge since the operation requires sophisticated techniques. Perform brazing while flowing dry nitrogen gas (N2) to prevent oxide film from forming during brazing application to the inside of the pipe.

NOTE · Never use gas other than nitrogen gas. Characteristics of flux · The activation temperature of flux matches the brazing temperature. · A wide effective temperature range makes flux hard to carbonize. · It is easy to remove slag after brazing. · The corrosive action to the treated metal and brazing metal is minimum.

· The good performance of flux gives no harm to a human body. Since flux works in a complicated manner as described above, select an appropriate type of flux according to metal treatment type, brazing metal and brazing method, or other conditions. Brazing method to prevent oxidation 1) Attach a reducing valve and a flow meter to the nitrogen cylinder. 2) Use a copper pipe to direct the piping material, and attach the flow meter to the balance. 3) Apply a mark to the clearance between the piping material and the copper pipe filled with nitrogen to prevent the back flow of the nitrogen gas.

4) If the nitrogen gas flows out, be sure to keep open the piping end. 13 5) Use the reducing valve to adjust the nitrogen gas flow speed to 0.05 m3/hour or 0.02 MPa (0.2 kgf/cm2). 6) After the steps above, keep the nitrogen gas flowing until the pipe cools down to a certain extent.

(Temperature where the pipe is cool enough to be touched by hands) 7) Remove the flux completely after brazing. Fig 2-5-1 Prevention of oxidation during brazing M Flow meter Stop valve Nitrogen gas cylinder From nitrogen cylinder Pipe Nitrogen gas Robber plug 14 3 Unit name Power source Specifications Hydro unit Outdoor unit HWS-802XWHM3-E, 802XWHT6-E HWS-802H-E 8.0 6.0 10 - 70 Hz Single phase 50Hz 230V Heating Hydro unit Current (A) Power (kW) Power factor (%) Outdoor unit Current (A) Power (kW) Power factor (%) Total Starting current (A) 0.

*98 0.101 91.5 8.26 1.859 97.8 9.24 29 49 4.08 Outer dimension Height (mm) Width (mm) Depth (mm) Net weight (kg) Color Remote controller Outer dimension *3 Height (mm) Width (mm) Depth (mm) Circulating pump Motor output (W) Flow rate (L/min) Type Heat exchanger 22.9 Non-self-suction centrifugal pump Plate-type heat exchange Height (mm) Width (mm) Depth (mm) Net weight (kg) Color Compressor Motor output (W) Type Model Fan motor Standard air capacity (m3/min) Motor output (W) 890 900 320 63 Silky shade (Munsell 1Y8.5/0.*
5) 1400 Twin rotary type with DC-inverter variable speed control DA220A2F-22L 50.0 60 Flare connection Liquid Gas Outdoor unit Maximum length (m) Maximum chargeless length (m) Maximum height difference (m) Minimum length (m) Liquid Gas Ø9.52 Ø15.9 Ø9.52 Ø15.
9 30 30 ±30 5 R410A 1.8 R1 1/4 None (Need the flow rate 17.5 /min or more) ±7 300 5-32 -20-43 15-85 15-100 3 wires: including ground line (Outdoor unit) 4 wires: including ground line 925 525 355 50 Silky shade (Munsell 1Y8.5/0.5) 120 120 20 125 (MAX) 17.
*2 Cooling 0.46 0.097 91.7 8.90 2.033 99.3 9.36 29 49 2.82 Heating capacity *1 (kW) Cooling capacity *2 (kW) Variable range of compressor frequency Operation mode Electric characteristic *1 *2 Operating noise *1 *2 *4 Coefficient of performance *1 *2 Hydro unit Hydro unit (dB(A)) Outdoor unit (dB(A)) Outdoor unit Outer dimension Refrigerant piping Connection method Hydro unit Refrigerant Water piping Refrigerant name Charge amount (kg) Pipe diameter Maximum length (m) Maximum height difference (m) Maximum working water pressure (kPa) Operating temperature range Operating humidity range Wiring connection Hydro unit (°C) Outdoor unit (°C) Hydro unit (%) Outdoor unit (%) Power wiring Connecting line *1 Heating performance measurement conditions: outside air temperature 7 or 6 °C, water supply temperature 30 °C, outlet temperature 35 °C, refrigerant piping length 7.5 m (no height difference), capacity 97%, COP 95%, operating noise +3 dB *2 Cooling performance measurement conditions: outside air temperature 35 °C, water supply temperature 12 °C, outlet temperature 7 °C, refrigerant piping length 7.*

*5 m (no height difference), capacity 97%, COP 95%, operating noise +3 dB *3 · The remote controller should be shipped with the hydro unit. · Use two 1.5-meter wires to connect the hydro unit with the remote controller. *4 The outdoor unit operating noise is measured at the point of 1m away from the unit back surface center and 1m high from the ground. The hydro unit operating noise is measured at the point of 1m away from the unit front surface center. The value of the operating noise varies depending on room structure where the unit is installed. *5 Do not leave the hydro unit at 5 °C or below. *6 Check the water piping for leakage under the maximum operating pressure. 15 Unit name Heating capacity *1 (kW) Cooling capacity *2 (kW) Hydro unit Outdoor unit HWS-1402XWHM3-E, 1402XWHT6-E, 1402XWHT9-E HWS-1102H-E 11.2 10.*
0 10 - 60Hz Single phase 50Hz 230V Heating Cooling 0.61 0.130 92.7 14.88 3.
39 99.1 15.49 29 49 2.84 925 525 355 54 Silky shade (Munsell 1Y8.5/0.
5) Height (mm) Width (mm) Depth (mm) Motor output (W) Flow rate (L/min) Type 32.1 28.9 120 120 20 190 (MAX) 40.1 31.5 Non-self-suction centrifugal pump Plate-type heat exchange Height (mm) Width (mm) Depth (mm) 1340 900 320 90 Silky shade (Munsell 1Y8.5/0.5) Motor output (W) Type Model 2500 Twin rotary type with DC-inverter variable speed control DA422A3F-25M 103.0 100 × 2 Flare connection Liquid Gas Liquid Gas Ø9.52 Ø15.9 Ø9.

