(19) Europäisches Patentamt
European Patent Office
Office européen des brevets

(11) EP 2 249 093 A1

(12) **EUROPEAN PATENT APPLICATION**
published in accordance with Art. 153(4) EPC

(43) Date of publication:
**10.11.2010 Bulletin 2010/45**

(21) Application number: **09703872.3**

(22) Date of filing: **20.01.2009**

(51) Int Cl.:
***F24F 11/02*** *(2006.01)*

(86) International application number:
**PCT/JP2009/050706**

(87) International publication number:
**WO 2009/093552 (30.07.2009 Gazette 2009/31)**

(84) Designated Contracting States:
**AT BE BG CH CY CZ DE DK EE ES FI FR GB GR HR HU IE IS IT LI LT LU LV MC MK MT NL NO PL PT RO SE SI SK TR**
Designated Extension States:
**AL BA RS**

(30) Priority: **24.01.2008 JP 2008014247**
**08.02.2008 JP 2008028926**

(71) Applicant: **Daikin Industries, Ltd.**
**Osaka 530-8323 (JP)**

(72) Inventors:
- **NISHINO, Atsushi**
  **Kusatsu-shi**
  **Shiga 525-8526 (JP)**
- **KAI, Takashige**
  **Kusatsu-shi**
  **Shiga 525-8526 (JP)**
- **SHIMOZU, Naotake**
  **Kusatsu-shi**
  **Shiga 525-8526 (JP)**
- **TAMBA, Satoru**
  **Kusatsu-shi**
  **Shiga 525-8526 (JP)**
- **HASHIMOTO, Satoshi**
  **Kusatsu-shi**
  **Shiga 525-8526 (JP)**
- **MISHIMA, Koji**
  **Kusatsu-shi**
  **Shiga 525-8526 (JP)**

(74) Representative: **Goddar, Heinz J.**
**Forrester & Boehmert**
**Pettenkoferstrasse 20-22**
**80336 München (DE)**

(54) **AIR CONDITIONER MANAGEMENT APPARATUS**

(57) The invention provides an air conditioner managing apparatus that, in a property such as an office building wherein a plurality of indoor units are installed, facilitates the work of specifying an indoor unit with a problem and checking the details thereof. An air conditioner managing apparatus **(40)** of this invention includes a storage unit, which accumulates operation data about numerous indoor units **(12aa-12ad, 12ba-12bd, 12ca-12cd,** ...); a first screen generating unit **(34g),** which generates a first screen wherein a plurality of indoor units-among target indoor units-with a problem can be visually verified based on the operation data; a second screen generating unit **(34h)** that generates a second screen wherein the operation data related to one specific indoor unit can be visually verified; and a display switching unit **(34i)** that-when one indoor unit of the plurality of indoor units with the problem displayed in the first screen is selected and an input of a prescribed button is accepted-switches to the display of the second screen related to that selected indoor unit.

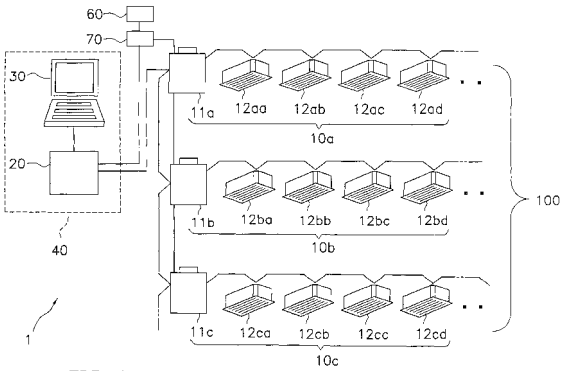



FIG. 1

EP 2 249 093 A1

## Description

### TECHNICAL FIELD

**[0001]** The present invention relates to an air conditioner managing apparatus.

### BACKGROUND ART

**[0002]** Conventionally, a multi-type air conditioner, which comprises at least one outdoor unit and a plurality of indoor units, is often used in properties such as office buildings. In addition, to facilitate the management of a plurality of indoor units in such a property, a management system is employed (refer to Patent Document 1: Japanese Unexamined Patent Application Publication No. 2003-302092) that is provided with an air conditioner managing apparatus, which is for collecting information from the air conditioners in the same property, and that centrally manages the indoor units in the property.

### DISCLOSURE OF THE INVENTION

<Technical Problem>

**[0003]** However, in such a case, an administrator of the property must check the information collected by the air conditioner managing apparatus about all of the indoor units so that he or she can specify an indoor unit with some kind of problem and check the details thereof. As a result, the information about the indoor units with no problems and whose information does not need to be checked is also checked, which makes the work troublesome.

**[0004]** An object of the present invention is to provide an air conditioner managing apparatus that, in a property such as an office building wherein a plurality of indoor units are installed, facilitates the work of specifying an indoor unit with a problem and checking the details thereof.

<Solution to Problem>

**[0005]** An air conditioner managing apparatus according to a first aspect of the present invention comprises a storage unit, a first screen generating unit, a second screen generating unit, and a display switching unit. The storage unit accumulates operation data about numerous indoor units. The first screen generating unit generates a first screen wherein a plurality of indoor units-among target indoor units-with a problem can be visually verified based on the operation data. The second screen generating unit generates a second screen wherein the operation data related to one specific indoor unit can be visually verified. The display switching unit-when one indoor unit of the plurality of indoor units with the problem displayed in the first screen is selected and an input of a prescribed button is accepted-switches to the display of the second screen related to the selected indoor unit.

**[0006]** In the air conditioner managing apparatus according to the present invention, operation data about numerous indoor units is accumulated, and a first screen is generated wherein a plurality of indoor units-among target indoor units-with a problem can be visually verified. In addition, a second screen is generated wherein the operation data related to one specific indoor unit can be visually verified. Furthermore, when one indoor unit of the plurality of indoor units with the problem displayed in the first screen is selected and an input of a prescribed button is accepted, the display is switched to the second screen related to the single selected indoor unit.

**[0007]** Thereby, it is possible to easily specify an indoor unit with a problem based on the operation data related to a plurality of indoor units; furthermore, detailed information can be easily checked.

**[0008]** An air conditioner managing apparatus according to a second aspect of the present invention is the air conditioner managing apparatus according to the first aspect of the present invention, and further comprises an identifying unit. The identifying unit identifies the plurality of the indoor units with the problem based on each viewpoint of a plurality of viewpoints. The first screen switchably displays, by viewpoint, the plurality of the indoor units with the problem.

**[0009]** In the air conditioner managing apparatus according to the present invention, the indoor units with the problem are identified based on each viewpoint of a plurality of viewpoints, and the indoor units with the problem are displayed, switchably by viewpoint, on the first screen. The plurality of viewpoints includes excessive consumption of electric power, long-time operation, reduced comfort, and the like.

**[0010]** Thereby, it is possible to easily check on, by viewpoint, the indoor units with a problem.

**[0011]** An air conditioner managing apparatus according to a third aspect of the present invention is the air conditioner managing apparatus according to the second aspect of the present invention, wherein the second screen switchably displays, based on the operation data, an operation status display screen that indicates an operation status of one indoor unit and an occurrence day display screen that indicates the problem occurrence day of the one indoor unit.

**[0012]** In the air conditioner managing apparatus according to the present invention, the operation data display screen displays the operation data of an identified indoor unit, and the occurrence day display screen displays the problem occurrence day.

**[0013]** Thereby, it is possible to easily check the problem occurrence day and the operation data for the problem occurrence day.

**[0014]** An air conditioner managing apparatus according to a fourth aspect of the present invention is the air conditioner managing apparatus according to the third aspect of the present invention, wherein the second screen displays a graph that aggregates the operation

data in accordance with the plurality of viewpoints.

**[0015]** In the air conditioner managing apparatus according to the present invention, the second screen displays a graph that aggregates the operation data of one indoor unit in accordance with the plurality of viewpoints.

**[0016]** Thereby, it is possible to visually verify the operation data simultaneously for the plurality of viewpoints; for example, it is possible to grasp the occurrence status (e.g., time slot, severity, etc.), the cause, the correlation, and the like for a plurality of problems.

**[0017]** An air conditioner managing apparatus according to a fifth aspect of the present invention is the air conditioner managing apparatus according to the fourth aspect of the present invention, wherein the operation status includes an average operation status of the one indoor unit during a prescribed interval and the operation status of the one indoor unit during a prescribed day within the prescribed interval; and the second screen displays, side by side, a graph that indicates the average operation status during the interval and a graph that indicates the operation status for the prescribed day.

**[0018]** In the air conditioner managing apparatus according to the present invention, the second screen displays, side by side, a graph that indicates the average operation status during the interval and a graph that indicates the operation status for the prescribed day.

**[0019]** Thereby, it is possible to easily compare the average operation status during the interval and the operation status for the prescribed day; for example, it is possible to grasp the problem occurrence frequency, the problem severity for one day, and the like.

**[0020]** An air conditioner managing apparatus according to a sixth aspect of the present invention is the air conditioner managing apparatus according to any one aspect of the third through fifth aspects of the present invention, wherein the second screen displays a method of correcting the problem based on the operation status.

**[0021]** In the air conditioner managing apparatus according to the present invention, the indoor unit with a problem and the method of correcting that indoor unit's problem are displayed, which makes it possible to effectively manage the indoor unit.

**[0022]** An air conditioner managing apparatus according to a seventh aspect of the present invention is the air conditioner managing apparatus according to the sixth aspect of the present invention, wherein the first screen includes a distribution diagram that indicates the distribution of the indoor units based on the problem severity.

**[0023]** In the air conditioner managing apparatus according to the present invention, the distribution of the identified indoor units based on problem severity is displayed.

**[0024]** Thereby, it is possible to visually grasp the number of indoor units with a problem and the severity of that problem.

**[0025]** An air conditioner managing apparatus according to an eighth aspect of the present invention is the air conditioner managing apparatus according to the seventh aspect of the present invention and further comprises an input unit that inputs an identification condition for identifying the plurality of the indoor units with the problem.

**[0026]** In the air conditioner managing apparatus according to the present invention, the plurality of the indoor units with the problem is identified based on an identification condition input by the input unit.

**[0027]** Thereby, it is possible to flexibly meet the user's needs.

<Advantageous Effects of Invention>

**[0028]** In the air conditioner managing apparatus according to the first aspect of the present invention, it is possible to easily specify the indoor units with a problem based on the operation data related to a plurality of indoor units; furthermore, detailed information can be easily checked.

**[0029]** In the air conditioner managing apparatus according to the second aspect of the present invention, it is possible to check on, by viewpoint, the indoor units with a problem.

**[0030]** In the air conditioner managing apparatus according to the third aspect of the present invention, it is possible to easily check the problem occurrence day and the operation data for the problem occurrence day.

**[0031]** In the air conditioner managing apparatus according to the fourth aspect of the present invention, it is possible to visually verify the operation data simultaneously for the plurality of viewpoints; for example, it is possible to grasp the occurrence status (e.g., time slot, severity, etc.), the cause, the correlation, and the like for a plurality of problems.

**[0032]** In the air conditioner managing apparatus according to the fifth aspect of the present invention, it is possible to easily compare the average operation data during the interval and the operation data for the prescribed day; for example, it is possible to grasp the problem occurrence frequency, the problem severity for one day, and the like.

**[0033]** In the air conditioner managing apparatus according to the sixth aspect of the present invention, it is possible to effectively manage the air conditioner.

**[0034]** In the air conditioner managing apparatus according to the seventh aspect of the present invention, it is possible to visually grasp the number of indoor units with a problem and the severity of that problem.

**[0035]** In the air conditioner managing apparatus according to the eighth aspect of the present invention, it is possible to flexibly meet the user's needs.

## BRIEF DESCRIPTION OF THE DRAWINGS

**[0036]**

**FIG. 1** shows the overall configuration of an air conditioner managing system according to the present

embodiment.

**FIG. 2A** shows the configuration of an air conditioner managing apparatus according to the present embodiment.

**FIG. 2B** shows a data structure of an operation data storage area in a local controller and a comprehensive managing apparatus.

**FIG. 2C** shows a data structure of an area for storing electric power consumption values (i.e., total electric power consumption values) in the local controller and the comprehensive managing apparatus.

**FIG. 2D** shows a data structure of an area for storing electric power consumption values (i.e., electric power consumption values) in the comprehensive managing apparatus.

**FIG. 2E** shows a data structure of an area for storing average values.

**FIG. 3** is a flowchart that shows a method of calculating a long-time operation occurrence day count using the air conditioner managing apparatus according to the present embodiment.

**FIG. 4** is a flow chart that shows a method of calculating a reduced comfort time using the air conditioner managing apparatus according to the present embodiment.

**FIG. 5** is an example of an identification screen related to excessive electric power consumption displayed by the air conditioner managing apparatus according to the present embodiment.

**FIG**. **6** is an example of an identification screen related to long-time operation displayed by the air conditioner managing apparatus according to the present embodiment.

**FIG**. **7A** is an example of an identification screen related to reduced comfort displayed by the air conditioner managing apparatus according to the present embodiment.

**FIG. 7B** is an example of an identification screen related to reduced comfort displayed by the air conditioner managing apparatus according to the present embodiment.

**FIG. 7C** is an example of an identification screen related to reduced comfort displayed by the air conditioner managing apparatus according to the present embodiment.

FIG. **8A** is an example of a detailed screen related to operation status displayed by the air conditioner managing apparatus according to the present embodiment.

**FIG. 8B** is an example of a detailed screen related to operation status displayed by the air conditioner managing apparatus according to the present embodiment.

**FIG. 9** is an example of a detailed screen related to problem occurrence days displayed by the air conditioner managing apparatus according to the present embodiment.

**FIG. 10** is an example of a settings screen of identification conditions displayed by the air conditioner managing apparatus according to the present embodiment.

**FIG. 11** shows the configuration of the air conditioner managing system according to a modified example (2) of the present embodiment.

**FIG. 12** shows a startup screen displayed by the air conditioner managing apparatus according to a modified example (8) of the present embodiment.

**FIG. 13** shows a settings screen of the identification conditions displayed by the air conditioner managing apparatus according to the modified example (8) of the present embodiment.

## BEST MODE FOR CARRYING OUT THE INVENTION

<First Embodiment>

**[0037]** The following text explains an air conditioner managing system 100 according to a first embodiment of the present invention, referencing the drawings.

<Overall Configuration>

**[0038]** **FIG. 1** shows the configuration of the air conditioner managing system of the present embodiment in a property **1.** The property **1** is a building, such as an office building or a tenant building, wherein a plurality of air conditioners **10a**, **10b, 10c,** ... and an air conditioner managing apparatus **40** are installed. Each of the air conditioners **10a, 10b, 10c,** ... is a multi-type air conditioner that comprises one outdoor unit and a plurality of indoor units connected to the outdoor unit.

**[0039]** In the air conditioner managing system according to the present embodiment, a power supply **60** is connected to outdoor units **11a, 11b**, **11c**, ..., and electric power from the power supply **60** is supplied to the air conditioners **10a, 10b, 10c,** ... via electric power supply lines. An electric power meter **70,** which is provided in the electric power supply line that connects the power supply **60** and the outdoor units **11a**, **11b**, **11c**, ...., measures the electric power supplied to the air conditioners **10a, 10b, 10c,** ... (i.e., the total electric power consumption).

**[0040]** The air conditioner managing apparatus **40** according to the present embodiment identifies-among numerous indoor units **12aa-12ad, 12ba-12bd, 12ca-12cd,** ... installed in the property **1**-those indoor units **12aa-12ad, 12ba-12bd, 12ca-12cd,** ... wherein prescribed problems are occurring and, furthermore, displays the details of these problems for each of the indoor units **12aa-12ad, 12ba-12bd, 12ca-12cd,** .... The prescribed problems are excessive consumption of electric power, long-time operation, and reduced comfort.

**[0041]** The following text explains the configuration of the air conditioner managing apparatus **40** and each of the problems the air conditioner managing apparatus **40** manages; furthermore, the explanation is based on an

illustrative example of a management screen that shows how the air conditioner managing apparatus **40** manages each of the problems.

