[Document Name] Specification

[Title of the Invention] Electric circuit board and refrigeration apparatus equipped with the electric circuit board

[Technical Field]

To provide an electric circuit board connected to a control board of a refrigerating apparatus via a communication line, and a refrigerating apparatus equipped with the electric circuit board.

[Background of the Invention]

Conventionally, in a multi-air conditioner type, the indoor unit with cut off power supply controls the opening degree of the electric expansion valve to a predetermined opening degree by the electric power supplied from the outdoor unit via the transmission line. For example, in the multi-air conditioner type disclosed in Patent Document 1 (Japanese Unexamined Patent Publication No. 2013-40698), the communication line connected to the outdoor unit is used as an emergency power supply line only for a certain period of time, and the opening degree of the electric expansion valve of the indoor unit with cut off power supply is controlled to a predetermined opening degree.

[Summary of the Invention]

[Problems to be Solved by the Invention]

Therefore, during the time when the power supply cut off of the indoor unit occurs until the inoperable voltage of the controller on the indoor unit side, it is necessary to provide a signal indicating that the power cut off has occurred to the controller on the outdoor unit side. Upon receiving this, the controller on the outdoor unit side is to transmit the signal to the other indoor units during normal operation to suspend communication only for the above-mentioned predetermined time.

As described above, in the indoor unit disclosed in Patent Document 1, when the power cut off occurs in one of the indoor units, the indoor unit in which the power supply cut off does not occur is also affected. Therefore, the problem is that it is not necessary to suspend the communication with the indoor unit during its normal operation for a certain period of time, even if the power supply is cut off from one of the indoor units. This problem remains to be solved.

[Means for Solving Problems]

Aspects of the invention are defined in the independent claims. Some optional features of the invention are defined in the dependent claims.

The electric circuit board related to the first exemplary arrangement is an electric circuit board that is electrically connected to a control board of an indoor unit of a refrigerating apparatus connected to a first power source via a communication line. The electric circuit board is further connected to the second power source. The electric circuit board comprises a relay. The relay switches to the second power supply when power is not supplied from the first power supply to the control board.

With this electric circuit board, electric power can be appropriately

supplied to the control board of the indoor unit. "The electric circuit board is further connected to the second power source" also includes that the second power source is equipped with the electric circuit board.

The electric circuit board related to the second exemplary arrangement is the electric circuit board according to the first exemplary arrangement. The refrigerating apparatus includes an indoor unit, which an outdoor unit electrically connected to the indoor unit. The electric power of the second power source is the electric power supplied from the outdoor unit.

The electric circuit board related to the third exemplary arrangement is the electric circuit board according to the first exemplary arrangement or the second exemplary arrangement, and further includes a switching circuit. The switching circuit is switched between a first state that is electrically connected to the second power supply and a second state that is not electrically connected. The switching circuit is switched to the first state by the relay when power is not supplied from the first power supply to the control board.

The electric circuit board related to the fourth exemplary arrangement is the electric circuit board according to the third exemplary arrangement, and further includes a switch. The switch turns on or off the energization of the relay to switch the switching circuit to the first state, when the power is not supplied from the first power supply to the control board.

In this electric circuit board, the switch energizes and de-energizes the relay according to the presence or absence of power supply from the first power source, so that the configuration can be simplified, and the cost can be reduced.

The electric circuit board related to the fifth exemplary arrangement is the electric circuit board according to the fourth exemplary arrangement. The switch is turned on to energize the relay while power is being supplied from the first power source. Further, the switch is turned off to cut off the power supply to the relay while the power is not supplied from the first power source.

In this electric circuit board, the configuration with a simple circuit and a small number of parts can be obtained, in which a switch is turned on to energize a relay when power is supplied from a first power source.

The electric circuit board related to the sixth exemplary arrangement is an electric circuit board according to any one of the third exemplary arrangement to the fifth exemplary arrangement. The relay comprises a relay coil and a relay switch. The relay switch switches the switching circuit to the first state when the energization of the relay coil is on or off.

This electric circuit board does not require a logic circuit and a general-purpose mechanical relay including a coil and a switch can be used, it is possible to control the production cost.

The electric circuit board related to the seventh exemplary

arrangement is an electric circuit board according to any one of the first exemplary arrangement to the sixth exemplary arrangement. The electric circuit board is separated from the control board.

In this electric circuit board, the electric circuit board can be retrofitted by separating the electric circuit board from the control board. Therefore, it can be located with an indoor unit wherein the electric circuit board is not equipped.

The refrigerating apparatus related to the eighth exemplary arrangement is a refrigerating apparatus equipped with an electric circuit board according to any one of the first exemplary arrangement to the seventh exemplary arrangement.

A refrigerating apparatus equipped with an electric circuit board relates to the eighth exemplary arrangement. The refrigeration system includes an outdoor unit and a plurality of indoor units connected to the outdoor unit. When the power from the first power supply is not supplied to the control board of any one of the plurality of indoor units, the power supply is switched from the second power supply by the relay.

[Brief Description of the Drawings]

FIG. 1 is a configuration diagram of an air conditioner which is a refrigerating apparatus equipped with an electric circuit board according to an embodiment of the present disclosure.

FIG. 2 is a diagram of an electric circuit of an air conditioner.

FIG. 3 is a circuit diagram of a polarity correction circuit.

FIG. 4 is a circuit diagram of a switching circuit.

FIG. 5 is a polarity correction circuit diagram showing a transmission path of a positive electrode signal and a negative electrode signal when a positive electrode signal is input to the first input line and a negative electrode signal is input to the second input line.

FIG. 6 is a polarity correction circuit diagram showing transmission paths of a positive electrode signal and a negative electrode signal when a positive electrode signal is input to the second input line and a negative electrode signal is input to the first input line.

FIG. 7 is an explanatory diagram showing a state of a switching circuit when the power supply from the first power supply is not cut off.

FIG. 8 is an explanatory diagram showing a state of a switching circuit when the power supply from the first power supply is cut off.

[Modes for Carrying Out the Invention]

(1) Outline of air conditioner 100

FIG. 1 is a configuration diagram of an air conditioner 100, which is a refrigerating apparatus equipped with an electric circuit board according to an embodiment of the present disclosure. Further, FIG. 2 is a diagram of an electric circuit of the air conditioner 100.

First, in FIG. 1, the air conditioner 100 consists of an indoor unit 1 which is a user side unit and an outdoor unit 2 which is a heat source side unit.

The indoor unit 1 is installed in each room of the tenant, for

example, and each indoor unit 1 is connected to the outdoor unit 2 by a refrigerant connecting pipe.

The air conditioner 100, includes a compressor 15, a four- way switching valve 16, an outdoor heat exchanger 17, an outdoor expansion valve 18 as a decompression mechanism, the refrigerant circuit 10 having an indoor expansion valve 20, and an indoor heat exchanger 13 are annularly connected in a ring shape by a refrigerant pipe.

(1-1) Indoor unit 1

The indoor expansion valve 20 and the indoor heat exchanger 13 of the refrigerant circuits 10 are components of the indoor unit 1. In