52 Ø15.9 30 30 ±30 3 R410A 2.7 R1 1/4 None (Need the flow rate 13 /min or more) ±7 300 5-32 -20-43 15-85 15-100 3 wires: including ground line (Outdoor unit) 4 wires: including ground line Heating 0.67 0.145 94.0 13.57 3.005 96.4 14.24 29 51 4.
45 Cooling 0.63 0.135 93.2 17.47 3.
945 98.1 18.10 29 51 2.69 HWS-1402H-E 14.0 11.
*0 10 - 70 Hz Variable range of compressor frequency Power source Operation mode Electric characteristic *1 *2 Hydro unit Current (A) Power (kW) Power factor (%) Outdoor unit Current (A) Power (kW) Power factor (%) Total Operating noise *1 *2 *4 Coefficient of performance *1 *2 Hydro unit Outer dimension Height (mm) Width (mm) Depth (mm) Net weight (kg) Color Remote controller Outer dimension *3 Hydro unit (dB(A)) Outdoor unit (dB(A)) Starting current (A) 0.63 0.135 93.2 10.14 2.265 96.9 10.77 29 49 4.66 Circulating pump Heat exchanger Outdoor unit Outer dimension Net weight (kg) Color Compressor Fan motor Refrigerant piping Connection method Hydro unit Outdoor unit Maximum length (m) Standard air capacity (m3/min) Motor output (W) Maximum chargeless length (m) Maximum height difference (m) Minimum length (m) Refrigerant Water piping Refrigerant name Charge amount (kg) Pipe diameter Maximum length (m) Maximum height difference (m) Maximum working water pressure (kPa) Operating temperature range Operating humidity range Wiring connection Hydro unit (°C) Outdoor unit (°C) Hydro unit (%) Outdoor unit (%) Power wiring Connecting line *1 Heating performance measurement conditions: outside air temperature 7 or 6 °C, water supply temperature 30 °C, outlet temperature 35 °C, refrigerant piping length 7.5 m (no height difference), capacity 97%, COP 95%, operating noise +3 dB *2 Cooling performance measurement conditions: outside air temperature 35 °C, water supply temperature 12 °C, outlet temperature 7 °C, refrigerant piping length 7.*

*5 m (no height difference), capacity 97%, COP 95%, operating noise +3 dB *3 · The remote controller should be shipped with the hydro unit. · Use two 1.5-meter wires to connect the hydro unit with the remote controller. *4 The outdoor unit operating noise is measured at the point of 1m away from the unit back surface center and 1m high from the ground. The hydro unit operating noise is measured at the point of 1m away from the unit front surface center. The value of the operating noise varies depending on room structure where the unit is installed. *5 Do not leave the hydro unit at 5 °C or below. *6 Check the water piping for leakage under the maximum operating pressure. 16 4 Outside Drawing 4-1. Hydro unit HWS-802XWHM3-E, 802XWHT6-E HWS-1402XWHM3-E, 1402XWHT6-E, 1402XWHT9-E 525 40.*
5 371.5 355 2-dia.12x17 long hole (for dia.

8-10 anchor bolt) B leg part 72.5 380 40 Anchor bolt long hole pitch 72.
5 960 Anchor bolt long hole pitch 925 20 Manometer Remote controler 54 20 40.5 A leg part 40 2-dia.12x17 U-shape hole (for dia.8-10 anchor bolt) 19.5 116 Hot water outlet connecting pipe 1 1/4" 9 259 186.
5 37.5 144.5 309.5 59.5 Gas line dia.15.88 Liquid line dia.9.52 352 Drain nipple Water inlet connecting pipe 1 1/4" 19.5 158 135.