Configuration of the Air Conditioner Managing Apparatus>

**[0042]** The air conditioner managing apparatus **40** comprises a local controller **20,** which is connected to the outdoor units **11a**, **11b**, **11c**, ..., and a comprehensive managing apparatus **30,** which is connected to the local controller **20.** The local controller **20** acquires operation data about the plurality of indoor units **12aa-12ad, 12ba-12bd, 12ca-12cd,** ... via the outdoor units **11a**, **11b**, **11c**, .... The comprehensive managing apparatus **30** comprehensively manages the operation data the local controller **20** acquires. Here, operation data is data related to either an operation history or an operation state. The data related to the operation history refers to information about a power supply ON/OFF state, a thermostat ON/OFF state, an operation mode (i.e., a cooling mode, a heating mode, a ventilating mode, and the like), a set temperature, an indoor temperature (i.e., an inlet temperature), and the like of the indoor units **12aa-12ad, 12ba-12bd, 12ca-12cd,** ... connected to the outdoor units **11a**, **11b**, **11c**, .... The data related to the operation state are values detected by various sensors attached to the air conditioners **10a, 10b, 10c,** .... Based on the operation data, it is possible to obtain information about operation time, a degree of opening of an indoor expansion valve, and the like of each of the indoor units **12aa-12ad, 12ba-12bd, 12ca-12cd,** .... Furthermore, the operation time in the present embodiment is, specifically, the thermostat ON time of the indoor units **12aa-12ad, 12ba-12bd, 12ca-12cd,** .... Here, the thermostat ON time is the time during which the indoor units **12aa-12ad, 12ba-12bd, 12ca-12cd,** ... supply cooling or heat. The following text explains the configurations of the local controller **20** and the comprehensive managing apparatus **30,** referencing **FIG. 2A.**

(i) Configuration of the Local Controller 20

**[0043]** The local controller **20** principally comprises a communication unit **21,** a storage unit **22,** and a control unit **23.**

(Communication Unit)

**[0044]** The communication unit **21** is an input-output port that sends signals to and receives signals from the air conditioners **10a**, **10b**, **10c,** ... and the comprehensive managing apparatus **30.**

(Storage Unit)

**[0045]** The storage unit **22** has an operation data storage area **22a** and an electric power consumption value storage area **22b.**

**[0046]** The operation data acquired by an information acquiring unit **23a,** which is discussed below, from the air conditioners **10a**, **10b, 10c,** ... is stored in the operation data storage area **22a.** Specifically, the operation data storage area **22a** is a tabular database, as shown in **FIG. 2B,** and is provided with fields related to "equipment ID," "time of day," "power supply ON/OFF state," "thermostat ON/OFF state," "operation mode," "set temperature," "indoor temperature," and "humidity." In addition, although not illustrated in **FIG. 2B,** fields related to the degree of opening of an expansion valve, the values detected by various sensors are also provided. The operation data storage area **22a** has storage capacity capable of storing operation data of a prescribed interval only (in the present embodiment, 30 min.), and operation data outside that interval are successively deleted with every new acquisition of operation data.

**[0047]** Values related to the total electric power consumption (i.e., total electric power consumption values) of the air conditioners **10a, 10b, 10c,** ... measured by the electric power meter **70** are stored in the electric power consumption value storage area **22b.** Specifically, the electric power consumption value storage area **22b** is also a tabular database, as shown in **FIG. 2C,** and is provided with fields related to "time of day," and "total electric power consumption."

**[0048]** Furthermore, in addition to the abovementioned area, the storage unit **22** has an area that stores a management program capable of being read and executed by the control unit **23,** which is discussed below.

(Control Unit)

**[0049]** The control unit **23** principally comprises the information acquiring unit **23a** and a transmission unit **23b.** The information acquiring unit **23a** acquires at prescribed intervals (in the present embodiment, every minute) operation data from the air conditioners **10a, 10b, 10c,** ... via the communication unit **21.** The transmission unit **23b** transmits at prescribed intervals (in the present embodiment, every minute) information stored in the operation data storage area **22a** and the electric power consumption value storage area **22b** to the comprehensive managing apparatus **30** via the communication unit **21.**

(ii) Configuration of the Comprehensive Managing Apparatus 30

**[0050]** The comprehensive managing apparatus **30** principally comprises a communication unit **31,** an input unit **32,** a storage unit **33,** a control unit **34,** and a display unit 35.

(Communication Unit)

**[0051]** The communication unit **31** is an input-output port that sends signals to and receives signals from the

local controller **20.**

(Input Unit)

**[0052]** The input unit **32** accepts instructions from a user. Upon acceptance of an instruction by the input unit **32,** a process corresponding to that instruction is executed by the comprehensive managing apparatus **30** and/or by the local controller **20** via the comprehensive managing apparatus **30.** For example, if the input unit **32** accepts an instruction to turn ON the power supply of the air conditioners **10a, 10b, 10c,** ..., then a power supply ON instruction is transmitted to the air conditioners **10a, 10b, 10c,** ... via the local controller **20.** In addition, upon acceptance of an input of a prescribed interval by the input unit **32,** an aggregation interval, which is the target interval during which a process is performed by the comprehensive managing apparatus **30** (discussed below), is determined. Furthermore, upon the user's inputting of an instruction to a screen displayed by the display unit 35 (discussed below), the instruction is accepted by the input unit **32.**

(Storage Unit)

**[0053]** The storage unit **33** has an operation data storage area **33a,** an electric power consumption value storage area **33b,** an average value storage area **33c,** a reference value storage area **33d,** a corrective action data storage area **33e,** and a determined value storage area **33f.**

**[0054]** The operation data storage area **33a** stores operation data of the air conditioners **10a, 10b, 10c,** ... transmitted from the local controller **20.** The operation data storage area **33a** is a tabular database, as in **FIG. 2B,** and is provided with fields related to "equipment ID," "time of day," "power supply ON/OFF state," "thermostat ON/OFF state," "operation mode," "set temperature," "indoor temperature," and "humidity."

**[0055]** Information related to electric power consumption is stored in the electric power consumption value storage area **33b.** Specifically, the information related to the electric power consumption includes a value related to the total electric power consumption of the air conditioners **10a, 10b, 10c,** ... transmitted from the local controller **20** (i.e., the total electric power consumption value) and a value related to the electric power consumption of each of the indoor units **12aa-12ad, 12ba-12bd, 12ca-12cd,** ... calculated by an apportioning unit **34a** (i.e., the electric power consumption values), which is discussed below. The total electric power consumption value is stored in a format identical to that of the total electric power consumption value stored in the electric power consumption value storage area **22b** discussed above. Namely, it is stored in a tabular database, as shown in **FIG. 2C,** and the database is provided with fields related to "time of day," and "total electric power consumption." The values related to the electric power consumption of each of the indoor units **12aa-12ad, 12ba-12bd, 12ca-12cd,** ... (i.e., the electric power consumption values) are also stored in a tabular database, as shown in **FIG. 2D,** and the database is provided with fields related to "equipment ID," "electric power consumption," and "time."

**[0056]** An average of the electric power consumption values, which is calculated by an average value calculating unit **34b** (discussed below), is stored in the average value storage area **33c.** The average value storage area **33c** is likewise a tabular database, as shown in **FIG. 2E,** and is provided with fields related to "equipment ID," "electric power consumption," and "time."

**[0057]** A reference value of the electric power consumption values, which is determined by a reference value determining unit **34c** (discussed below), is stored in the reference value storage area **33d.**

**[0058]** Data related to a plurality of corrective actions, which is selected by a corrective action selecting unit **34f** (discussed below), is stored in the corrective action data storage area **33e.**

**[0059]** The prescribed value that the input unit **32** accepts from the user is stored in the determined value storage area **33f.**

(Control Unit)

**[0060]** The control unit **34** comprises the apportioning unit **34a,** the average value calculating unit **34b,** the reference value determining unit **34c,** an identifying unit **34d,** a correcting unit **34e,** the corrective action selecting unit **34f,** a first screen generating unit **34g,** a second screen generating unit **34h,** and a display switching unit **34i.**

**[0061]** The apportioning unit **34a** apportions the total electric power consumption value of the air conditioners **10a, 10b, 10c,** ... stored in the electric power consumption value storage area **33b** among the operation data stored in the operation data storage area **33a** and calculates the electric power consumption of each of the indoor units **12aa-12ad, 12ba-12bd, 12ca-12cd,** .... Specifically, as shown in Japanese Unexamined Patent Application Publication No. H5-157336, the total electric power consumption is apportioned in accordance with information such as the degree of opening of the expansion valve of each of the indoor units **12aa-12ad, 12ba-12bd, 12ca-12cd,** and the electric power consumption of each of the indoor units **12aa-12ad, 12ba-12bd, 12ca-12cd,** ... is calculated. Furthermore, the electric power consumption values calculated by the apportioning unit **34a** are stored in the electric power consumption value storage area **33b** discussed above.

**[0062]** Based on the information stored in the operation data storage area **33a** and the electric power consumption value storage area **33b,** the average value calculating unit **34b** calculates the average electric power consumption per day of all of the indoor units **12aa-12ad, 12ba-12bd, 12ca-12cd,** ... over the prescribed interval accepted by the input unit **32** discussed above. The av-

erage value calculated by the average value calculating unit **34b** is stored in the average value storage area **33c** discussed above.

**[0063]** Based on the information stored in the operation data storage area **33a** and the electric power consumption value storage area **33b,** the reference value determining unit **34c** determines the reference value for determining which of the indoor units **12aa-12ad, 12ba-12bd, 12ca-12cd,** ... are consuming a large amount of electric power. This will be explained in detail using the <Target Problem and Determination Reference> column, which is discussed below. Furthermore, the reference value determined by the reference value determining unit **34c** is stored in the reference value storage area **33d** discussed above.

**[0064]** The identifying unit **34d** identifies the indoor units **12aa-12ad, 12ba-12bd, 12ca-12cd,** ... whose electric power consumption exceeds the reference value. Specifically, the identifying unit **34d** compares the average of the electric power consumption per day of each of the indoor units **12aa-12ad, 12ba-12bd, 12ca-12cd,** ... over the prescribed interval accepted by the input unit **32** discussed above with the reference value per day over the prescribed interval determined by the reference value determining unit **34c** and identifies those indoor units **12aa-12ad, 12ba-12bd, 12ca-12cd,** ... whose electric power consumption exceeds the reference value.

**[0065]** In accordance with an instruction accepted by the input unit **32,** the correcting unit **34e** corrects the identification result produced by the identifying unit **34d.** Here, the correcting unit **34e** performs its correction on the identification results for electric power consumption and reduced comfort. Correcting the identification result for electric power consumption means correcting the electric power consumption value of each of the indoor units **12aa-12ad, 12ba-12bd, 12ca-12cd,** ... , taking into consideration the air conditioning capacity of the identified indoor units **12aa-12ad, 12ba-12bd, 12ca-12cd,** .... Here, the air conditioning capacity is the horsepower or the capacity (kW), or the like of the indoor units **12aa-12ad, 12ba-12bd, 12ca-12cd,** .... In accordance with the instruction, the correcting unit **34e** divides the electric power consumption value of each of the indoor units **12aa-12ad, 12ba-12bd, 12ca-12cd**, ... by the horsepower. In the present embodiment, the correction of electric power consumption is performed by default. Correcting the identification result for reduced comfort involves ranking the indoor units **12aa-12ad, 12ba-12bd, 12ca-12cd, ...** taking into consideration the rate of occurrence of reduced comfort. In accordance with an instruction, the correcting unit **34e** ranks each of the indoor units **12aa-12ad, 12ba-12bd, 12ca-12cd**, ... taking into consideration the reduced comfort occurrence rate. Specifically, the equation *reduced comfort time* $\times$ *(reduced comfort time* $\div$ *operation time)* is used to calculate the reduced comfort time taking into consideration the occurrence rate.

**[0066]** The corrective action selecting unit **34f** selects an appropriate corrective action for each problem taking into consideration the operation data, such as the set temperature and the operation time, of the indoor units **12aa-12ad, 12ba-12bd, 12ca-12cd,** ... identified by the identifying unit **34d.** Specifically, corrective actions include reexamining the set temperature, reexamining the operation schedule, performing a filter inspection, and the like.

**[0067]** Based on the various values stored in the storage unit **33,** the first screen generating unit **34g** generates a first screen for displaying the information about the identified indoor units **12aa-12ad, 12ba-12bd , 12ca-12cd,** ... on the display unit 35. The first screen is a screen capable of switching the viewpoint and the indoor units **12aa-12ad, 12ba-12bd, 12ca-12cd,** ... identified by that viewpoint. In detail, tabs that display the identification result of each viewpoint of the plurality of viewpoints (i.e., excessive electric power consumption, long-time operation, and reduced comfort) are formed in the first screen. In each tab, the details of the corresponding identification result are displayed using a table and a scatter diagram. The first screen corresponds to an identification screen, which is discussed below, and is a screen wherein all of the identified indoor units **12aa-12ad, 12ba-12bd, 12ca-12cd,** ... can be visually verified.

**[0068]** The second screen generating unit **34h** generates a second screen, wherein the operation data related to a specific indoor unit of the identified indoor units **12aa-12ad, 12ba-12bd, 12ca-12cd,** ... can be visually verified. In detail, the second screen is a screen capable of switching between a tab that displays an operation status and a tab that displays problem occurrence days, both of which are based on the operation data related to the specific indoor unit. In the tab that displays the operation status, a graph is displayed that indicates the average operation status for the interval and the operating status for one day of the specific indoor unit. In the tab that displays the problem occurrence days, a table is displayed that indicates the problem occurrence days related to the plurality of viewpoints (i.e., excessive electric power consumption, long-time operation, and reduced comfort) of the specific indoor unit. In the second screen, a graph that aggregates operating data by the plurality of viewpoints is displayed. The second screen corresponds to a detailed screen, which is discussed below.

**[0069]** In accordance with an instruction that the input unit **32** accepts from the user, the display switching unit **34i** switches the display from the first screen, which is displayed by the display unit **35,** to the second screen, which displays the details of the indoor unit selected on the first screen. Namely, in accordance with an instruction from the user, the display switching unit **34i** switches the screen displayed by the display unit **35** from the identification screen, which displays the identification results of all of the indoor units, to the detailed screen of the single indoor unit selected on the identification screen.

**[0070]** The display unit **35** is a display screen for dis-

playing the information received by the comprehensive managing apparatus **30,** displaying the first screen, displaying the second screen, and the like. The information displayed by the display unit **35** will be explained in detail in the <Illustrative Example of Management Screen and Operation> section.

<Target Problem and Determination Reference>

**[0071]** The following text explains the prescribed problems, namely, excessive electric power consumption, long-time operation, and reduced comfort, of the indoor units identified by the air conditioner managing apparatus **40** according to the present embodiment.

(i) Excessive Electric Power Consumption

**[0072]** The excessive consumption of electric power means that the electric power consumption value is large. The air conditioner managing apparatus **40** determines the reference value related to excessive electric power consumption, identifies the indoor units **12aa-12ad, 12ba-12bd, 12ca-12cd,** ... that have consumed amounts of electric power that exceed the reference value, and furthermore displays those identified indoor units **12aa-12ad, 12ba-12bd, 12ca-12cd,** ... in descending order based on their electric power consumption value. Furthermore, if their electric power consumption value has been corrected by the correcting unit **34e** discussed above, then the order is determined based on the value corrected by the correcting unit **34e.**

**[0073]** In the present embodiment, the air conditioner managing apparatus **40** uses the equation $y = k \cdot a \cdot x$ to determine the reference value for determining which of the indoor units **12aa-12ad, 12ba-12bd, 12ca-12cd,** ... is consuming excessive electric power. Here, $y$ is the reference value of the electric power consumption over the prescribed interval, $x$ is an average operation time during the interval, $k$ is a prescribed value determined when identification conditions are set, and $a$ is the slope of the average electric power. The average electric power is the straight line approximation calculated using the least squares method for the average electric power consumption during the interval and the average operation time during the interval of each of the indoor units. Furthermore, when the average electric power consumption during the interval is given as $y(i)$ <$i = 1, 2, \ldots n$ ($n$: number of indoor units)> and the average operation time during the interval is given as $x$(i) <$i$ = 1, 2, ... $n$ ($n$: number of indoor units)>, the approximation curve is expressed by $y = a \cdot x$, wherein the slope $a$ is derived based on the equation below in which the squared error is minimized.

(Equation 1)

$$a = \frac{\sum_{i=1}^{n} x_i \cdot y_i}{\sum_{i=1}^{n} x_i^{\,2}}$$

(ii) Long-Time Operation

**[0074]** Long-time operation refers to operation wherein a cumulative operation time per day exceeds a prescribed determination value. The prescribed determination value is a prescribed value set by the user. In the present embodiment, the air conditioner managing apparatus **40** identifies those indoor units whose long-time operation occurrence day count during the target aggregation interval is greater than or equal to one day and furthermore displays the identified indoor units in descending order based on their long-time operation occurrence day count. The method of calculating the long-time operation occurrence day count, as shown in **FIG. 3,** is first to calculate the one day cumulative operation time (hrs) (i.e., a step **S1**), and next to determine whether the cumulative operation time is greater than or equal to the prescribed determination value (i.e., a step **S2).** Subsequently, in step **S2,** if the cumulative operation time is greater than or equal to the determination value, then one day is added to the long-time operation occurrence day count (i.e., a step **S3).** In step **S2,** if the cumulative operation time is less than the determination value, then the day count is not incremented.

(iii) Reduced Comfort

**[0075]** Reduced comfort refers to cases wherein an inlet temperature does not reach a temperature set in the indoor unit and to a state wherein a value of the difference between the average inlet temperature per hour and the average set temperature per hour is greater than or equal to the prescribed determination value. In the present embodiment, the air conditioner managing apparatus **40** identifies those indoor units wherein the reduced comfort state was greater than or equal to one hour during the target aggregation interval and furthermore displays the identified indoor units in order of the length of time spent in the reduced comfort state. Furthermore, if the correcting unit **34e** discussed above made a correction, then the order is determined based on the corrected value by the correcting unit **34e.** In the method of calculating the reduced comfort time, as shown in **FIG**. **4,** first, the method determines whether the thermostat ON time continued for 60 min. or longer (i.e., a step **S11**). If the thermostat ON time did continue for 60 min. or longer, then it means that the state wherein the inlet temperature did not reach the set temperature also continued for 60 min. or longer.

In the step **S11**, if the thermostat ON time did continue for 60 min. or longer, then the method determines whether the difference between the inlet temperature and the set temperature is greater than or equal to the prescribed determination value (i.e., a step **S12**). In the step **S12**, if the difference between the inlet temperature and the set temperature is greater than or equal to the determination value, then one hour is added to the reduced comfort time (i.e., a step **S13**).

