Heat-Recovery Multi-Split Air Conditioning System for Building Use

Features

- Heat-recovery multi-split air-conditioning system that can provide simultaneous cooling and heating from indoor units in this system
  - This system, allowing flexible selection of cooling or heating operation for each of the indoor units, is suitable for space with mixed cooling and heating operations such as rooms with large temperature differences due to solar radiation or heat generation of OA equipment.
  - From morning to evening, cooling and heating are switched according to the loads of indoor units, thus maintaining comfort.
- Automatic switching between cooling and heating at a setting temperature ± 1.5 °C
  - A high-speed vector inverter is equipped to control the number of revolutions of the high-efficiency DC twin rotary compressor in 0.1 Hz increments, thus enabling fine capacity control to maintain the setting temperature and realize high-level comfort.

Basic Concept or Summary

- Air-conditioning system using a heat-pump cycle
  Air-conditioning system for buildings uses heat-pump cycles of compression, condensation, expansion, and evaporation. In the case of a type that does not allow mixed cooling and heating operations (cooling/heating switching type), cooling is done by an indoor unit that absorbs heat and an outdoor unit that exhausts heat. On the other hand, heating is done the other way around, by an outdoor unit that absorbs heat and an indoor unit that exhausts heat. In contrast, the heat-recovery type has an additional unit that can change the flow direction of the refrigerant. It allows an indoor unit to simultaneously use absorbed and exhausted heat and enable mixed operation of cooling and heating. Furthermore, heat absorbed by one indoor unit that conducts cooling operation can be used as heat exhausted by another indoor unit that conducts heating operation in the other room, thus achieving an energy saving effect. Additionally, adjusting absorbed and exhausted heat also between outdoor units by dividing the heat exchanger will optimize the heat exchange volume of the entire system and enable smooth response to ability variations of indoor units.
Effects or Remarks

- **Comparison of COP with cooling/heating switching type**
  The latest model (marketed since September 2012) is based on two improved technologies: The first one distributes the heat exchange volume of the outdoor heat exchanger using electronic control valves in the simultaneous cooling/heating operation; the second one, exhaust heat recovery technology, minimizes the heat exhaust from outdoor units using the optimal control of compressors and outdoor fans and also makes effective use of this heat as the heat source for indoor units. These technologies improved the simultaneous cooling/heating COP(*1) by about 45 % over the average COP(*2) of the cooling/heating rating.

  (*1) Energy consumption efficiency of the simultaneous cooling/heating operation: A maximum value derived by calculation of ")(Cooling capacity + Heating capacity) / Power consumption)" when using a connection of an 8-HP outdoor unit and four 2-HP indoor units of ceiling cassette and four-direction exhaust type. Other assumed conditions are outdoor air at 7 °C, two indoor units currently cooling (room temperature of 27/19 °C DB/WB) and two indoor units currently heating (room temperature at 20 °C).

  (*2) Average energy consumption efficiency of cooling/heating: A value calculated according to the JIS B 8615-1 conditions, using a connection of 8-HP outdoor unit and two 4-HP indoor units of ceiling cassette and four-direction exhaust type with reference piping (equivalent length of 7.5 m and drop of 0 m).

  (*3) As of April 2012
  (Source: Toshiba Carrier)

- **High flexibility in piping design**
  Although allowing for coexistence of cooling and heating operations with one refrigerant pipe, a high flexibility in piping design is available, supporting a height difference between indoor units: 40 m and a farthest equivalent length: 200 m. Thus this system can be installed even in large buildings.

Installation in Practice or Schedule

**Domestic**
This system has been delivered to office buildings, hotels, and educational institutes.

**Overseas**
Sales were made in 20 countries. This system has been delivered to office buildings, hotels, and educational institutes.
(Approximate annual sale of 2,350 systems in domestic and international markets)

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