5 17 380 Portion B Drain hole (25 burring hole) 17.5 60 200 Air inlet HWS-802H-E Name 12 Description 46 34 170 Air inlet (48 54 365 118 128 Mounting bolt hole 12 17 long hole) Refrigerant piping outlet Indoor and outdoor connecting line outlet Power source intake hole 38 knockout hole 75 40 40 74 Air outlet Portion A 39 96 Details of portion A Mounting bolt hole Details of portion B (12 17 U-shape hole) 4-2. Outdoor unit 17.5 383 5-Drain hole (20 88 burring hole) 150 600 900 320 52 550 Refrigerant liquid connection (9.5 flare) 30 Refrigerant gas connection (15.9 flare) 890 581 534 95 148 165 55 95 155 247 255 55 24 94 Optional mounting hole 178 18 135 60 18 178 178 80 80 151 400 55 95 65 7 18 12 64 (12- 3 embossed) 68 518 83 7 327 Knockout for lower part of piping Z arrow view 17.5 380 200 Air inlet 60 Mounting bolt hole (12 17 long hole) 12 Drain hole (25 burring hole) Portion B Name Description 1 2 Power source intake hole 38 knockout hole Refrigerant piping outlet Indoor and outdoor connecting line outlet 128 46 34 170 Air inlet 40 365 74 118 75 Details of portion A Air outlet 70 Portion A 600 39 96 320 Mounting bolt hole Details of portion B (12 17 U-shape hole) HWS-1102H-E, 1402H-E 17.5 383 150 900 550 5-Drain hole (20 88 burring hole) 52 534 581 48 54 Refrigerant liquid connection (9.5 flare) Refrigerant gas connection (15.9 flare) 655 121 74 534 581 2 2 1 360 605 613 1 1 85 70 55 95 155 55 95 24 1340 30 40 94 60 518 135 178 178 178 80 18 18 80 151 400 55 95 7 65 19 Z 12 64 83 7 Optional mounting hole (24- 3 embossed) 68 327 Knockout for lower part of piping Z arrow view 4-3.
*Hot water cylinder HWS-3001CSHM3-E(-UK) 550 HWS-2101CSHM3-E(-UK) 550 595 Specification for UK only 2066.6 595 2040 Specification for UK only 1497.6 1474 HWS-1501CSHM3-E(-UK) 550 595 1114 Specification for UK only 1090 20 5 Wiring Diagram ! 5-1. Hydro Unit WARNING *Option Remote controller (HWS-AMS11E) Remote controller (HWS-AMS11E) AB GRY WHI TB 07 7A 7B Perform the grounding from the earth terminal in the terminal block of the outdoor unit. ! TC TWI TWO THO LPS 1234 234 234 234 *Option TTW TFI AB Color indentification CAUTION AB 6A 6B 6C 6D GRY BRW BRW RED RED 99 8 BLU 77 6 BRW 55 4 3 2 WHI 11 WHI RED YEL CN10 (WHI) CR10 CR11 CR12 CR13 RY 10 RY 11 RY 12 RY 13 CN02 (WHI) 5 4 3 2 1 5 4 3 2 1 3 1 123 CN41 (BLU) 6 RED 55 BLU 44 ORN 33 GRN 22 BRW 11 12 12 CN203 (YEL) 3 1 123 CN204 (BRW) 12 12 CN205 (RED) WHI BLK BLK BLK BLK BLK BLK BLK BLK 3 1 123 CN206 (WHI) 12 12 CN207 (BLU) 2 1234 CN212 (WHI) 12 12 CN214 (WHI) 3 1 123 CN213 (WHI) 1 2 3 4 GRN 11 1 GRN 2 22 GRN 3 33 GRN 44 4 Relay p.*
*c.board (MCC-1217) PJ20 GRN 11 11 GRN 22 22 GRN 33 33 GRN 44 44 K1 K2 TB1 4 3 2 1 TB1 4 3 2 1 RED WHI Electric shock may happen. Don't touch the electric parts. TB 06 BLK : BLACK BRW : BROWN GRY : GRAY PNK : PINK WHI : WHITE BLU : BLUE GRN : GREEN ORN : ORANGE RED : RED YEL : YELLOW *Option p.c.*
board Boiler control O/P Alerm O/P CN208 (BLU) CN501 (YEL) CN209 (GRN) 33 2 11 CN01 (WHI) Relay p.c.board (MCC-1431) F01 (5A) SI SW14 est sur OFF la télécommande reste bloquée en SETTING P.C.board (MCC-1511) BLK BLU 33 11 Relay p.c.board (MCC-1217) PJ20 K1 K2 Operation O/P Defrost O/P CN210 (RED) 1 2 3 4 YEL 11 1 YEL 2 22 YEL 3 33 YEL 4 44 Photocoupler input p.c.board (MCC-1214) PJ17 TB1 3 2 1 Emergency stop I/P Hot water cylinder thermostat I/P WPM N N LL BRW CN603 (YEL) RY601 CN211 (BLK) 1 YEL 11 11 YEL 22 22 YEL 33 33 YEL 44 44 Photocoupler input p.c.

*board (MCC-1214) PJ17 TB1 22 11 3 2 1 Cooling thermostat I/P Heating thermostat I/P SW14 OFF RED A2 SW01 RY600 33 11 77 55 3 CN601 (RED) SW02 ON 1234 RY A1 05 WHI YEL WHI CN200 (RED) CN201 (WHI) CN202 (YEL) YEL 11 GRN 22 RED 33 BLK 11 BLK 22 BLK 11 2 BLK 33 1 2 3 4 5 6 1 2 3 4 5 6 BRW BRW RED RED ORN ORN 11 33 7 RY 8 01 Flow switch ON RY602 SW10 ON 1234 SW11 ON 1234 SW12 ON 1234 SW13 ON 1234 High pressure switch 4.15MPa Thermal protector (auto) 75 ± 3 SW06 ON RY603 SW07 12 WHI RED 11 CN602 (WHI) WHI YEL BLU WHI BRW RED RED PNK ORN WHI WHI YEL CN102 (WHI) RY604 RY605 RY606 RY607 CN101 (WHI) 51 52 53 54 55 56 57 58 59 TB 05 41 42 43 44 TB 04 Transformer 11 33 WHI WHI WPM 2WV BH 3WV Type 1 (2-wire spring return) RED WHI YEL MIXV Type 1 (3-wire SPST type) RED PNK ORN WHI CN604 (BLU) 7 7 RED 5 5 WHI 3 3 YEL 1 1 BLK CN605 (YEL) 1 1 WHI 3 3 ORN CN606 (BLU) 1 1 WHI 3 3 PNK CN305 (GRN) 3 3 GRY 1 CN100 (WHI) 5 3 3 WHI 1 1 RED F100 Fuse T5A 250V BLK *1 Symbol WPM 3WV 2WV MIXV BH RY01 RY06 LPS Backup heater1,2,3 57 58 59 TB 05 41 42 43 44 TB 04 HWS-802XWHT6-E : Installed HWS-1402XWHT6-E : Installed HWS-1402XWHT9-E : Installed HWS-802XWHM3-E : Not installed HWS-1402XWHM3-E : Not installed 6 5 7 A2 8 6 A1 RY01 4 3WV Type 2 (3-wire SPST type) Type 3 (3-wire SPDT type) MIXV RY 06 ORN RED PNK 2 4 6 8 RY 02 A1 RY 03 7 4 RY 04 A2 Parts name Water pump motor 3-way valve (local) 2-way valve (local) Mixing valve (local) Booster heater Relay01 Relay06 Low pressure sensor Heater AC230V, 3kW Symbol TC TWI TWO THO TTW TFI TB Parts name Water heat exchanger temperature sensor Water heat exchanger inlet temperature sensor Water heat exchanger outlet temperature sensor Backup heater outlet temperature sensor Hot water cylinder temperature sensor Floor heating inlet temperature sensor Terminal block Type 2 (3-wire SPDT type) WHI WHI *1 Backup heater 1 Thermal protector (single operation) 95 5 Thermal protector (single operation) 95 5 Thermal protector (single operation) 95 5 Thermal protector (single operation) 95 5 Thermal protector 1L1 3L2 RY05 2T1 4T2 BRW BLU F1, F2 Fuse AC250V T30A RY02 2T1 4T2 6T3 BLU BRW GRY 2T1 4T2 6T3 BLU BLU BLK (single operation) 95 5 Backup heater 1 Thermal protector (single operation) 95 ± 5 Backup heater 1 Backup heater 2 Backup heater 2 Backup heater 3 1L1 3L2 5L3 1L1 3L2 5L3 RY04 BLU BRW BLU 2T1 4T2 6T3 2T1 4T2 6T3 BLK RY02 2T1 4T2 6T3 BRW BLU F3, F4 Fuse AC250V T30A 1L1 3L2 5L3 1L1 3L2 5L3 1L1 3L2 5L3 RY04 RY02 F1 F2 F3 F4 F5 F6 F7 F8 F3 8 Fuse AC250V T30A F3 F4 F5 F6 F3 6 Fuse AC250V T30A F3 F4 YEL/GRN GRY GRY BRW BRW BLK RED BLU BLU BLK BLU BLU BLU BRW BRW 11 12 13 TB 01 Outdoor unit TB 03 31 32 LN *Option L1 L2 L3 N TB 02 Power supply 400V 3N 50Hz L1 L2 L3 N TB 02 Power supply 400V 3N 50Hz BRW WHI BLU BLU L BLU N TB 02 123 123 12 Power supply 230V 50Hz Power supply 230V 50Hz Hot water cylinder HWS-1402XWHT9-E HWS-802XWHT6-E HWS-1402XWHT6-E Power supply 230V 50Hz HWS-802XWHM3-E HWS-1402XWHM3-E 1.*