<Illustrative Example of Management Screen and Operation>

**[0076]** The following text explains the screens displayed by the display unit **35** of the air conditioner managing apparatus **40.** Furthermore, in **FIG. 5** through **FIG. 10,** what is explained in the present embodiment as the electric power consumption value is indicated as the electric power consumption.

**[0077]** **FIG. 5** shows an identification screen wherein the indoor units **12aa-12ad, 12ba-12bd, 12ca-12cd,** ... with a problem are identified. As indicated by a symbol **501,** the identification screen identifies those indoor units with a problem from the three viewpoints of excessive electric power consumption, long-time operation, and reduced comfort discussed above. In the identification screen shown in **FIG. 5,** the excessive electric power consumption tab is selected, and the indoor units **12aa-12ad, 12ba-12bd, 12ca-12cd**, ... whose electric power consumption values are large are identified. Here, as indicated by a symbol **502,** aggregation is performed for the period beginning on August 1, 2007 (Wed.) and ending on August 31, 2007 (Fri.). The aggregation interval, which is set by default to the most recent two weeks, can be changed by the user. Furthermore, when identifying the indoor units **12aa-12ad, 12ba-12bd, 12ca-12cd,** ..., the user can select a target group (refer to a symbol **503).** Here, if the average electric power consumption per day during the aggregation interval of the indoor units **12aa-12ad, 12ba-12bd, 12ca-12cd,** ... that belong to the selected group exceeds the reference value, then those indoor units that exceed the reference value are identified by the identifying unit **34d** and displayed in a table **504** and a graph **505.** In the table **504,** the names of the identified indoor units **12aa-12ad, 12ba-12bd, 12ca-12cd,** ... are displayed in descending order of their electric power consumption values. In addition, the electric power consumption per day and the operation time per day corresponding to the names of the indoor units **12aa-12ad, 12ba-12bd, 12ca-12cd,** ... are displayed. In the graph **505,** each of the identified indoor units **12aa-12ad, 12ba-12bd, 12ca-12cd,** ... is plotted according to its electric power consumption and its operation time, thereby revealing the distribution of the identified indoor units **12aa-12ad, 12ba-12bd, 12ca-12cd,** .... In addition, in the graph **505,** the average values calculated by the average value calculating unit **34b** are indicated by a straight line (in the graph, the average electric power) and the reference value determined by the reference value determining unit **34c** is indicated by a broken line (in the graph, the determination reference). At the location indicated by a symbol **506,** there is a checkbox for indicating whether to correct the electric power consumption value based on the horsepower. As shown in **FIG. 5,** the checkbox is by default set to ON, and therefore the correcting unit **34e** performs the correction. Accordingly, the results indicated in the table **504** are displayed based on the values wherein the electric power consumption value was corrected based on horsepower. Furthermore, by setting the checkbox of the symbol **506** to OFF, an instruction to that effect is input to the input unit **32,** which disables the correction made by the correcting unit **34e.** Namely, the identification results are displayed based on electric power consumption values that were not corrected based on the horsepower. Furthermore, if a specific indoor unit of the indoor units **12aa-12ad, 12ba-12bd, 12ca-12cd,** ... is selected in the table **504,** then the corresponding indoor unit of the indoor units **12aa-12ad, 12ba-12bd, 12ca-12cd,** ... in the graph **505** is color highlighted.

**[0078]** In **FIG. 6,** the tab in the identification screen of **FIG. 5** has been switched (refer to a symbol **601)** and now the indoor units **12aa-12ad, 12ba-12bd, 12ca-12cd,** ... that were determined to exhibit long-time operation are displayed. A table **602** displays the indoor units **12aa-12ad, 12ba-12bd, 12ca-12cd,** ... identified as having exhibited long-time operation are displayed in descending order of the long-time operation occurrence day count, wherein the name of each of the indoor units **12aa-12ad, 12ba-12bd, 12ca-12cd,** ..., the long-time operation occurrence day count, and the average operating time per day during the aggregation interval are displayed. In a graph **603,** the identified indoor units **12aa-12ad, 12ba-12bd, 12ca-12cd,** ... are plotted, wherein the ordinate is the occurrence day count and the abscissa is the average operating time per day during the aggregation interval.

**[0079]** In **FIG. 7A,** the tab in the identification screen of **FIG. 5** or **FIG. 6** has been switched (refer to a symbol **701),** and now the indoor units **12aa-12ad, 12ba-12bd, 12ca-12cd,** ... determined to exhibit reduced comfort are displayed. In a table **702,** the indoor units **12aa-12ad, 12ba-12bd, 12ca-12cd,** ... identified as exhibiting reduced comfort are displayed in descending order of the average amount of time of reduced comfort per day during the aggregation interval, wherein the name of each of the indoor units **12aa-12ad, 12ba-12bd, 12ca-12cd**, ..., the average amount of time of reduced comfort per day during the aggregation interval, and the average operating time per day during the aggregation interval are displayed. In a graph **703,** the identified indoor units **12aa-12ad, 12ba-12bd, 12ca-12cd,** ... are plotted, wherein the ordinate is the average time of reduced comfort per day during the aggregation interval and the abscissa is the average operating time per day during the aggregation interval.

**[0080]** Like **FIG. 7A, FIG. 7B** is a screen that displays

the indoor units **12aa-12ad, 12ba-12bd, 12ca-12cd,** ... determined to exhibit reduced comfort; however, as indicated by a symbol **709** and a symbol **704A** in the lower part of the screen, it is possible to correct the identification results. Checking the checkbox of the symbol **709** makes it possible to display all of the indoor units of the target group. In addition, checking the checkbox of the symbol **704A** (refer to a symbol **704B** in **FIG. 7C)** displays the identification results based on values wherein the reduced comfort is weighted by the occurrence rate.

**[0081]** Furthermore, in the lower part of the identification screen, a Display Details button (i.e., a symbol **705),** a Set Identification Conditions button (i.e., a symbol **706),** a Print Screen button (i.e., a symbol **707),** and a Close button (i.e., a symbol **708)** are provided. Pressing the Print Screen button (i.e., the symbol **707)** prints the displayed screen, and pressing the Close button (i.e., the symbol **708)** closes the identification screen. If a specific indoor unit is selected in any of the tables **504, 602, 702** of the identification screen and the Display Details button (i.e., the symbol **705)** is pressed, then the input unit **32** accepts an instruction from the user, and the display switching unit **34i** switches the display from the identification screen to the details screen, which displays the detailed information of the specific, single indoor unit that was selected. The following text explains the details screen that displays the detailed information, referencing **FIG. 8A, FIG. 8B,** and **FIG. 9.**

**[0082]** The details screen of the single, selected indoor unit has a tab (i.e., a symbol **801)** that shows the details of the operation status and a tab (i.e., a symbol **802)** that shows the details of the problem occurrence days. In **FIG. 8A,** the operation status tab is selected; furthermore, graphs (i.e., symbols **803a, 803b)** that show the average operation status for the interval, graphs (i.e., symbols **804a, 804b)** that show the operation status for a specific day, the problem severity (i.e., a symbol **805),** and the corrective actions (i.e., a symbol **806)** are displayed. In the graphs **803a, 804a,** the ordinate indicates the operation status (i.e., the room temperature, the set temperature, and the electric power consumption) of the indoor units **12aa-12ad, 12ba-12bd, 12ca-12cd,** ..., and the abscissa indicates the time of day. In the graphs **803b, 804b,** the ordinate indicates the operation status (i.e., the operation time) of the indoor units **12aa-12ad, 12ba-12bd, 12ca-12cd,** ..., and the abscissa indicates the time of day. In the graphs (i.e., the symbols **804a, 804b),** the operation status is displayed for the specific day the user selected (in **FIG. 8A,** August 25, 2007 (Sat.)). The specific day selected can be changed to any date within the aggregation interval, and the first day of the aggregation interval is displayed by default. Furthermore, as shown in **FIG. 8B**, in the diagnostic results (i.e., the symbol **805)** and the corresponding corrective actions (i.e., the symbol **806),** only the identified problems and the corrective actions corresponding thereto are displayed; furthermore, for indicators for which there are no problems (i.e., in **FIG. 8B,** long-time operation and reduced comfort), no information is displayed.

**[0083]** The screen shown in **FIG. 9** displays the details of the problem occurrence days. In each of tables **901, 902, 903,** the problem occurrence days are sorted in descending order of the problem severity. In detail, in the table **901,** which lists the problem occurrence days for excessive electric power consumption, the occurrence days are sorted in descending order of the cumulative electric power consumed per day. In the table **902,** which lists the long-time operation, the occurrence days are sorted in descending order of the cumulative operation time per day. In the table **903,** which lists the reduced comfort, the occurrence days are sorted in descending order of the cumulative time per day determined to exhibit reduced comfort. Furthermore, in the case of identical cumulative values, the entry with the earlier date is prioritized in the sort. Furthermore, below each of the tables **901, 902, 903,** exemplary causes of each problem are displayed.

**[0084]** **FIG. 10** shows a settings screen for the identification conditions. This settings screen is displayed by pressing an Set Identification Conditions button (e.g., the symbol **706** in **FIG.** 7C) provided in the lower part of the identification screen (i.e., **FIG. 6** through **FIG. 7C),** which shows the indoor units **12aa-12ad, 12ba-12bd, 12ca-12cd,** ... identified according to the three viewpoints of excessive electric power consumption, long-time operation, and reduced comfort (all of which are discussed above).

**[0085]** The settings screen is provided with a location (i.e., a symbol **1001)** wherein the dates of the target interval is input, locations (i.e., symbols **1002a-1002c)** wherein the target indoor unit of the indoor units **12aa-12ad, 12ba-12bd, 12ca-12cd,** ... is selected, a location (i.e., a symbol **1003)** for changing the determination criteria for excessive electric power consumption, a location (i.e., a symbol **1004)** for changing the determination criteria for long-time operation, and a location (i.e., a symbol **1005)** for changing the determination criteria for reduced comfort. In the locations (i.e., the symbols **1002a-1002c)** wherein the target indoor unit of the indoor units **12aa-12ad, 12ba-12bd, 12ca-12cd,** ... is selected, the indoor units to be identified can be registered as a group and the conditions for identifying the problems can be set per group of the indoor units **12aa-12ad, 12ba-12bd, 12ca-12cd,**

<Characteristics>

**[0086]**

(1) If a plurality of multi-type air conditioners, each of which includes the plurality of indoor units **12aa-12ad, 12ba-12bd, 12ca-12cd,** ... , are installed in an office building and the like as illustrated in the present embodiment, then an administrator, who ascertains the operation status of the indoor units **12aa-12ad, 12ba-12bd, 12ca-12cd,** ..., checks the infor-

mation regarding all of the indoor units **12aa-12ad, 12ba-12bd, 12ca-12cd,** ... using the air conditioner managing apparatus **40,** which collects the information of each of the indoor units **12aa-12ad, 12ba-12bd, 12ca-12cd,** .... At this time, to check whether, for example, the indoor units **12aa-12ad, 12ba-12bd, 12ca-12cd,** ... are running efficiently or are operating needlessly, a considerable amount of time and labor is needed to check each and every one of the indoor units **12aa-12ad, 12ba-12bd, 12ca-12cd,** ....

However, in the air conditioner managing system according to the present embodiment, the air conditioner managing apparatus **40** provides determination references based on prescribed problems, namely, on the three indicators of excessive electric power consumption, long-time operation, and reduced comfort, identifies which indoor units **12aa-12ad, 12ba-12bd, 12ca-12cd,** ... exceed the relevant determination reference, and generates the identification screen that displays those indoor units **12aa-12ad, 12ba-12bd, 12ca-12cd,** .... In this identification screen, the identification results of all target indoor units **12aa-12ad, 12ba-12bd, 12ca-12cd,** ... are displayed, which makes it possible to grasp the problems as a whole. Thereby, it is possible to limit the number of the indoor units **12aa-12ad, 12ba-12bd, 12ca-12cd,** ... that needs to be checked. In addition, the air conditioner managing apparatus **40** generates the details screen that displays the detailed information of the indoor units **12aa-12ad, 12ba-12bd, 12ca-12cd,** ... identified based on the three indicators. Thereby, it is possible to check in detail the status of problems that occurred in the target interval for a single indoor unit. Furthermore, the display switching unit **34i** switches the identification screen displayed by the display unit 35 to the details screen of the single indoor unit selected via the identification screen. Accordingly, it is possible to easily specify the information of the indoor unit to be checked and to reduce the time and labor expended in performing that check.

(2) To estimate the amount of electric power consumed by the plurality of indoor units **12aa-12ad, 12ba-12bd, 12ca-12cd,** ... in an office building and the like, as exemplified in the present embodiment, the electric power consumption value of each of the indoor units is calculated by apportioning the total electric power consumption value among them. However, it is not appropriate to conclude that energy must be conserved for every one of the indoor units **12aa-12ad, 12ba-12bd, 12ca-12cd,** ... that exhibits a large electric power consumption value. Namely, even if the use of one of the indoor units **12aa-12ad, 12ba-12bd, 12ca-12cd,** ... is kept to the minimum necessary, there is still the case wherein that indoor unit will be used all day long and the case wherein that indoor unit will not be used all day long; in the former case, the electric power consumption value will be large, and consequently the above conclusion should not be made simply by comparing its electric power consumption value.

However, the air conditioner managing apparatus **40** according to the present invention acquires data related both to the operation history and to the operation state of each of the indoor units **12aa-12ad, 12ba-12bd, 12ca-12cd,** ..., and, based on this data, identifies those indoor units **12aa-12ad, 12ba-12bd, 12ca-12cd,** ... whose electric power consumption value per day during the prescribed interval is higher than the reference value. Namely, because the result of the identification takes into consideration the set temperature, the operation time, and the like, it is possible to easily specify the indoor units **12aa-12ad, 12ba-12bd, 12ca-12cd,** ... for which energy can be conserved.

Furthermore, when identifying those indoor units **12aa-12ad, 12ba-12bd, 12ca-12cd,** ... that can save energy, the air conditioner managing apparatus **40** according to the present embodiment considers the air conditioning capacity of each of the indoor units. Specifically, when identifying those indoor units that can save energy or when setting the order of priority, if the electric power consumption value of a given indoor unit is large with respect to its rated air conditioning capacity, a correction-in addition to the correction wherein the order of priority of an indoor unit whose electric power consumption value is large with respect to its operation time is increased-is made that increases that indoor unit's order of priority. Accordingly, it is possible to compare the electric power consumption values taking into consideration differences in the air conditioning capacities.

(3) In addition, the air conditioner managing apparatus **40** according to the present embodiment can display the identification results for those indoor units **12aa-12ad, 12ba-12bd, 12ca-12cd,** ... determined to exhibit reduced comfort based on the values corrected by the reduced comfort occurrence rate as discussed above. For example, if we consider the case wherein the average time determined to exhibit reduced comfort is three hours when the average operation time per day is eight hours and the case wherein the average time determined to exhibit reduced comfort is two hours when the average operation time per day is four hours, then the problem severity of the latter is greater. Accordingly, displaying the identification results based on the values corrected for occurrence rate makes it possible to increase the priority of an indoor unit whose problem severity is substantially greater.

<Modified Examples>

**[0087]**

(1) The air conditioner managing apparatus **40** in the present embodiment comprises the local controller **20** and the comprehensive managing apparatus **30,** but the air conditioner managing apparatus **40** may be a single apparatus that has the functions provided to the local controller **20** and the comprehensive managing apparatus **30.**

(2) The present embodiment explained the air conditioner managing system that uses the single air conditioner managing apparatus **40** to manage a plurality of the air conditioners **10a, 10b, 10c,** ... in one property; however, as shown in **FIG. 11,** a remote management system **1000** may be adopted wherein a plurality of air conditioner managing apparatuses **40a, 40b, 40c,** ... installed in a plurality of properties **1a, 1b, 1c,** ... manage air conditioners **100a, 100b, 100c,** ... installed in the properties **1a, 1b**, **1c,** ..., respectively, and the air conditioners **100a, 100b, 100c,** ... are managed remotely via a communication circuit **6.**

In such a case, a remote management apparatus **50** comprises a communication unit **51,** a display unit **52,** an input unit **53,** and a control unit **54.** The communication unit **51** sends signals to and receives signals from the air conditioner managing apparatuses **40a, 40b, 40c,** ... , and a screen needed for processing in the remote management apparatus **50** is displayed by the display unit **52.** The input unit **53** accepts instructions from the user. The control unit **54** comprises an information acquiring unit **54a,** an average value calculating unit **54b,** a reference value determining unit **54c,** a correcting unit **54d,** and a transmitting unit **54e.** The information acquiring unit **54a** acquires from the air conditioner managing apparatuses **40a, 40b, 40c,** ... the operation data acquired by the air conditioner managing apparatuses **40a, 40b, 40c,** ... from the air conditioners **10a, 10b, 10c.** The average value calculating unit **54b,** the reference value determining unit **54c,** and the correcting unit **54d** of the remote management apparatus **50** have the same functions as the average value calculating unit **34b,** the reference value determining unit **34c,** and the correcting unit **34e** of the comprehensive managing apparatus **30** in the present embodiment. The transmitting unit **54e** transmits to the air conditioner managing apparatuses **40a, 40b, 40c,** ... the values acquired by the average value calculating unit **54b,** the reference value determining unit **54c,** and the correcting unit **54d.** Thereby, each of the air conditioner managing apparatuses **40a, 40b, 40c,** ... can acquire the reference value and the average value that takes into consideration not only the operation data acquired from the air conditioners **10a, 10b, 10c,** ... installed in one property, but also the operation data acquired from other air conditioners **10a, 10b, 10c,** .... Thereby, it is possible to compare the reference value and the average value based on a large amount of operation data for the electric power consumption values of each of the indoor units **12aa-12ad, 12ba-12bd, 12ca-12cd,** ....

(3) In the present embodiment, the straight line approximation calculated using the least squares method is used as the average electric power and the reference value is determined based thereon; however, the reference value may be determined using a correction value obtained by the method of the present embodiment.

(4) In the present embodiment, the operation time is the thermostat ON time of each of the indoor units **12aa-12ad, 12ba-12bd, 12ca-12cd,** ... , but the operation time may be the time during which each of the indoor units **12aa-12ad, 12ba-12bd, 12ca-12cd,** ... is operating. In such a case, the operation time may be determined to be the time during which the power supply of the given indoor unit of the indoor units **12aa-12ad, 12ba-12bd, 12ca-12cd,** ... is ON; furthermore, the operation time may also be the time when only the fan is running.

(5) The corrective action selecting unit **34f** considers the operation data, such as the set temperature and the operation time, of the indoor units **12aa-12ad, 12ba-12bd, 12ca-12cd,** ... identified by the identifying unit **34d** and selects an appropriate corrective action for each problem; however, a plurality of corrective actions may be stored for each problem and, based on the identification results, one corrective action may be selected from among the plurality of corrective actions.

(6) In the present embodiment, the graphs (i.e., the symbols **804a, 804b)** that show the operating status for a specific day display the first day of the aggregation interval as a default; however, the default may be set such that the day with the highest problem severity is displayed.

(7) In the details screens shown in **FIG. 8A** and **FIG. 8B**, the time slots during which problems occur can be emphasized in the graphs (i.e., the symbols **803a, 803b)** that show the average operation status during the interval and the graphs (i.e., the symbols **804a, 804b)** that show the operation status on a specific day by, for example, distinguishing the color of the time slots during which problems occur from the color of other time slots, appending some kind of mark to the time slots during which problems occur, and the like. Thereby, it is possible to much more easily identify the time slots during which problems occur.

Furthermore, in the screen that displays the details regarding problem occurrence days in **FIG. 9,** a design may be adopted such that clicking one of the occurrence days in any of the tables **901, 902, 903** displays graphs (i.e., the symbols **804a, 804b)** that show the operation status for that occurrence day. Thereby, the operation data on the day on which the problem occurred can be easily checked.

(8) By selecting the Set Identification Conditions button (i.e., the symbol **706)** provided in the lower part

of the identification screen (in **FIG. 5** through **FIG. 7C),** the air conditioner managing apparatus **40** according to the present embodiment transitions to the identification conditions settings screen shown in **FIG. 10,** wherein the desired identification conditions can be set; however, a design may be adopted wherein the identification conditions can be stored separately for each user. Thereby, by selecting the user at the startup of the air conditioner managing apparatus **40** as shown in **FIG. 12,** it is possible to check on the indoor units identified by the identification conditions a given user desires.

Furthermore, as shown in **FIG. 13,** a design may be adopted wherein an identification condition equation can be input directly and a pattern of that equation can be stored. Thereby, a plurality of the patterns can be stored in advance and the indoor units with problems can be identified based on the desired pattern.

(9) In the air conditioner managing apparatus **40** according to the present embodiment, when a specific indoor unit of the indoor units **12aa-12ad, 12ba-12bd, 12ca-12cd,** ... is selected in the table **504** (refer to **FIG. 5)** displayed in the identification screen, the corresponding indoor unit of the indoor units **12aa-12ad, 12ba-12bd, 12ca-12cd,** ... in the graph **505** is color highlighted; however, a design may be adopted wherein the corresponding indoor unit of the indoor units **12aa-12ad, 12ba-12bd, 12ca-12cd,** ... in the graph 505 flashes on and off instead of or in combination with the color highlighting.

<Other Embodiment>

**[0088]** The above text explained an embodiment of the present invention based on the drawings, but the specific constitution is not limited to these embodiments, and it is understood that variations and modifications may be effected without departing from the spirit and scope of the invention.

## INDUSTRIAL APPLICABILITY

**[0089]** The present invention is useful as an air conditioner managing apparatus that facilitates the work of specifying and checking the details of indoor units with problems in a property such as an office building wherein a plurality of indoor units are installed.

## EXPLANATION OF THE REFERENCE NUMERALS

**[0090]**

**20** Local controller
**30** Comprehensive managing apparatus
**40** Air conditioner managing apparatus
**50** Remote management apparatus

Patent Document 1
Japanese Unexamined Patent Application Publication No. 2003-302092

## Claims

**1.** An air conditioner managing apparatus, comprising:

a storage unit **(33)** configured to accumulate operation data about numerous indoor units;
a first screen generating unit **(34g)** configured to generate a first screen wherein a plurality of indoor units-among target indoor units-with a problem can be visually verified based on the operation data;
a second screen generating unit **(34h)** configured to generate a second screen wherein the operation data related to one specific indoor unit can be visually verified; and
a display switching unit **(34i)** that-when one indoor unit of the plurality of indoor units with the problem displayed in the first screen is selected and an input of a prescribed button is accepted-switches to the display of the second screen related to the selected indoor unit.

**2.** An air conditioner managing apparatus according to claim 1, further comprising:

an identifying unit **(34d)** that identifies the plurality of the indoor units with the problem based on each viewpoint of a plurality of viewpoints; wherein,
the first screen switchably displays, by viewpoint, the plurality of the indoor units with the problem.

**3.** An air conditioner managing apparatus according to claim 2, wherein
the second screen switchably displays, based on the operation data, an operation status display screen that indicates an operation status of one indoor unit and an occurrence day display screen that indicates the problem occurrence day of the one indoor unit.

**4.** An air conditioner managing apparatus according to claim 3, wherein
the second screen displays a graph that aggregates the operation data in accordance with the plurality of viewpoints.

**5.** An air conditioner managing apparatus according to claim 4, wherein
the operation status includes an average operation status of the one indoor unit during a prescribed interval and the operation status of the one indoor unit during a prescribed day within the prescribed inter-

val; and
the second screen displays, side by side, a graph that indicates the average operation status during the interval and a graph that indicates the operation status for the prescribed day.

**6.** An air conditioner managing apparatus according to any one claim of claim 3 through claim 5, wherein
the second screen displays a method of correcting the problem based on the operation status.

**7.** An air conditioner managing apparatus according to claim 6, wherein
the first screen includes a distribution diagram that indicates the distribution of the indoor units based on the problem severity.

**8.** An air conditioner managing apparatus according to claim 7, further comprising:

an input unit that inputs an identification condition for identifying the plurality of the indoor units with the problem.

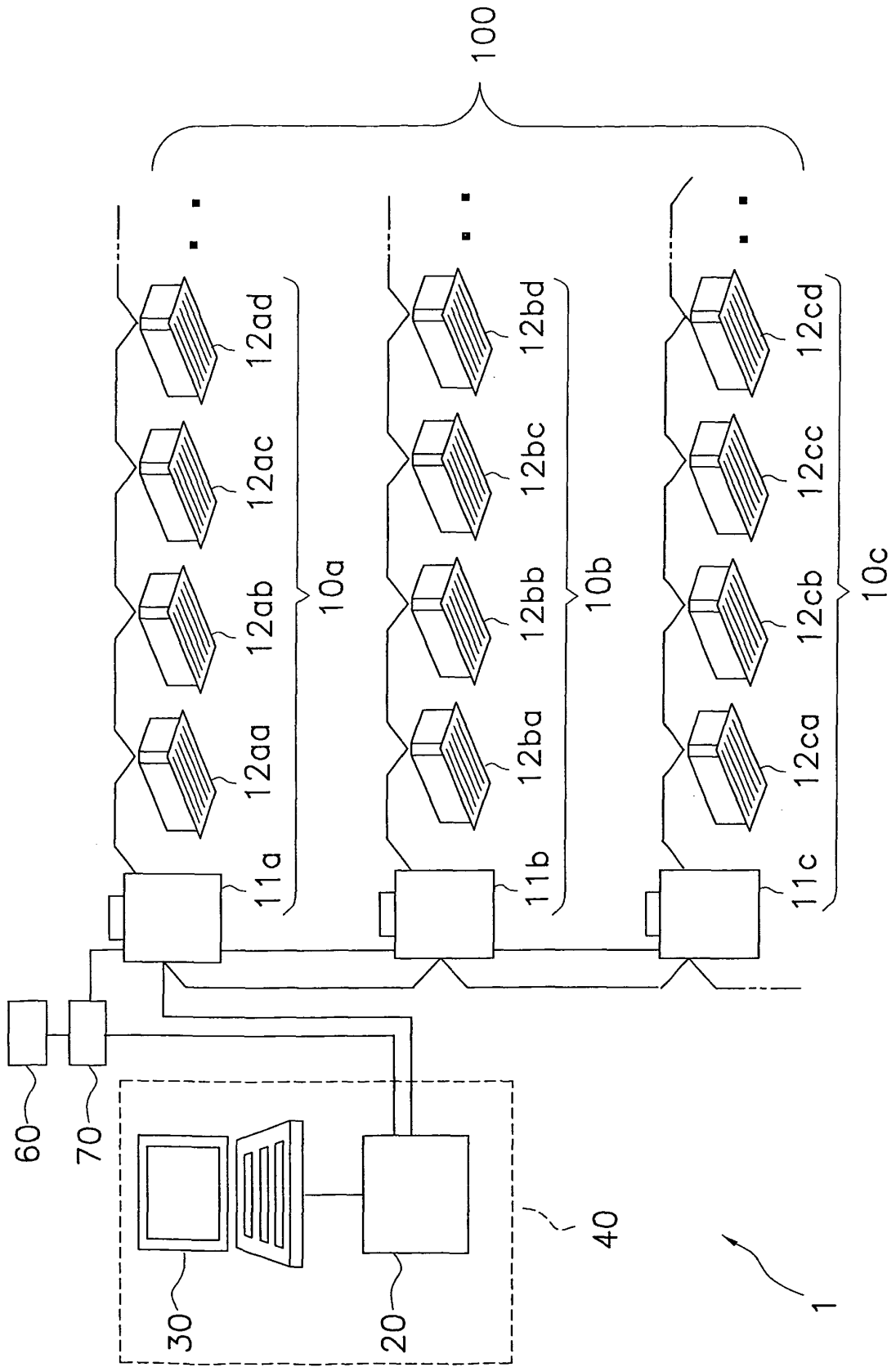

100
10a
10b
10c
11a
11b
11c
12aa
12ab
12ac
12ad
12ba
12bb
12bc
12bd
12ca
12cb
12cc
12cd
20
30
40
60
70
1

FIG. 1

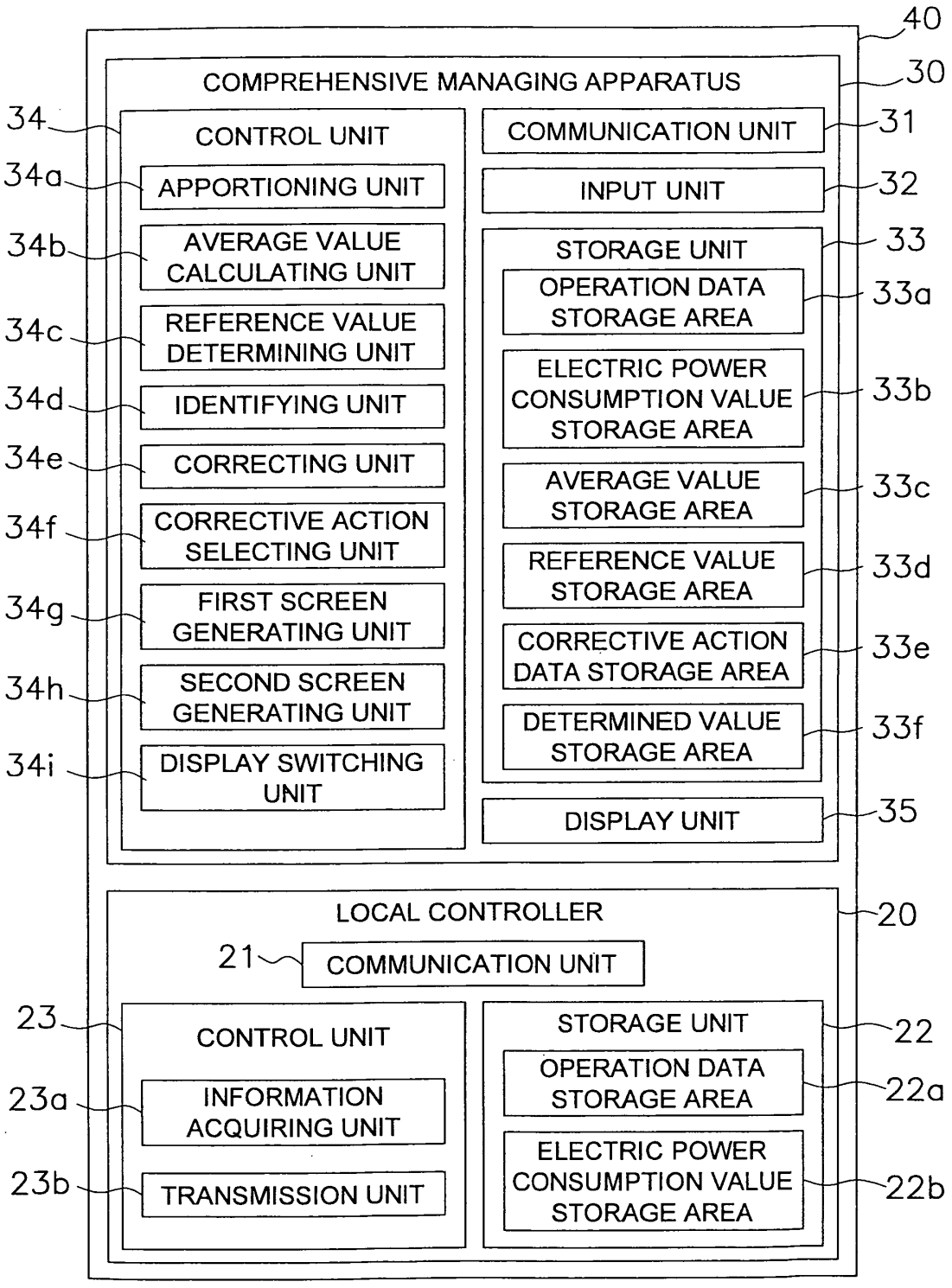
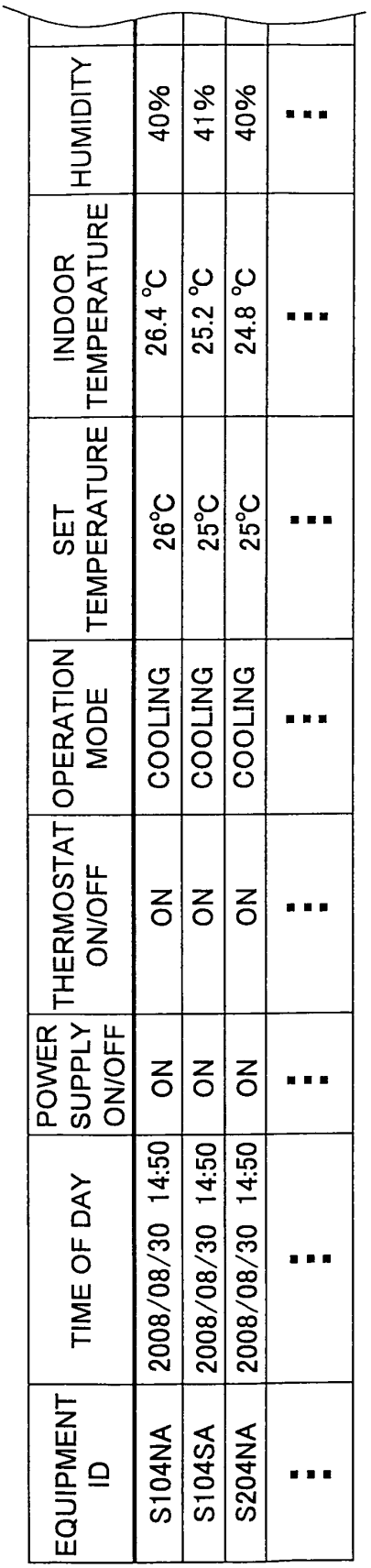