*The one-dot chain line indicates wiring at the local site, and the dashed line indicates accessories sold separately and service wires, respectively. 2. , and indicates the terminal board and the numberals indicate the terminal numbers. 3. indicates P.C. board. * Be sure to fix the electric parts cover surely with screws.*

(Otherwise water enters into the box resulting in malfunction.) 21 Reactor Upper (White) (White) RW B 5-2. Outdoor Unit (Blue) Symbol Item nam (White) (White) HMS-1102, 1402H-E only Control board External input (Yellow) 22 GW R B Red White Earth screw Outdoor unit Earth screw (White) Compressor Fan motor Pulse motor valve coil Discharge temperature sonsor Suction temperature sensor Heat exchange sensor 1 Heat exchange sensor 2 Outdoor temperature sensor Compressor case thermostat Fuse 25 A, 250 VAC Fuse 10A, 250 VAC (White) (Yellow) (White) (White) 1. indicates a terminal plate. The number inside indicates the terminal number.

2. The double-dashed line indicates a local wiring while the dashed line indicates an optional accessory or service wiring. 3. indicates a printed board. 4. For the hydro unit circuit, see the hydro unit wiring diagram. (White) (White) (White) Operating power 4-way valve coil Hydro unit Power supply single phase 230V 50Hz Earth screw 5-3. Hot Water Cylinder Unit Blue Green / Yellow Brown Double pole thermal cut out Blue Brown 12 TB03(230V) AB TB06(TTW) Green / Yellow TTW sensor Hot water cylinder heater To hydro unit Supply 230 V from hydro unit Cable size 1.5 mm2 (minimum) 23 6 No. 1 2 3 Key Electric Component Rating 6-1. Hydro Unit HWS-802XWHM3-E, 802XWHT6-E Model name Component name M3-E Circulating pump Backup heater 6 kW Backup heater 9 kW Water heat exchange temperature sensor (TC sensor) Water inlet temperature sensor (TWI sensor) Water outlet temperature sensor (TWO sensor) Heater outlet water temperature sensor (THO sensor) Floor inlet temperature sensor (TFI sensor) Pressure switch Low pressure sensor Bimetal thermostat (auto) Bimetal thermostat (single operation) Flow switch Output board (OP) Input board (OP) Remote control Water 3-way valve terminal Water 2-way valve terminal Mixing valve terminal Circulating pump terminal Booster heater terminal Fuse O O O O Type name T6-E O O Rating AC230 V 0.54 A (MAX) AC 400 V (3N) 6 kW (AC230 V 3 kW compatible) AC400V (3N) 9 kW 10 k (25°C) UPS025-65 K 130 4 5 O O 10 k (25°C) 10 k (25°C) 10 k (25°C) 6 O O 7 O O 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 O O O O O O O OP OP O O O O O O O O O O O O O O O OP OP O O O O O O O O - 10 k (25°C) Operating pressure 4.15 MPa +0 -0.3 MPa Operating pressure 0.20 MPa Operating temperature 75±3°C DC42 V / 0.

2 A Operating temperature 95±5°C AC250 V / 16 A Operating flowing quantity 13 L/min AC230 V 0.5 A DC24 V 1 A Contact input TCB-PCIN3E TCB-PCM03E HWS-AMS11E AC230 V 0.1 A 2Wire, 3Wire SPST, SPDT type mountable AC230 V 0.1 A 2Wire type mountable AC230 V 0.1 A 3Wire SPST, SPDT type mountable AC230 V 1.0 A AC230 V 1.0 A AC 250 V 30 A O ····· Applied OP····· Optional accessory 24 HWS-1402XWHM3-E, 1402XWHT6-E, 1402XWHT9-E Model name No. 1 2 3 Component name M3-E T6-E T9-E Circulating pump Backup heater 6 kW Backup heater 9 kW Water heat exchange temperature sensor (TC sensor) Water inlet temperature sensor (TWI sensor) Water outlet temperature sensor (TWO sensor) Heater outlet water temperature sensor (THO sensor) Floor inlet temperature sensor (TFI sensor) Pressure switch Low pressure sensor Thermal protector (auto) Thermal protector (single operation) Flow switch Output board (OP) Input board (OP) Remote control Water 3-way valve terminal Water 2-way valve terminal Mixing valve terminal Circulating pump terminal Booster heater terminal Fuse O O O O O O O O Type name UPS25-80 130 Rating AC230 V 0.83 A (MAX) AC 400 V (3N) 6 kW (AC230 V 3kW compatible) AC 400 V (3N) 9 kW 10 k (25°C) 4 O 5 O O O 10 k (25°C) 10 k (25°C) 10 k (25°C) 6 O O O 7 O O O 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 O O O O O O O OP OP O O O O O O O O O O O O O O O OP OP O O O O O O O O O O O O O O O OP OP O O O O O O O O 10 k (25°C) Operating pressure 4.15 MPa +0 -0.

3 MPa Operating pressure 0.20 MPa Operating temperature 75±3°C DC42 V / 0.2 A Operating temperature 95±5°C AC250 V 16 A Operating flowing quantity 18 L/min AC230 V 0.5 A DC24 V 1 A Contact input TCB-PCIN3E TCB-PCM03E HWS-AMS11E AC230 V 0.1 A 2Wire, 3Wire SPST, SPDT type mountable AC230 V 0.

1 A 2Wire type mountable AC230 V 0.1 A 3Wire SPST, SPDT type mountable AC230 V 1.0 A AC230 V 1.0 A AC 250 V 30 A O ····· Applied OP····· Optional accessory 25 6-2. Outdoor Unit HWS-802H-E No.

1 2 3 4 5 6 7 Component name Compressor Outdoor fan motor 4-way valve coil Pulse motor valve (PMV) coil Compressor case thermostat Reactor PC board Type name DA220A2F-22L ICF-280-A60-1 VHV-01AP552B1 CAM-MD12TF-15 US-622KXTMQO-SS CH-56 MCC-1571 Output 60 W Rating AC230 full-wave rectifier input, alive time 10 sec or less DC12 V OFF: 125±4°C ON: 90±5°C 5.8 mH, 18.5 A Input 1Ø, AC230 V±23 V, 50/60 Hz 26 HWS-1102H-E, 1402H-E No. 1 2 3 4 5 6 7 Component name Compressor Outdoor fan motor (x2) Reactor (x2) 4-way valve coil Pulse motor valve (PMV) coil Board Compressor case thermostat Type name DA422A3F-25M ICF-280-A100-1 CH-44 UKV-A038 VHV-01AP552B1 MCC-1560 US-622KXTMQO-SS Output 100 W 1.4 mH, 25 A Rating AC230 V full-wave rectifier input, alive time 10 sec or less DC12 V Input 3Ø, AC230 V±23 V, 50/60 Hz OFF = 125 ± 4 °C, ON = 90 ± 5 °C 27 6-3. Hot Water Cylinder Unit Model name No. Component name 1501 CSH M3-E (-UK) O 2101 CSH M3-E (-UK) O 3001 CSH M3-E (-UK) O Type name Rating 1 Hot water cylinder heater Hot water cylinder temperature sensor (TTW sensor) AC230 V 2.75 KW 10 k (25°C) 2 O O O 3 Thermal cut-out O O O Operating temperature Manual reset 82°C (+3k/-2k) O ····· Applied 28 6-4. Water Heat Exchange Control Board HWS-802XWHM3-E, 802XWHT6-E HWS-1402XWHM3-E, 1402XWHT6-E, 1402XWHT9-E TC sensor connector TTW sensor connector CN203 CN214 Low pressure sensor connector Remote control TFI sensor CN207, CN212 connector connector CN41 CN213 THO sensor connector CN206 TWI sensor connector CN204 TWO sensor connector CN205 Pressure switch connector CN201 Overheat protection thermostat input connector CN202 Flow switch connector CN200 Relay board connector CN501 Option board connector CN208-CN211 Transformer connector CN102 Built-in pump connector CN603 Hot water cylinder drive connector CN601 Transformer input connector CN101 AC power supply connector CN100 3WV drive connector CN602 Mixing valve drive connector CN604 Backup heater 1 drive connector CN605 Serial input connector CN305 Backup heater 2 drive connector CN606 29 6-5.

Outdoor Control Board HWS-802H-E Reactor connection connector Compressor output terminals CN202 CN201 CN200 Electrolytic capacitors Power circuit protection fuse F100 (250 V, 3.