40
COMPREHENSIVE MANAGING APPARATUS
30
34
CONTROL UNIT
34a
APPORTIONING UNIT
34b
AVERAGE VALUE CALCULATING UNIT
34c
REFERENCE VALUE DETERMINING UNIT
34d
IDENTIFYING UNIT
34e
CORRECTING UNIT
34f
CORRECTIVE ACTION SELECTING UNIT
34g
FIRST SCREEN GENERATING UNIT
34h
SECOND SCREEN GENERATING UNIT
34i
DISPLAY SWITCHING UNIT
COMMUNICATION UNIT
31
INPUT UNIT
32
STORAGE UNIT
33
OPERATION DATA STORAGE AREA
33a
ELECTRIC POWER CONSUMPTION VALUE STORAGE AREA
33b
AVERAGE VALUE STORAGE AREA
33c
REFERENCE VALUE STORAGE AREA
33d
CORRECTIVE ACTION DATA STORAGE AREA
33e
DETERMINED VALUE STORAGE AREA
33f
DISPLAY UNIT
35
LOCAL CONTROLLER
20
21
COMMUNICATION UNIT
23
CONTROL UNIT
23a
INFORMATION ACQUIRING UNIT
23b
TRANSMISSION UNIT
STORAGE UNIT
22
OPERATION DATA STORAGE AREA
22a
ELECTRIC POWER CONSUMPTION VALUE STORAGE AREA
22b

FIG. 2A



| EQUIPMENT ID | TIME OF DAY | POWER SUPPLY ON/OFF | THERMOSTAT ON/OFF | OPERATION MODE | SET TEMPERATURE | INDOOR TEMPERATURE | HUMIDITY |
|---|---|---|---|---|---|---|---|
| S104NA | 2008/08/30 14:50 | ON | ON | COOLING | 26°C | 26.4 °C | 40% |
| S104SA | 2008/08/30 14:50 | ON | ON | COOLING | 25°C | 25.2 °C | 41% |
| S204NA | 2008/08/30 14:50 | ON | ON | COOLING | 25°C | 24.8 °C | 40% |
| ... | ... | ... | ... | ... | ... | ... | ... |

FIG. 2B

FIG. 2C

| TIME OF DAY | TOTAL ELECTRIC POWER CONSUMPTION |
|---|---|
| 2008/01/05 9:00 | XXXX kWh |
| 2008/01/05 10:00 | XXXX kWh |
| 2008/01/05 11:00 | XXXX kWh |
| ⋮ | ⋮ |

FIG. 2D

| EQUIPMENT ID | ELECTRIC POWER CONSUMPTION (kWh) | TIME (hr) |
|---|---|---|
| S104NA | 942 | 285 |
| S104SA | 849 | 285 |
| S204NA | 780 | 288 |
| ⋮ | ⋮ | ⋮ |

FIG. 2E

| EQUIPMENT ID | ELECTRIC POWER CONSUMPTION (kWh) | TIME (hr) |
|---|---|---|
| S104NA | 31.4 | 9.5 |
| S104SA | 28.3 | 9.5 |
| S204NA | 26.0 | 9.6 |
| ⋮ | ⋮ | ⋮ |

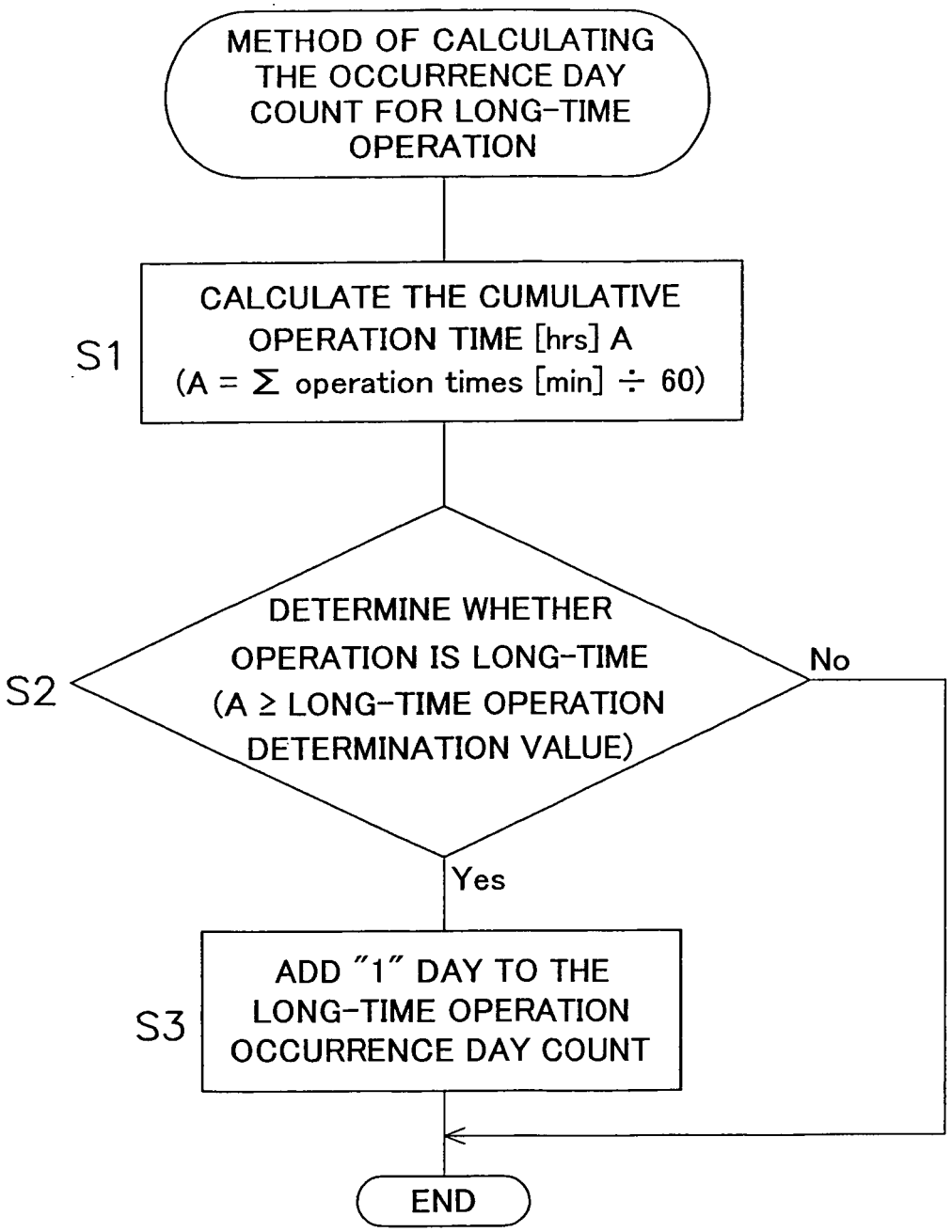

METHOD OF CALCULATING THE OCCURRENCE DAY COUNT FOR LONG-TIME OPERATION
S1
CALCULATE THE CUMULATIVE OPERATION TIME [hrs] A
(A = Σ operation times [min] ÷ 60)
S2
DETERMINE WHETHER OPERATION IS LONG-TIME
(A ≥ LONG-TIME OPERATION DETERMINATION VALUE)
No
Yes
S3
ADD "1" DAY TO THE LONG-TIME OPERATION OCCURRENCE DAY COUNT
END

FIG. 3

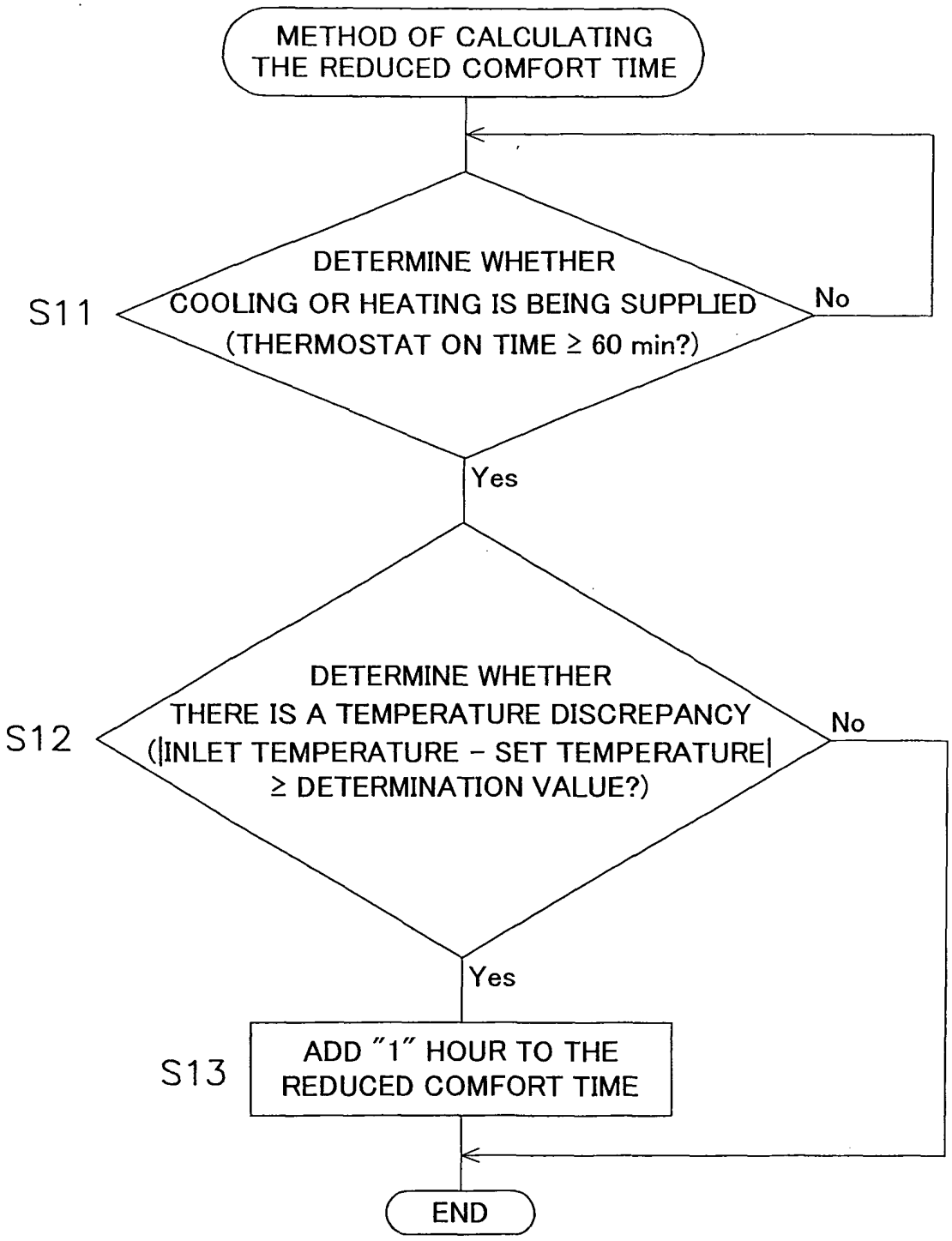

METHOD OF CALCULATING THE REDUCED COMFORT TIME
S11
DETERMINE WHETHER COOLING OR HEATING IS BEING SUPPLIED (THERMOSTAT ON TIME ≥ 60 min?)
No
Yes
S12
DETERMINE WHETHER THERE IS A TEMPERATURE DISCREPANCY (|INLET TEMPERATURE − SET TEMPERATURE| ≥ DETERMINATION VALUE?)
No
Yes
S13
ADD "1" HOUR TO THE REDUCED COMFORT TIME
END

FIG. 4

FIG. 5

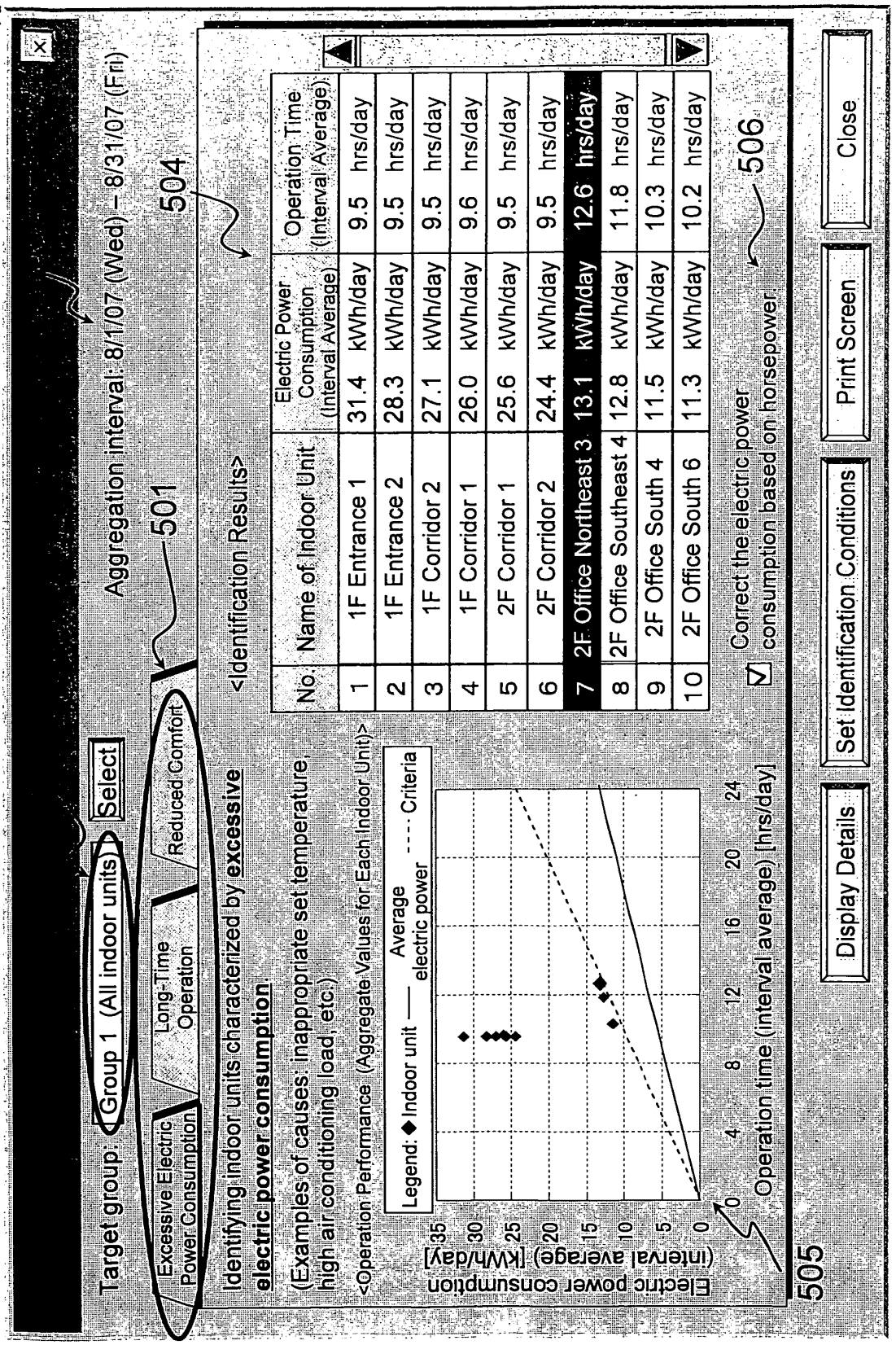

Target group: Group 1 (All indoor units) Select
Aggregation interval: 8/1/07 (Wed) – 8/31/07 (Fri)
Excessive Electric Power Consumption
Long-Time Operation
Reduced Comfort
501
504
Identifying indoor units characterized by excessive electric power consumption
<Identification Results>
(Examples of causes: inappropriate set temperature, high air conditioning load, etc.)
<Operation Performance (Aggregate Values for Each Indoor Unit)>
Legend: ◆ Indoor unit — Average electric power ---- Criteria
Electric power consumption (interval average) [kWh/day]
Operation time (interval average) [hrs/day]
505
No.
Name of Indoor Unit
Electric Power Consumption (Interval Average)
Operation Time (Interval Average)
1 1F Entrance 1 31.4 kWh/day 9.5 hrs/day
2 1F Entrance 2 28.3 kWh/day 9.5 hrs/day
3 1F Corridor 2 27.1 kWh/day 9.5 hrs/day
4 1F Corridor 1 26.0 kWh/day 9.6 hrs/day
5 2F Corridor 1 25.6 kWh/day 9.5 hrs/day
6 2F Corridor 2 24.4 kWh/day 9.5 hrs/day
7 2F Office Northeast 3 13.1 kWh/day 12.6 hrs/day
8 2F Office Southeast 4 12.8 kWh/day 11.8 hrs/day
9 2F Office South 4 11.5 kWh/day 10.3 hrs/day
10 2F Office South 6 11.3 kWh/day 10.2 hrs/day
Correct the electric power consumption based on horsepower
506
Display Details
Set Identification Conditions
Print Screen
Close