15 A, plastic case) Case thermostat connector CN609(Blue) Fan motor output CN300 (White) 4-way valve connector CN701(White) Compressor ON output connector CN704(Blue) Heater output connector CN703(Grey) External input connector CN610(Yellow) Special operation switches SW801 SW804 Display change-over switches SW800 SW803 Temperature sensor connectors TL CN604(White) TD CN603(White) TO CN602(Yellow) TE CN601(White) TS CN600(White) Alive, error display LEDs D800 804(Yellow) D805(Green) PMV connector CN710 (White) Initialization switch SW802 4-way valve protection fuse F700 (250 V, 3.15 A, plastic case) Power circuit protection fuse F01 (250V, 25A) Power supply connection lead Connecting cable connector wires CN04(White) P01(Red) Hydro-outdoor communication signal LEDs D503 (Green, Outdoor => Hydro) Connecting cable protection fuse P02(White) Earth lead wire F03 (250 V, 10 A) D502 (Amber, Hydro => Outdoor) P09 (Black) 30 HWS-1102H-E, 1402H-E Fan motor output (Lower) CN300(White) Fan motor output (Upper) CN400(White) Compressor output terminals CN202 CN201 CN200 Electrolytic capacitors Case thermostat connector CN609(Blue) Power circuit protection fuse F100(250V,3.15A, plastic case) 4-way valve connector CN701(White) Compressor ON output connector CN704(Blue) External input connector CN610(Yellow) Special operation switches SW801 SW804 Display change-over switches SW800 SW803 Temperature sensor connectors TL CN604(White) TD CN603(White) TO CN602(Yellow) TE CN601(White) TS CN600(White) Alive, abnormal display LEDs D800 804(Yellow) D805(Green) PMV connector CN710(White) Initialization switch SW802 4-way valve protection fuse F700(250V,3.15A plastic case) Power supply connection lead wires P01(Red) P02(White) P03(Black) Earth lead wire P09(Black) Connecting cable connector Hydro-outdoor communication CN04(White) signal LEDs D503 (Green, Outdoor =>Hydro) Connecting cable protection fuse D502 (Amber, Hydro => Outdoor) F03(250V,10A) Power supply protection fuses F01 (250V,25A) 31 7 zone1 Fan coil unit Expansion vessel set : 1bar Booster heater (local) Boiler (local) Safety valve set : 3.5bar AC pump max : 10bar By-pass valve (locally procured) Air vent valve Pressure relief valve set : 3bar THO Thermal protector Single operation set : 95 ± 5°C Thermal protector (auto) set : 75 ± 3°C Pressure switch 4.15MPa M TWO Menometer gage : - 6bar Motorized 3-way valve (locally procured) AC230V Water vent valve 7-1. Water System Diagram Low pressure sensor TC Backup heater Ø1 : 3kW Ø3 : 6kW Ø3 : 9kW Strainer (locally procured) Flow sw TWI 40 mesh 2-way valve for cooling mode (locally procured) AC230V Radiator unit Refrigeration Cycle / Water System Diagram 32 Drain cock for water charge (locally procured) Relief valve(UK) 90°C 10 bar Water heat exchanger max : 10bar By-pass valve (locally procured) Pressure relief Set value : 7bar(UK) Water outlet zone2 Moterized mixing valve (locally procured) AC230V AC pump (locally procured) Thermal cut-out (manual reset) 82°C (+3k/-2k) Outdoor unit 8,11,14kw Cylinder heater Ø1 : 2.75kW TTW TFI M Reducing valve(UK) Floor heating 3.5bar Water inlet Buffer tank(locally procured) Local hot water system Hot water cylinder Installation example of water circuit (1) (2) (3) (4) (5) (6) The water circuit for a system without buffer tank ((1), (2), (3), (5)) requires 5 or more branches of Floor heating or Radiator etc. Less than 5 branches may cause a flow deficiency.

In this case, please provide a buffer tank and secondary pumps as shown in (4). 33 7-2. Refrigeration Cycle System Diagram HWS-802XWHM3-E, 802XWHT6-E/802H-E Outdoor unit Heating / Hot-water supply Defrosting / Cooling Low pressure sensor Hydro unit Expansion vessel Manometer TWO TD Water vent valve Air vent valve Pressure switch Backup heater Safety valve Circulating pump (UPS025-65 K 130) THO TC TWI Compressor (DA220A2F-22L) TS 4-way valve (STF-218G) Pulse motor valve (CAM-B30YGTF-2) TE Plate-type water heat exchanger TO P Flow switch (VH-8706) Outdoor heat exchanger Accumulator (1800 cc) Refrigerant R410A ...

1.8 kg HWS-1402XWHM3-E, 1402XWHT6-E, 1402XWHT9-E/1102H-E, 1402H-E Outdoor unit Heating / Hot-water supply Defrosting / Cooling Low pressure sensor Hydro unit Expansion vessel Manometer TWO TD Water vent valve Air vent valve Pressure switch Backup heater Safety valve Circulating pump (UPS25-80 130) THO TC TWI Compressor (DA422A3F-25M) TS 4-way valve (STF-0401G) Pulse motor valve (UKV-25D100) TE Plate-type water heat exchanger TO P Flow switch (VH-8705) Outdoor heat exchanger Accumulator (2500 cc) Refrigerant R410A ... 2.

7 kg 34 8 8-1 Operational Description Item Basic Operation 1) Operation control 2) Hot water supply operation 3) Heating operation 4) Cooling operation Operation Mode and Control Method 1) Hot water supply operation 2) Heating operation 3) Cooling operation 4) Simultaneous operation of "hot water supply" and "heating" 5) Simultaneous operation of "how water supply" and "cooling" 6) Boiler-assisted heating operation 7) HOT WATER BOOST operation 8) Anti bacteria 9) Night setback operation 10) FROST PROTECTION operation 11) AUTO operation 12) Nighttime low-noise operation Hydro Unit Control 1) Capacity control (compressor, high-temperature release, low-temperature release) 2) Heater control 3) Circulation pump control 4) Flow switch control 5) Mixing valve control (2-temperature heating control) 6) Q-H characteristics of hydro unit 7) Automatic restart control 8) Piping anti-freezing control Outdoor Unit Control 1) PMV (Electronic control valve) control 2) Outlet temperature release control 3) Current release control 4) Current releases shift control 5) Outdoor fan control 6) Defrosting control 7) Winding heating control 8) Continued operation prevention under short-circuit conditions 9) Overcurrent protection control Page This chapter describes the working circuit and control of Air to Water Heat Pump about the following operations. 36-38 8-2 39-47 8-3 48-56 8-4 57-63 35 Item 8-1. 1) Operation control Basic Operation Remote controller Operation flow and applicable data, etc. Operation description 1. Purpose The operations of the hydro unit and the outdoor unit are controlled according to user-defined operation condition settings. 2. Details The operation controls include those shown in the left. 3. Operations 1) An operation condition is selected with the remote controller. 2) Setting the remote controller button to "ON" transmits a signal to the hydro unit.

3) The hydro unit controller controls the operations shown in the left while also controlling the water 2way valve, water 3-way valve, circulation pump, mixing valve, hot water cylinder heater, and backup heater. 4) The hydro unit controller transmits an operation instruction to the outdoor unit, and uses serial signals to transmit and receive control statuses. 5) The outdoor unit control unit performs the operation controls shown in the left while also controlling the compressor, outdoor fan motor, pulse motor valve, and 4-way valve. Operation condition selection Heating: Run/Stop Hot water supply: Run/Stop Cooling: Run/Stop Serial signals transmit and receive Remote control settings <Heating> Temperature setting <Hot water supply > Temperature setting <Cooling> Temperature setting Auto Temp Anti Bacteria Frost protection Hot waterboost AC 230 V for Hot water cylinder heater AC 400 V (3N~) for Back up heater Hydro unit Serial signals transmit and receive Thermostat (Cooling/Heating) Forcible stop input Water heat exchange Sub board Abnormal stop output Defrosting output Operation output Boiler "ON/OFF" Booster Heater Condensed temperature sensor (TC) Water inlet temperature sensor (TWI) Water outlet temperature sensor (TWO) Water heater outlet temperature sensor (THO) Hot water cylinder (TTW) Floor inlet sensor (TFI) Overheat prevention thermostat Flow switch Hot water cylinder heater Backup heater 1 power-relay Backup heater 2 power-relay AC pump 1 (Built-in pump) 2WV_W 3WV_W Hot water supply heater MG Mixing Valve Pressure switch Lo pressure sensor Water heat exchange control board Serial signals transmit and receive Outdoor unit Serial communication AC 230 V for heat pump Serial signals transmit and receive Outdoor unit contro Inverter Inverter frequency control Waveform synthesis function Calculation function (Temperature calculation) Compressor Outdoor fan motor Outdoor unit control AD conversion function Rapid heating function Compressor restart Delay function G-Tr overcurrent prevention function Defrosting operation function Td sensor Ts sensor Te sensor To sensor PMV 4-way valve 36 Item Operation flow and applicable data, etc. Operation description Hot water supply operation 1. Purpose Hot water supply 2. Details This section performs hot water supply operation according to heating conditions specified for the steps in the left. 3. Operations 1) Set the [HOT WATER] remote controller button to "ON". 2) The hydro unit controller starts to transmit a hot water supply operation signal to the outdoor unit control unit. 3) The hydro unit performs the operation controls shown in the left while also controlling the circulation pump, hot water cylinder heater "ON/OFF". 4) The outdoor unit controls the compressor, outdoor fan motor, electric expansion valve, and 4-way valve based on the operation signals transmitted by the hydro unit. Heating operation 1. Purpose Heating 2. Details This section performs heating operation according to heating conditions specified for the steps in the left.

3. Operations 1) Set the [ZONE1, 2] remote controller button to "ON". 2) The hydro unit controller starts to transmit a heating operation signal to the outdoor control unit. 3) The hydro unit performs the operation controls shown in the left while also controlling the circulation pump, backup booster heater "ON/OFF", water 2way valve, and water 3way valve. 4) The outdoor unit controls the compressor, outdoor fan motor, electric expansion valve, and 4-way valve based on the operation signals transmitted by the hydro unit.

8-1. 2) Hot water supply operation Basic Operation [HOT WATER] button set to "ON" Hot water temperature: 40°C to 75°C Hydro unit control Circulation pump "ON/OFF" control Water 3-way valve control Hot water cylinder heater control Operation instruction signal transmit Number of compressor revolutions control Number of outdoor fan motor revolutions control Pulse motor valve control 4-way valve control Outdoor unit control 3) Heating operation ZONE1, 2 button set to "ON" Heating temperature: 20°C to 55°C Circulation pump "ON/OFF" control Water 3-way valve control Water 2-way valve control Mixing Valve control Backup heater control Booster heater control Hydro unit control Operation instruction signal transmit Outdoor unit control Number of compressor revolutions control Number of outdoor fan motor revolutions control Pulse motor valve control 4-way valve control Set temperature (TSC_F) [°C] A(40) B(35) C(30) D(25) E(20) -20 T1 0 T3 20 A, B, C, D, E Setting available range 20 to 55°C T1 Setting available range -15 to 0°C T3 Setting available range 0 to +15°C 37 Item Operation flow and applicable data, etc. Operation description 1. Purpose Cooling 2. Details This section performs cooling operation according to cooling conditions specified for the steps in the left. 3. Operations 1) Set the [ZONE1, 2] remote controller button to "ON". 2) The hydro unit controller starts to transmit a cooling operation signal to the outdoor unit control unit. 3) The hydro unit controller performs the operation controls shown in the left while also controlling the circulation pump, water 2-way valve, and water 3-way valve. 4) The outdoor unit controls the compressor, outdoor fan motor, pulse motor valve, and 4-way valve based on the operation signals transmitted by the hydro unit.

8-1. 4) Cooling operation Basic Operation ZONE1, 2 button set to "ON" Cooling temperature: 10°C to 25°C Hydro unit control Circulation pump "ON/OFF" control Water 3-way valve control Water 2-way valve control Operation instruction signal transmit Number of compressor revolutions control Number of outdoor fan motor revolutions control Pulse motor valve control 4-way valve control Outdoor unit control NOTE: No coding mode in default setting. When use the cooling mode, please change the FC02 to "0". Related FC FC No. 02 Setting item Cooling mode availability Default 1: No Setting available range 0: Yes 38 Item Operation flow and applicable data, etc. The following shows the operation modes and controlled objects. 8-2. Operation Operation Heating and Hot water Mode and mode Heat pump select Control Method Heat pump select Cooling only Controlled object Heat pump Backup heater Hot water cylinder heater O × × O O × O × O Heating only Hot water supply only for heating Heating side O O × Hot water supply side × × O for hot water supply Hot water supply side O × O Cooling and Hot water Heat pump select for cooling Cooling side O × × Hot water supply side × × O Heat pump select for hot water supply Cooling side × × × Hot water supply side O × O Heating side × × × × Not possible 1) Hot water supply operation 1) Operation start condition When the [HOT WATER] remote controller button is pressed and the following operation start condition is met, the operation starts.