FIG. 6

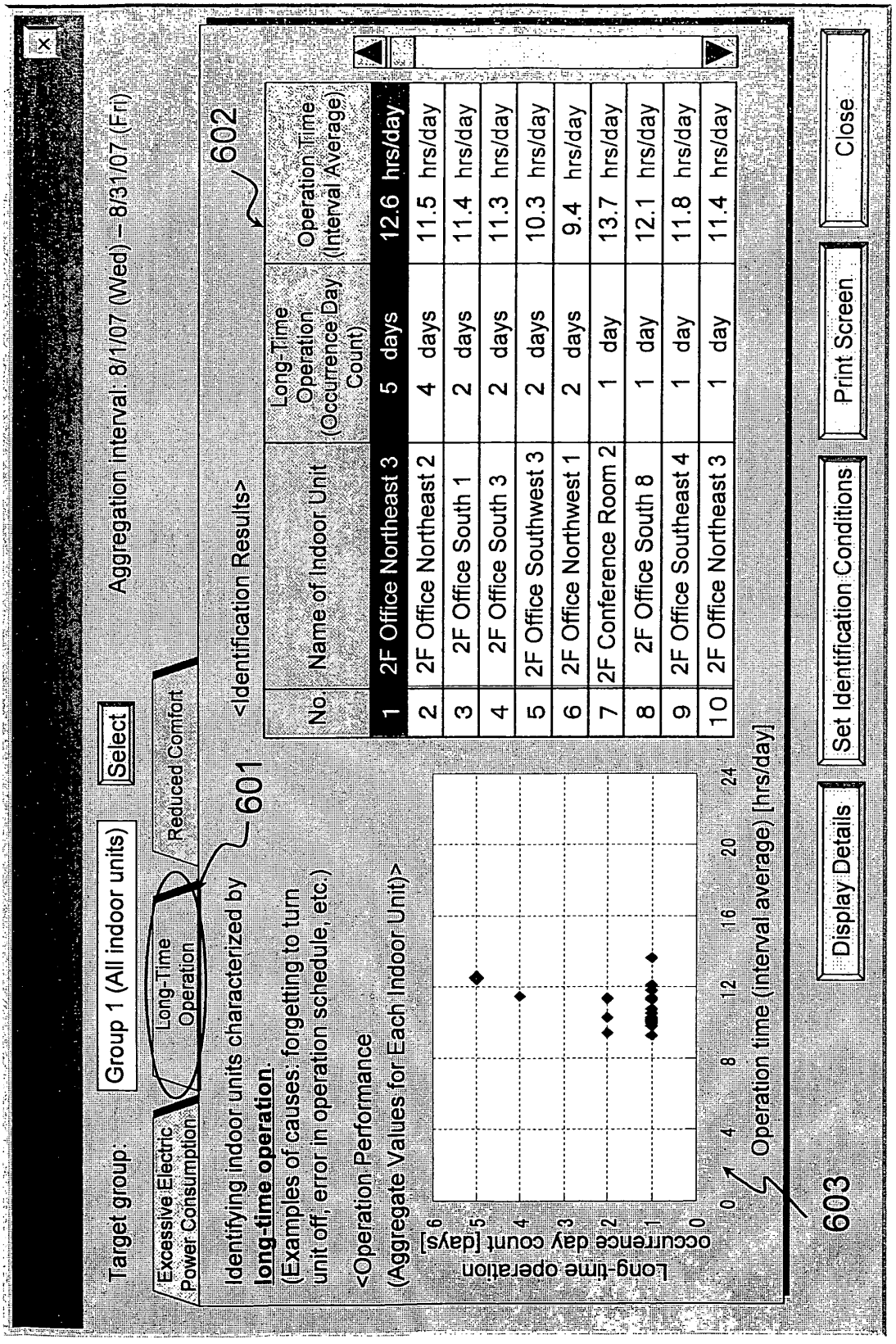

Target group:
Group 1 (All indoor units)
Select
Aggregation interval: 8/1/07 (Wed) – 8/31/07 (Fri)
Excessive Electric Power Consumption
Long-Time Operation
Reduced Comfort
601
602
Identifying indoor units characterized by long-time operation.
(Examples of causes: forgetting to turn unit off, error in operation schedule, etc.)
<Operation Performance (Aggregate Values for Each Indoor Unit)>
<Identification Results>
No.
Name of Indoor Unit
Long-Time Operation (Occurrence Day Count)
Operation Time (Interval Average)
1 2F Office Northeast 3 5 days 12.6 hrs/day
2 2F Office Northeast 2 4 days 11.5 hrs/day
3 2F Office South 1 2 days 11.4 hrs/day
4 2F Office South 3 2 days 11.3 hrs/day
5 2F Office Southwest 3 2 days 10.3 hrs/day
6 2F Office Northwest 1 2 days 9.4 hrs/day
7 2F Conference Room 2 1 day 13.7 hrs/day
8 2F Office South 8 1 day 12.1 hrs/day
9 2F Office Southeast 4 1 day 11.8 hrs/day
10 2F Office Northeast 3 1 day 11.4 hrs/day
Long-time operation occurrence day count [days]
0
1
2
3
4
5
6
0
4
8
12
16
20
24
Operation time (interval average) [hrs/day]
603
Display Details
Set Identification Conditions
Print Screen
Close

FIG. 7A

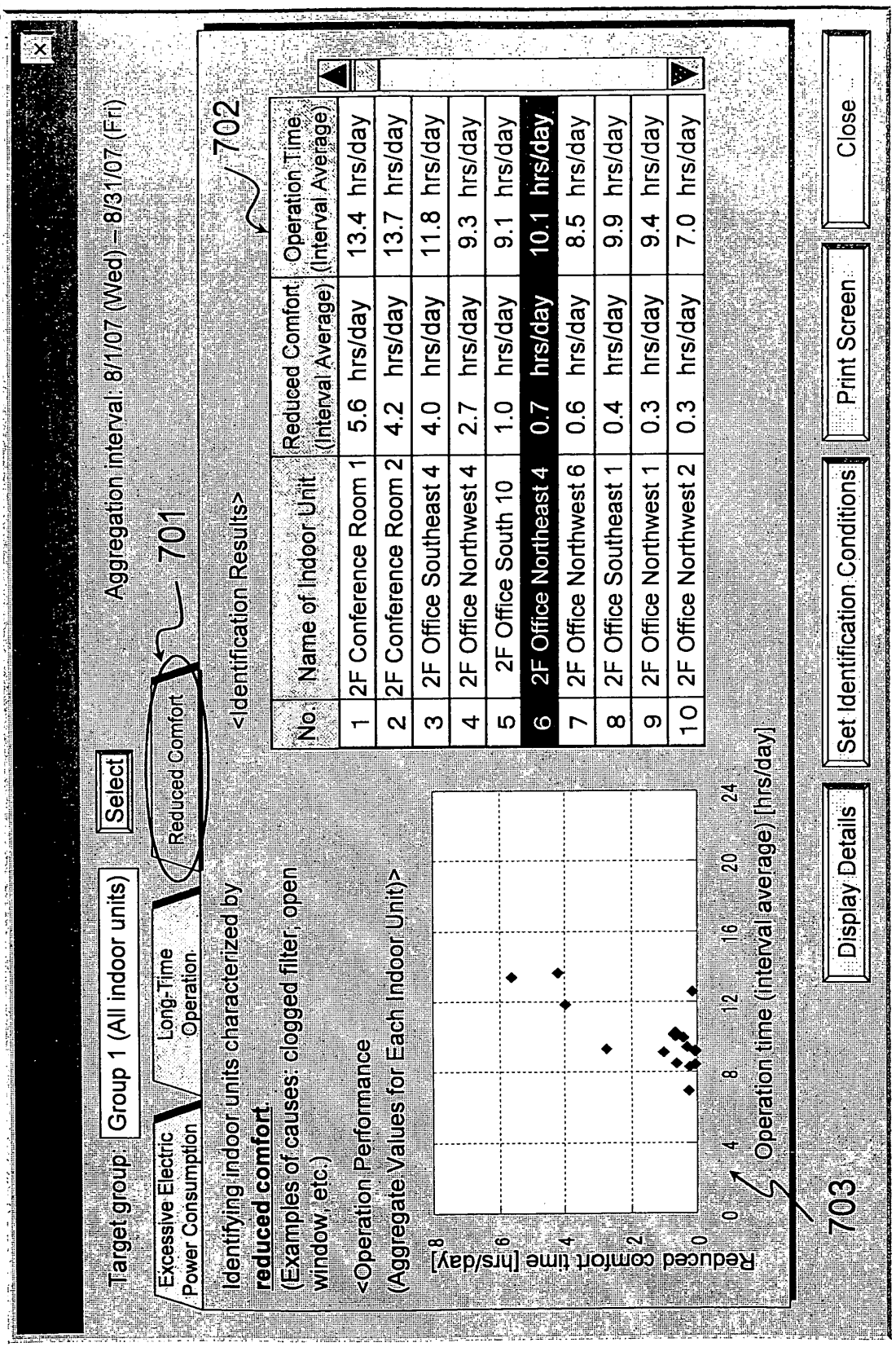
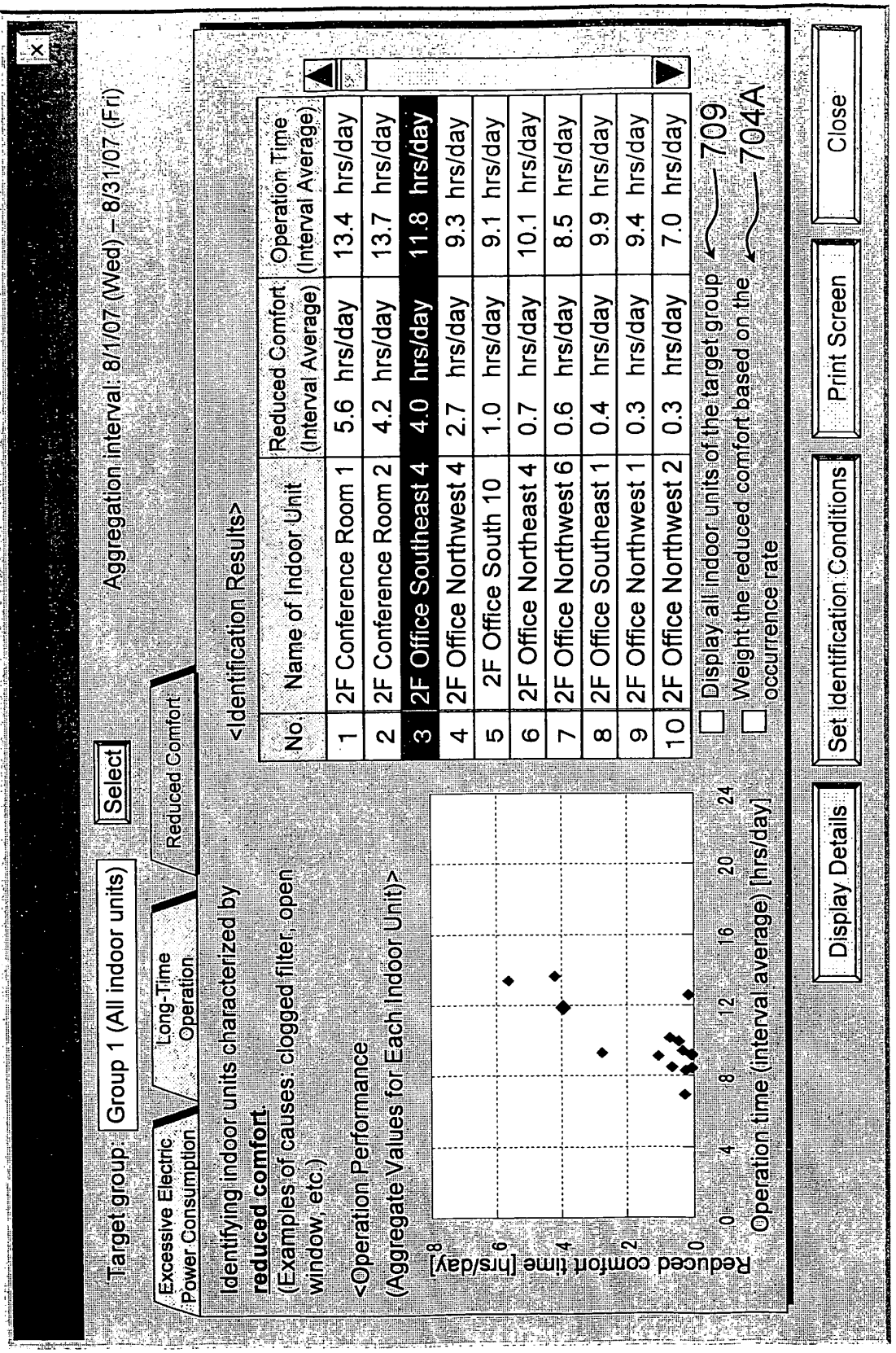

Target group: Group 1 (All indoor units) Select
Aggregation interval: 8/1/07 (Wed) – 8/31/07 (Fri)
Excessive Electric Power Consumption
Long-Time Operation
Reduced Comfort
701
Identifying indoor units characterized by reduced comfort.
(Examples of causes: clogged filter, open window, etc.)
<Identification Results>
702
<Operation Performance (Aggregate Values for Each Indoor Unit)>
No. | Name of Indoor Unit | Reduced Comfort (Interval Average) | Operation Time (Interval Average)
1 | 2F Conference Room 1 | 5.6 hrs/day | 13.4 hrs/day
2 | 2F Conference Room 2 | 4.2 hrs/day | 13.7 hrs/day
3 | 2F Office Southeast 4 | 4.0 hrs/day | 11.8 hrs/day
4 | 2F Office Northwest 4 | 2.7 hrs/day | 9.3 hrs/day
5 | 2F Office South 10 | 1.0 hrs/day | 9.1 hrs/day
6 | 2F Office Northeast 4 | 0.7 hrs/day | 10.1 hrs/day
7 | 2F Office Northwest 6 | 0.6 hrs/day | 8.5 hrs/day
8 | 2F Office Southeast 1 | 0.4 hrs/day | 9.9 hrs/day
9 | 2F Office Northwest 1 | 0.3 hrs/day | 9.4 hrs/day
10 | 2F Office Northwest 2 | 0.3 hrs/day | 7.0 hrs/day
Reduced comfort time [hrs/day]
0 2 4 6 8
0 4 8 12 16 20 24
Operation time (interval average) [hrs/day]
703
Display Details
Set Identification Conditions
Print Screen
Close

FIG. 7B


Target group: Group 1 (All indoor units)
Select
Excessive Electric Power Consumption
Long-Time Operation
Reduced Comfort
Aggregation interval: 8/1/07 (Wed) – 8/31/07 (Fri)
Identifying indoor units characterized by reduced comfort
(Examples of causes: clogged filter, open window, etc.)
<Identification Results>
<Operation Performance (Aggregate Values for Each Indoor Unit)>
No.
Name of Indoor Unit
Reduced Comfort (Interval Average)
Operation Time (Interval Average)
1 2F Conference Room 1 5.6 hrs/day 13.4 hrs/day
2 2F Conference Room 2 4.2 hrs/day 13.7 hrs/day
3 2F Office Southeast 4 4.0 hrs/day 11.8 hrs/day
4 2F Office Northwest 4 2.7 hrs/day 9.3 hrs/day
5 2F Office South 10 1.0 hrs/day 9.1 hrs/day
6 2F Office Northeast 4 0.7 hrs/day 10.1 hrs/day
7 2F Office Northwest 6 0.6 hrs/day 8.5 hrs/day
8 2F Office Southeast 1 0.4 hrs/day 9.9 hrs/day
9 2F Office Northwest 1 0.3 hrs/day 9.4 hrs/day
10 2F Office Northwest 2 0.3 hrs/day 7.0 hrs/day
Reduced comfort time [hrs/day]
Operation time (interval average) [hrs/day]
0
2
4
6
8
0
4
8
12
16
20
24
Display all indoor units of the target group
Weight the reduced comfort based on the occurrence rate
709
704A
Display Details
Set Identification Conditions
Print Screen
Close