*· TTW < 38°C is detected. 2) Operation mode determination An operation mode is determined according to the temperature of TTW sensor. · Heat pump operation selection *1 *2 · When TTW < 38°C (a zone in the right figure) is met, the heat pump operation is selected. · Heater operation selection When 45°C TTW < TSC_H (b zone in the right figure) is met, the heater operation is selected. · Thermostat status "OFF" selection When TTW TSC_H is met, the thermostat status "OFF" is selected. 3) Operation stop The operation stops in the following cases. · The remote controller gives a stop instruction. · TTW TSC_H is met. *1: When the outside temperature is -20°C or below, the heater operation is selected even if the TTW temperature falls into "a zone". *2: When "Hot water supply" and "Heating" are simultaneously in operation, the heater operation may be selected depending on the outside air temperature. Related FC FC No. 1E 1F 20 21 24 25 Setting item Upper limit of hot water supply temperature Lower limit of hot water supply temperature Heat pump start temperature Heat pump end temperature Outside air correction start temperature for hot water supply*3 Outside air correction temperature for hot water supply*3 Default 75°C 40°C 38°C 45°C 0°C 3 deg Setting available range 60-80°C 40-60°C 20-45°C 40-50°C -20-10°C 0 -15 deg O Possible TTW sensor (Hot water cylinder unit) TTW TSC_H (Temperature set with Thermostat OFF c Zone remote controller) Heater operation b Zone HP_H OFF 45°C HP_H ON 38°C Heat pump operation a Zone TSC_H is hot water temperature set with remote controller *3:When the outside temperature is 0°C or below, the boil-up temperature will be higher that setting temperature in hot water supply mode. 39 Item 8-2. Operation Mode and Control Method Operation flow and applicable data, etc. 2) Heating operation <Operation only for ZONE1> · This operation is enabled when DP_SW12_2 ZONE1 is set to "ON" (default). · The remote controller displays settings, and only the set temperature of can be changed. <Operation for ZONE1 and ZONE2 (2 temperatures control)> · This operation is enabled when DP_SW12_2 ZONE1 is set to "ON" (default) and DP_SW12_3 ZONE2 to "ON". · The remote controller displays settings, and the set temperatures of can be changed. · To set temperatures for and , use SELECT to switch and . · For 2 temperatures control, the flow adjustment of MIXING VALVE controls the water temperature of . For details, see the description on MIXING VALVE control in 8-3-5. 1) Operation start condition Pressing the [ZONE1, 2] button of remote controller starts a heating operation.*

**1 *2 2) Operation mode selection An operation mode is determined according to the temperature of TWI sensor. · Heat pump operation selection *1 *2 When TWI < TSC_F (d zone in the right figure) is met, the heat pump operation is selected. · Thermostat status "OFF" When TWI TSC_F (e zone in the right figure) is met, the thermostat status "OFF" is selected. 3) Operation stop condition When the following condition is met, the heating operation stops. · The remote controller gives a stop instruction. *1: When the outside temperature is -20°C or below, the heater operation is selected even if the TTW temperature falls into "d zone". *2: When "Hot water supply" and "Heating" are simultaneously in operation, the heater operation may be selected depending on the outside air temperature. Related FC FC No. 1A 1B 1C 1D Setting item Upper limit of heating (Zone1) limited temperature Lower limit of heating (Zone1) limited temperature Upper limit of heating (Zone2) limited temperature Lower limit of heating (Zone2) limited temperature Default 55 20 55 20 Setting available range 37-55°C 20-37°C 37-55°C 20-37°C TWI Thermostat off operation TSC_F diff2K C_f = 0 d zone e zone Heat pump operation TSC_F is a heating temperature set with remote controller 40 Item Operation flow and applicable data, etc. 3) Cooling operation 8-2. Operation Pressing the [ZONE1, 2] button and then [OPERATION MODE] starts a cooling operation. Mode and Control Method 1) Operation start condition TWI Pressing the [ZONE1, 2] button and then [OPERATION MODE] starts a cooling operation. TSC_F d zone Heat pump operation (cooling) Diff : 2k e zone Thermostat off operation 2) Operation mode selection An operation mode is determined according to the temperature of TWI sensor. · Heat pump operation selection *1 *2 When TWI TSC_F (d zone in the right figure) is met, the heat pump operation is selected. · Thermostat status "OFF" When TWI < TSC_F (e zone in the right figure) is met, the thermostat status "OFF" is selected. 3) Operation stop condition When either of the following conditions is met, the cooling operation stops. · The remote controller gives a stop instruction. · The operation is switched to heating. *1: When the outside temperature is 10°C or below, cooling does not start even if the TWI temperature falls into "d zone". Related FC FC No. 02 18 19 Cooling mode availability Upper limit of cooling setting temperature Lower limit of cooling setting temperature Setting item (Temperature set with remote controller) TSC_F TSC is a cooling temperature set with the remote controller Default 1: No 25 10 Setting available range 0: Yes 18-30°C 10-18°C 4) Simultaneous operations of "hot water supply" and "heating" At the time of "Hot water supply" and "Heating" simultaneous operation, the operation mode is select as follows depending on the outside air temperature. · f zone Operation with hot water supply priority A heat pump operation is performed in the hot water supply side, and a heating operation in the heating side. · g zone Operation with heating priority A heat pump operation is performed in the heating side, and a heating operation in the hot water supply side. Operation mode by zone Zone f g h Hot water supply side Heat pump * Heater Heater Heating side Stop * Heat pump Heater TO Hot water supply heat pump priority operation f zone Diff : 5deg g zone Diff : 5deg D (Note) Heating heat pump priority operation -20 Heater operation h zone * Note that after a heat pump operation for "Hot water supply" is selected in f zone, when the operation moves to a heater operation for "hot water" and then 5 minutes has passed (Hot water supply operation in b zone), the operation mode changes as follows. Zone f' Hot water supply side Heater Heating side Heat pump When TTW Related FC FC No. 07 22 45°C (FC: changeable) is met, the operation ends f' zone and returns to f zone.*