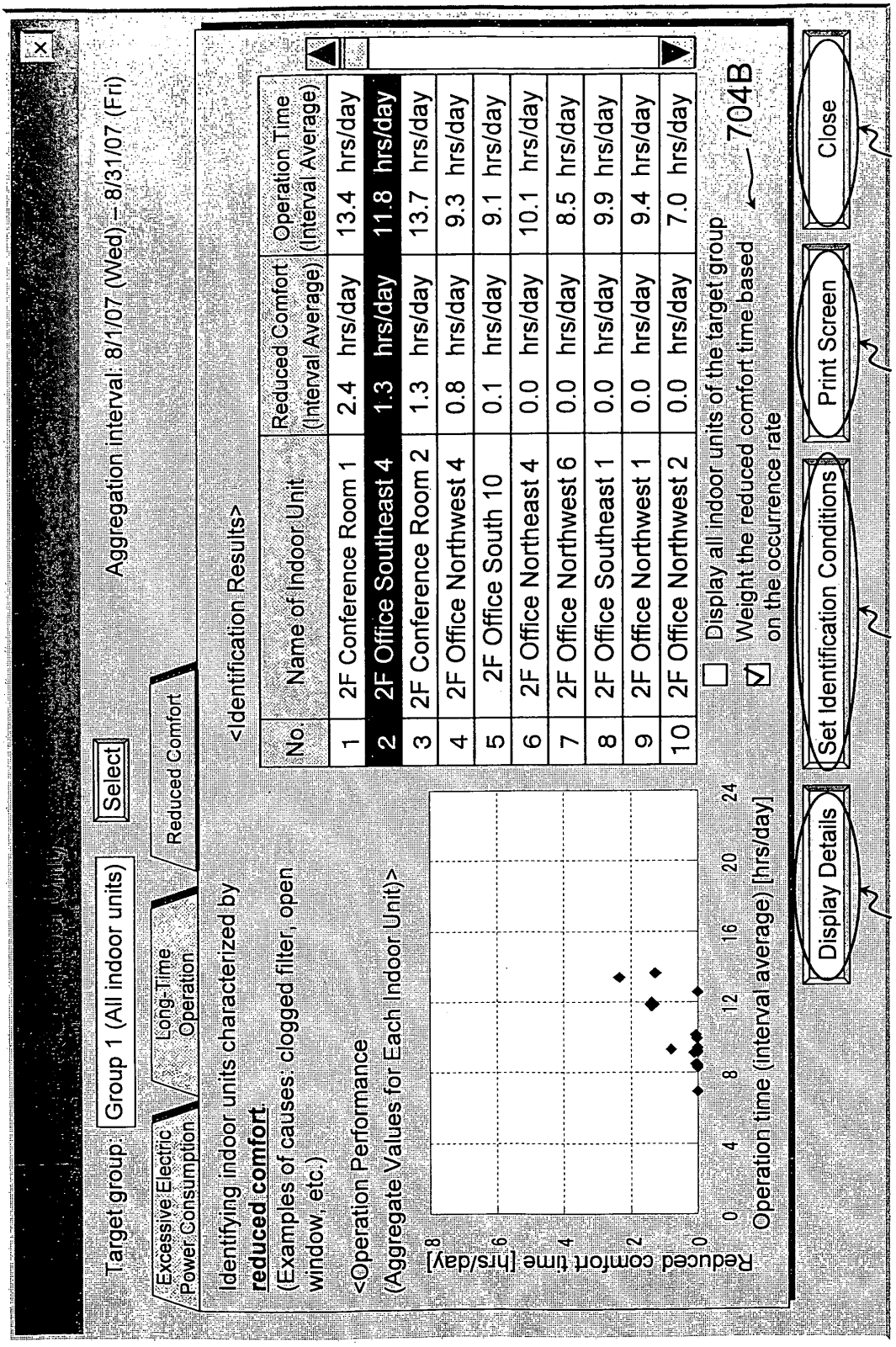

Target group: Group 1 (All indoor units)
Select
Aggregation interval: 8/1/07 (Wed) – 8/31/07 (Fri)
Excessive Electric Power Consumption
Long-Time Operation
Reduced Comfort
Identifying indoor units characterized by reduced comfort
(Examples of causes: clogged filter, open window, etc.)
<Identification Results>
<Operation Performance (Aggregate Values for Each Indoor Unit)>
No.
Name of Indoor Unit
Reduced Comfort (Interval Average)
Operation Time (Interval Average)
1 2F Conference Room 1 2.4 hrs/day 13.4 hrs/day
2 2F Office Southeast 4 1.3 hrs/day 11.8 hrs/day
3 2F Conference Room 2 1.3 hrs/day 13.7 hrs/day
4 2F Office Northwest 4 0.8 hrs/day 9.3 hrs/day
5 2F Office South 10 0.1 hrs/day 9.1 hrs/day
6 2F Office Northeast 4 0.0 hrs/day 10.1 hrs/day
7 2F Office Northwest 6 0.0 hrs/day 8.5 hrs/day
8 2F Office Southeast 1 0.0 hrs/day 9.9 hrs/day
9 2F Office Northwest 1 0.0 hrs/day 9.4 hrs/day
10 2F Office Northwest 2 0.0 hrs/day 7.0 hrs/day
Reduced comfort time [hrs/day]
Operation time (interval average) [hrs/day]
Display all indoor units of the target group
Weight the reduced comfort time based on the occurrence rate
704B
Display Details
Set Identification Conditions
Print Screen
Close
705
706
707
708

FIG. 7C

FIG. 8A

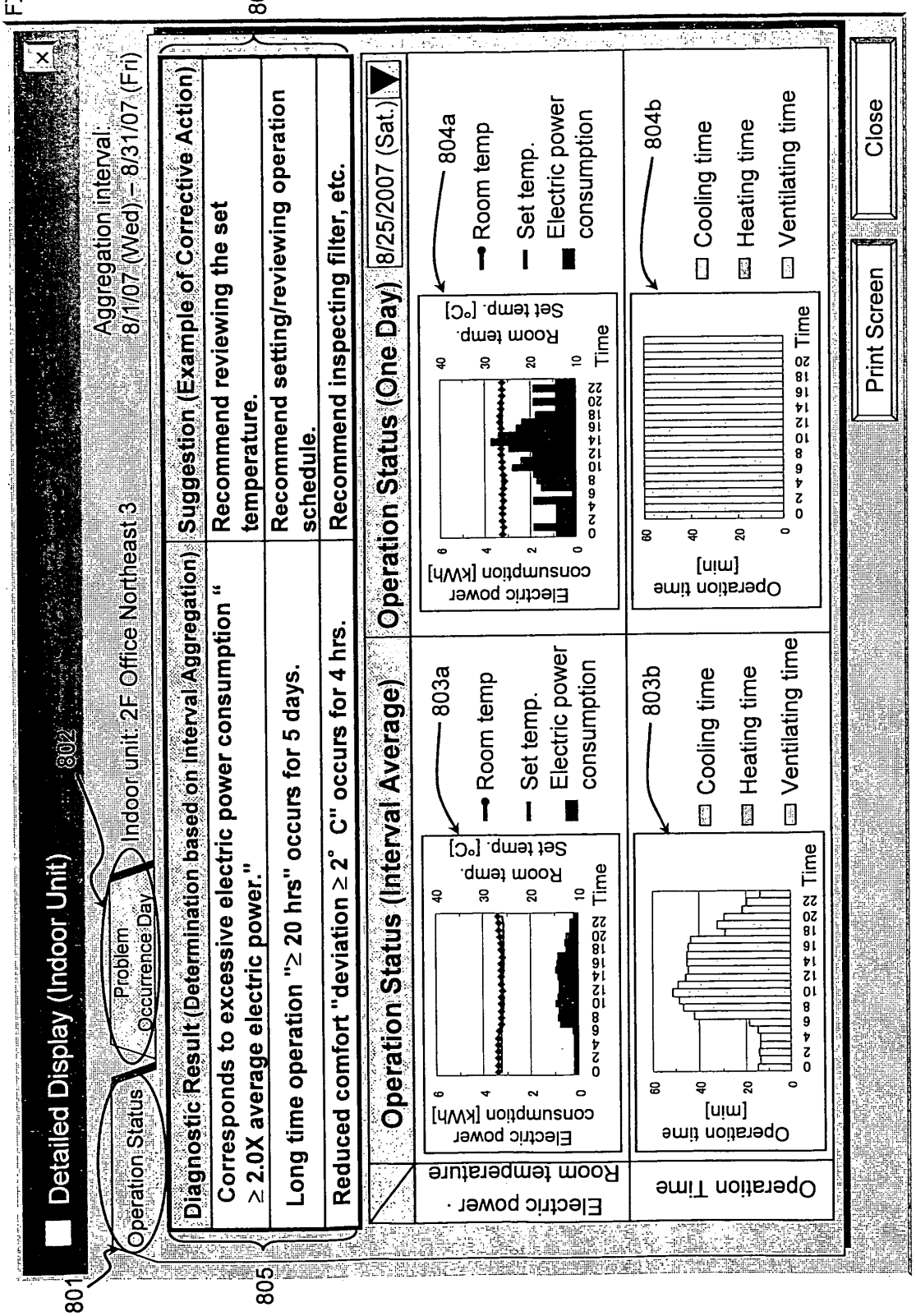

Detailed Display (Indoor Unit)
801
802
Problem Occurrence Day
Operation Status
Indoor unit: 2F Office Northeast 3
Aggregation interval: 8/1/07 (Wed) – 8/31/07 (Fri)
805
Diagnostic Result (Determination based on Interval Aggregation)
Suggestion (Example of Corrective Action)
Corresponds to excessive electric power consumption " ≥ 2.0X average electric power."
Recommend reviewing the set temperature.
Long time operation "≥ 20 hrs" occurs for 5 days.
Recommend setting/reviewing operation schedule.
Reduced comfort "deviation ≥ 2° C" occurs for 4 hrs.
Recommend inspecting filter, etc.
806
Operation Status (Interval Average)
Operation Status (One Day)
8/25/2007 (Sat.)
Electric power · Room temperature
Operation Time
803a
Room temp
Set temp.
Electric power consumption
Electric power consumption [kWh]
Room temp. Set temp. [°C]
Time
803b
Cooling time
Heating time
Ventilating time
Operation time [min]
804a
804b
Print Screen
Close

FIG. 8B

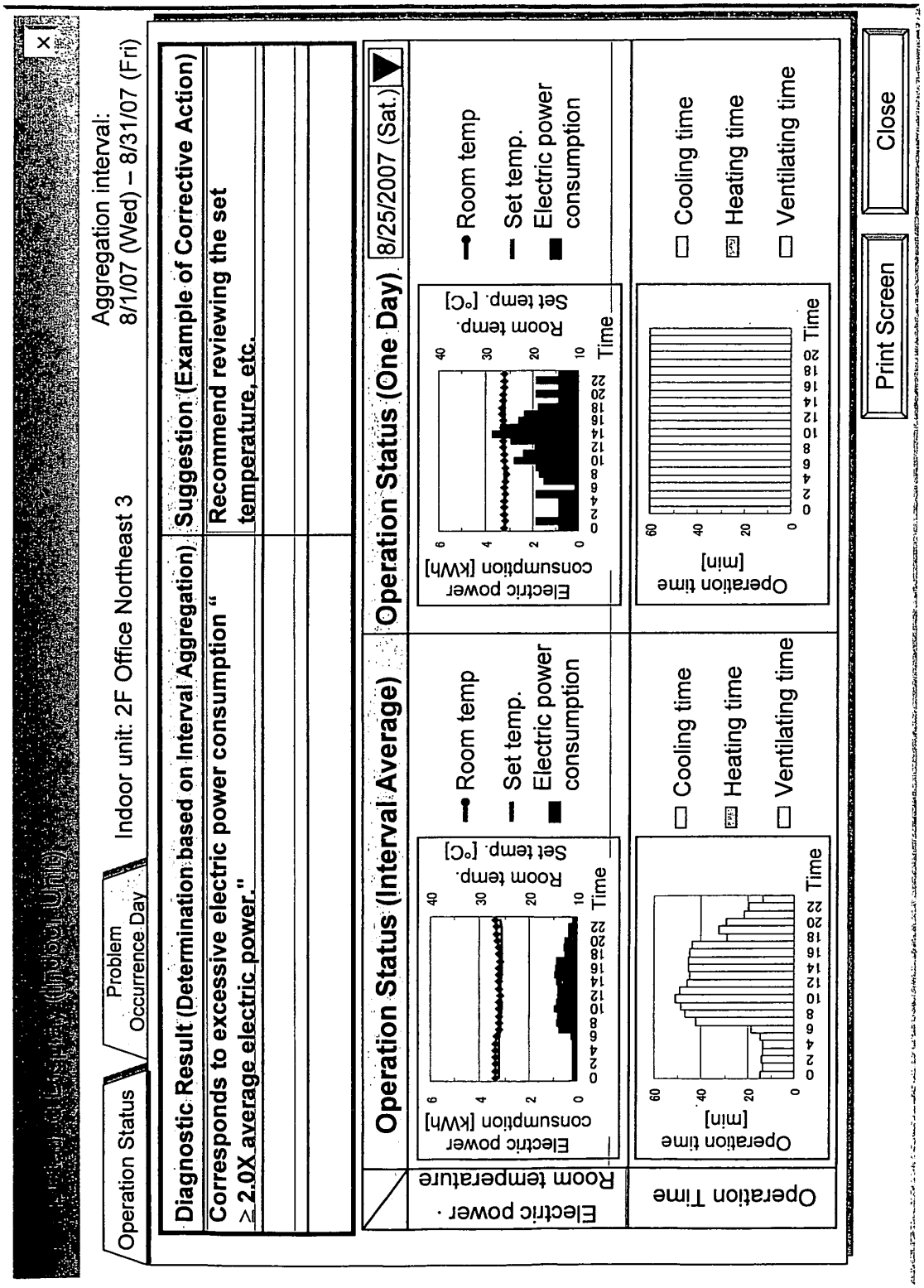
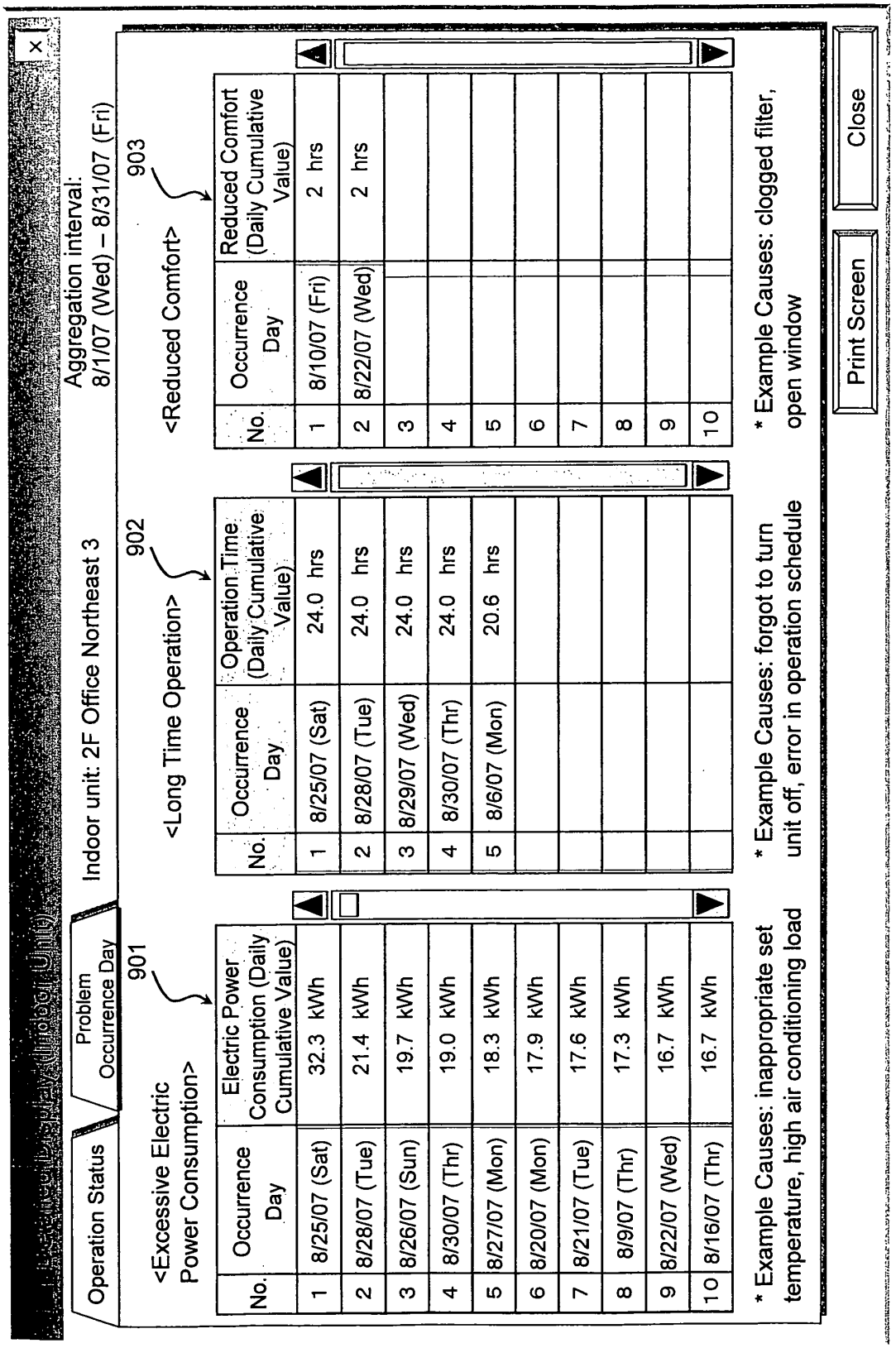

Operation Status
Problem Occurrence Day
Indoor unit: 2F Office Northeast 3
Aggregation interval:
8/1/07 (Wed) – 8/31/07 (Fri)
Diagnostic Result (Determination based on Interval Aggregation)
Suggestion (Example of Corrective Action)
Corresponds to excessive electric power consumption " ≥ 2.0X average electric power."
Recommend reviewing the set temperature, etc.
Operation Status (Interval Average)
Operation Status (One Day)
8/25/2007 (Sat.)
Electric power · Room temperature
Operation Time
Electric power consumption [kWh]
Room temp. Set temp. [°C]
Time
Room temp
Set temp.
Electric power consumption
Operation time [min]
Cooling time
Heating time
Ventilating time
Print Screen
Close

FIG. 9


Operation Status
Problem Occurrence Day
Indoor unit: 2F Office Northeast 3
Aggregation interval: 8/1/07 (Wed) – 8/31/07 (Fri)
901
<Excessive Electric Power Consumption>
902
<Long Time Operation>
903
<Reduced Comfort>
No. | Occurrence Day | Electric Power Consumption (Daily Cumulative Value)
1 | 8/25/07 (Sat) | 32.3 kWh
2 | 8/28/07 (Tue) | 21.4 kWh
3 | 8/26/07 (Sun) | 19.7 kWh
4 | 8/30/07 (Thr) | 19.0 kWh
5 | 8/27/07 (Mon) | 18.3 kWh
6 | 8/20/07 (Mon) | 17.9 kWh
7 | 8/21/07 (Tue) | 17.6 kWh
8 | 8/9/07 (Thr) | 17.3 kWh
9 | 8/22/07 (Wed) | 16.7 kWh
10 | 8/16/07 (Thr) | 16.7 kWh
No. | Occurrence Day | Operation Time (Daily Cumulative Value)
1 | 8/25/07 (Sat) | 24.0 hrs
2 | 8/28/07 (Tue) | 24.0 hrs
3 | 8/29/07 (Wed) | 24.0 hrs
4 | 8/30/07 (Thr) | 24.0 hrs
5 | 8/6/07 (Mon) | 20.6 hrs
No. | Occurrence Day | Reduced Comfort (Daily Cumulative Value)
1 | 8/10/07 (Fri) | 2 hrs
2 | 8/22/07 (Wed) | 2 hrs
* Example Causes: inappropriate set temperature, high air conditioning load
* Example Causes: forgot to turn unit off, error in operation schedule
* Example Causes: clogged filter, open window
Print Screen
Close

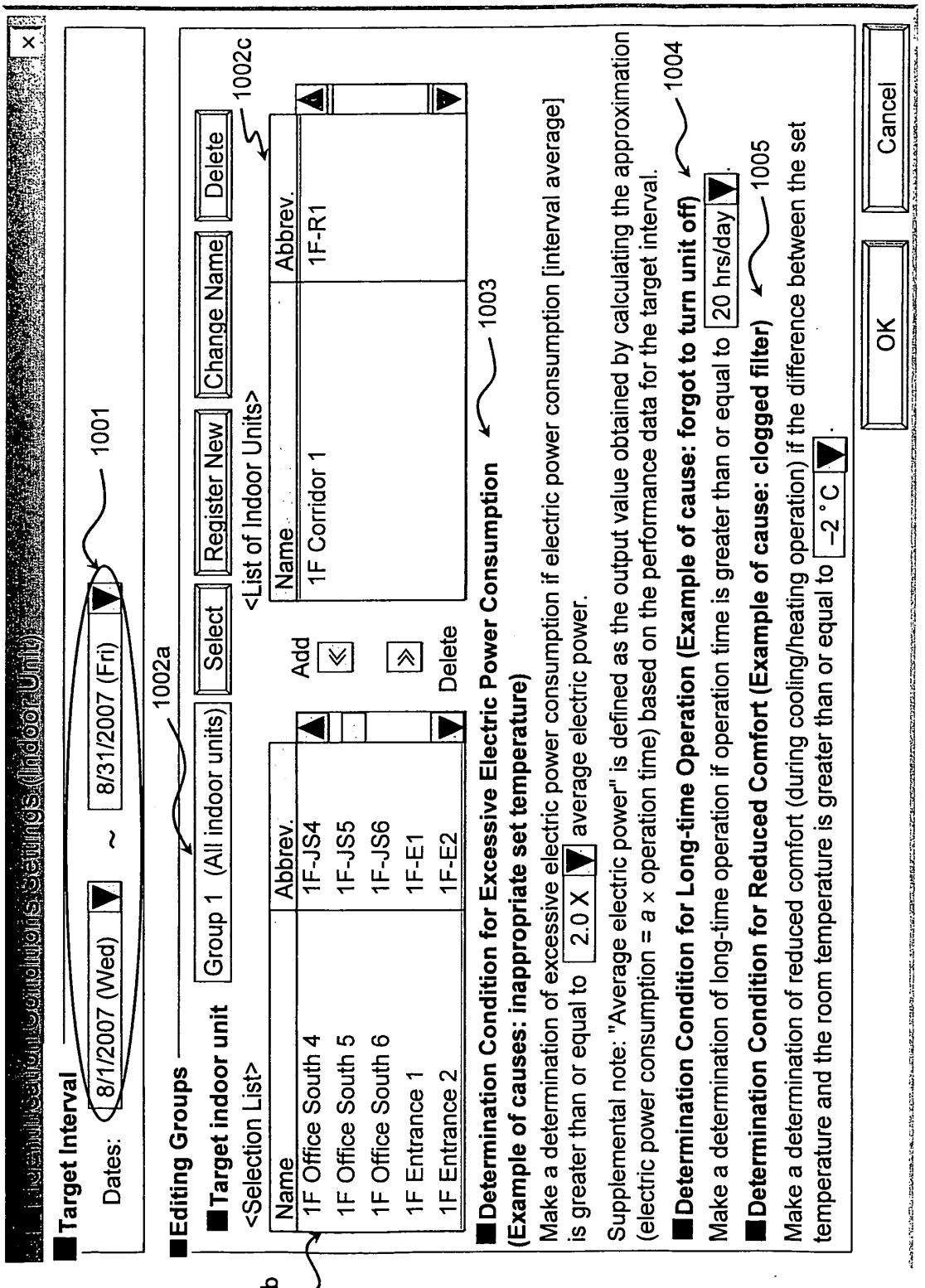

Determination Conditions Settings (Indoor Unit)
Target Interval
Dates:
8/1/2007 (Wed)
~
8/31/2007 (Fri)
1001
Editing Groups
1002a
Target indoor unit
Group 1 (All indoor units)
Select
Register New
Change Name
Delete
1002c
<Selection List>
<List of Indoor Units>
1002b
Name
Abbrev.
1F Office South 4
1F-JS4
1F Office South 5
1F-JS5
1F Office South 6
1F-JS6
1F Entrance 1
1F-E1
1F Entrance 2
1F-E2
Add
Delete
Name
Abbrev.
1F Corridor 1
1F-R1
Determination Condition for Excessive Electric Power Consumption
1003
(Example of causes: inappropriate set temperature)
Make a determination of excessive electric power consumption if electric power consumption [interval average] is greater than or equal to 2.0 X average electric power.
Supplemental note: "Average electric power" is defined as the output value obtained by calculating the approximation (electric power consumption = a × operation time) based on the performance data for the target interval.
Determination Condition for Long-time Operation (Example of cause: forgot to turn unit off)
1004
Make a determination of long-time operation if operation time is greater than or equal to 20 hrs/day.
Determination Condition for Reduced Comfort (Example of cause: clogged filter)
1005
Make a determination of reduced comfort (during cooling/heating operation) if the difference between the set temperature and the room temperature is greater than or equal to −2 °C.
OK
Cancel

FIG. 10

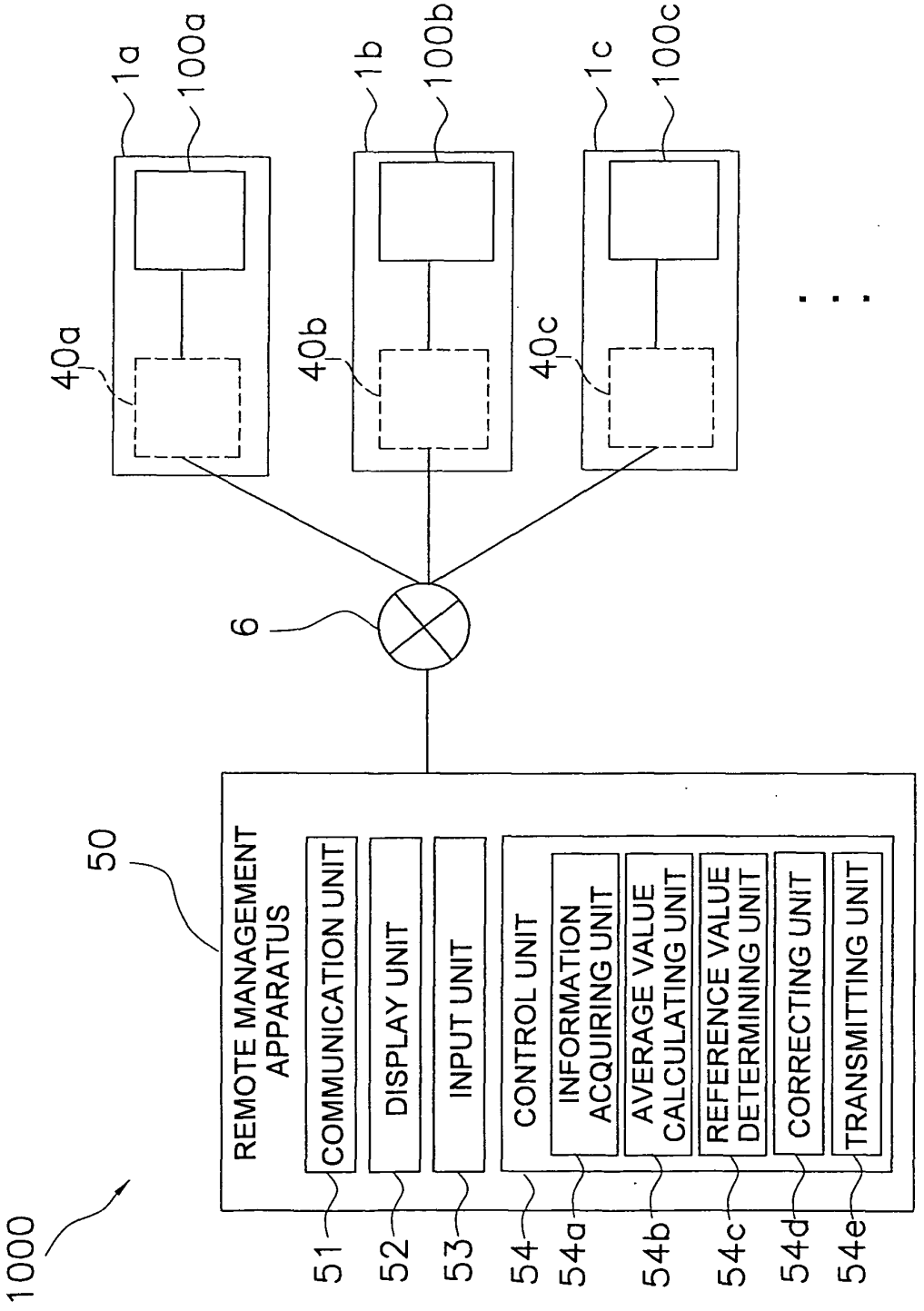

1000
50
REMOTE MANAGEMENT APPARATUS
COMMUNICATION UNIT
DISPLAY UNIT
INPUT UNIT
CONTROL UNIT
INFORMATION ACQUIRING UNIT
AVERAGE VALUE CALCULATING UNIT
REFERENCE VALUE DETERMINING UNIT
CORRECTING UNIT
TRANSMITTING UNIT
51
52
53
54
54a
54b
54c
54d
54e
6
40a
40b
40c
1a
1b
1c
100a
100b
100c

FIG. 11

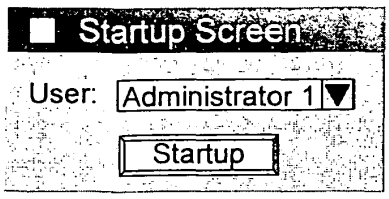

Startup Screen
User:
Administrator 1
Startup

FIG. 12

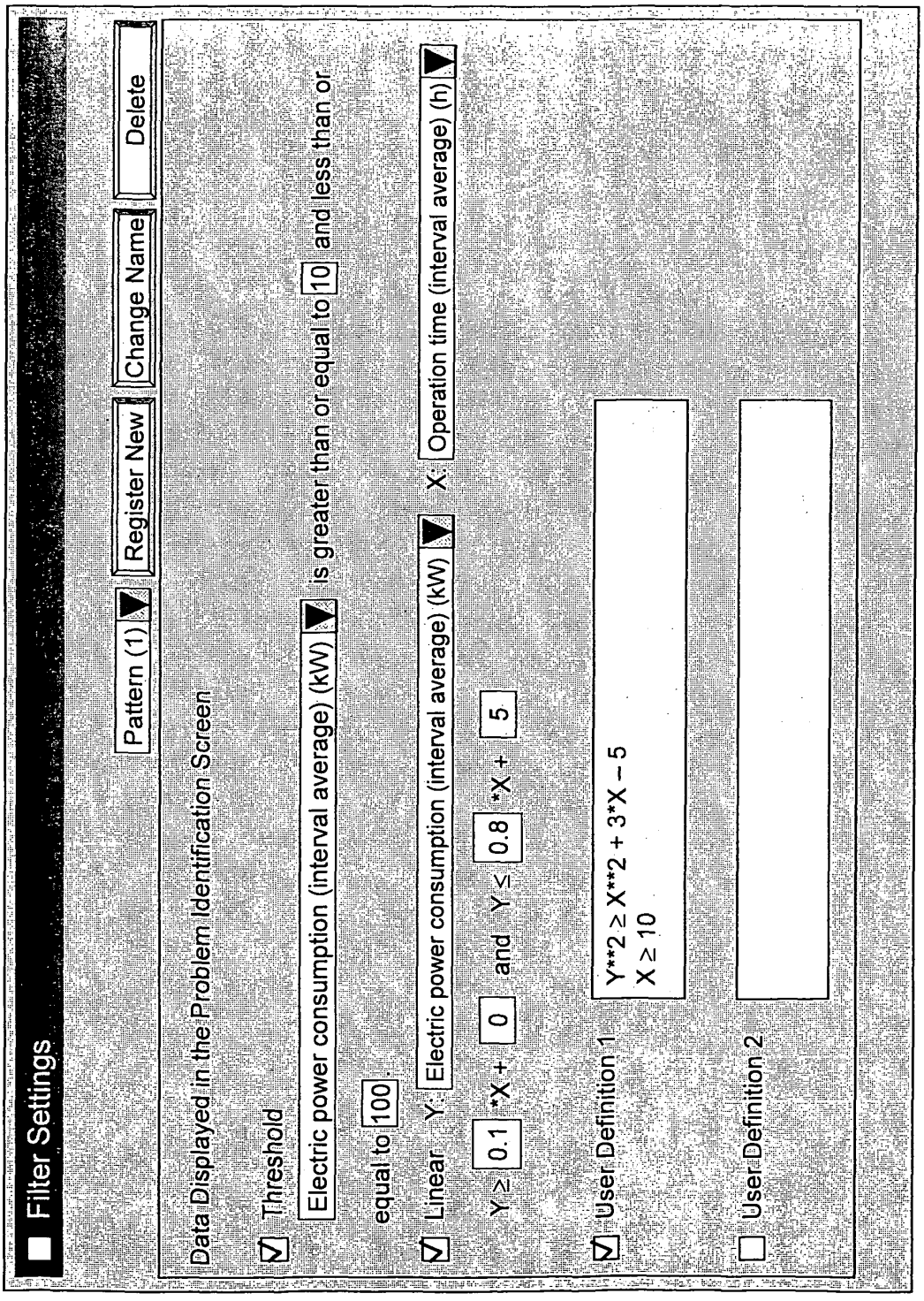

Filter Settings
Pattern (1)
Register New
Change Name
Delete
Data Displayed in the Problem Identification Screen
Threshold
Electric power consumption (interval average) (kW)
is greater than or equal to 10
and less than or equal to 100
Linear Y: Electric power consumption (interval average) (kW)
X: Operation time (interval average) (h)
Y≥ 0.1 *X + 0 and Y≤ 0.8 *X + 5
User Definition 1
Y**2 ≥ X**2 + 3*X – 5
X ≥ 10
User Definition 2

FIG. 13

**INTERNATIONAL SEARCH REPORT**

International application No.
PCT/JP2009/050706

A. CLASSIFICATION OF SUBJECT MATTER
*F24F11/02*(2006.01)i

According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)
F24F11/02

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

| | | | |
|---|---|---|---|
| Jitsuyo Shinan Koho | 1922-1996 | Jitsuyo Shinan Toroku Koho | 1996-2009 |
| Kokai Jitsuyo Shinan Koho | 1971-2009 | Toroku Jitsuyo Shinan Koho | 1994-2009 |

Electronic data base consulted during the international search (name of data base and, where practicable, search terms used)

C. DOCUMENTS CONSIDERED TO BE RELEVANT

| Category* | Citation of document, with indication, where appropriate, of the relevant passages | Relevant to claim No. |
|---|---|---|
| X<br>A | JP 2004-127047 A (Daikin Industries, Ltd.),<br>22 April, 2004 (22.04.04),<br>Par. Nos. [0022] to [0025]; Figs. 4, 5, 9<br>(Family: none) | 1-4,6,7<br>5,8 |

☐ Further documents are listed in the continuation of Box C. ☐ See patent family annex.

* Special categories of cited documents:
"A" document defining the general state of the art which is not considered to be of particular relevance
"E" earlier application or patent but published on or after the international filing date
"L" document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified)
"O" document referring to an oral disclosure, use, exhibition or other means
"P" document published prior to the international filing date but later than the priority date claimed
"T" later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention
"X" document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone
"Y" document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art
"&" document member of the same patent family

| Date of the actual completion of the international search | Date of mailing of the international search report |
|---|---|
| 23 March, 2009 (23.03.09) | 31 March, 2009 (31.03.09) |
| Name and mailing address of the ISA/<br>Japanese Patent Office<br><br>Facsimile No. | Authorized officer<br><br>Telephone No. |

Form PCT/ISA/210 (second sheet) (April 2007)

## REFERENCES CITED IN THE DESCRIPTION

*This list of references cited by the applicant is for the reader's convenience only. It does not form part of the European patent document. Even though great care has been taken in compiling the references, errors or omissions cannot be excluded and the EPO disclaims all liability in this regard.*

### Patent documents cited in the description


- JP 2003302092 A **[0002] [0090]**
- JP H5157336 B **[0061]**