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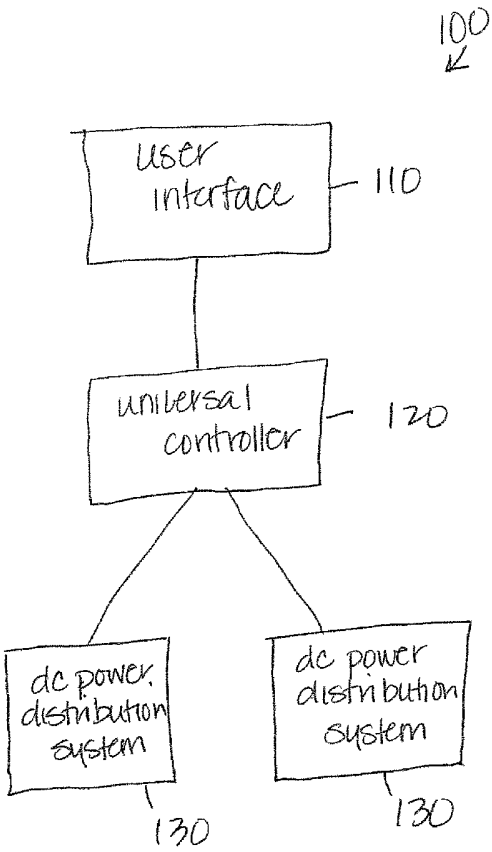
(54) Title: UNIVERSAL POWER SYSTEM, METHODS OF PRODUCTION AND USES THEREOF



(57) Abstract: A universal power system, as described herein, includes: a) at least one DC power distribution system, b) at least one universal controller connected to the at least one power distribution system and c) at least one user interface connected to the at least one universal controller. A method of producing a universal power system, as also described herein, includes a) providing at least one DC power distribution system, b) providing at least one universal controller, c) connecting at least part of the at least one universal controller to the at least one power distribution system, d) providing at least one user interface, and e) connecting at least part of the at least one user interface to the at least one universal controller.

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UNIVERSAL POWER SYSTEM, METHODS OF PRODUCTION AND USES THEREOF

This application claims priority to US Provisional Patent Application Serial Number 60/642695 filed on January 10, 2005, which is commonly-owned and incorporated herein in its entirety by reference.

FIELD OF THE SUBJECT MATTER

The field of the subject matter is universal power systems and/or platforms, specifically those power systems and platforms that can accept a variety of different manufacturers' devices, such as rectifiers, power shelves and/or controllers, including those manufactured by different vendors and/or having different user/operating protocols.

BACKGROUND

The telecommunications and data communications industries have grown exponentially in the last 5 to 8 years partly because both industries have been able to expand their customer base from customers that are close to the center of operations/transmissions to customers who are located a significant distance from the center of operations/transmissions. Expansion of data transmissions to customers located at significant distances from the center of operations is facilitated by remote sites that are portable and smaller than the center of operations site. Both industries include those utilities and industries that provide one-way and two-way data transmission and transportation. The telecommunications industry also includes wireless communications, wire-based communications and combinations thereof. Wireless communications includes infrared, satellite, antennae, etc. Wire-based communications includes fiber optic cable, conventional cable, coax cable, shielded and unshielded twisted pair cable, etc.

Remote sites usually contain electrical and telecommunications wiring and components, such as batteries and other power components, antennae, circuit boards,

keypads and other related components that in many cases can be fragile, relatively inaccessible and certainly sensitive to the elements and other environmental conditions. Therefore, these remote sites should be enclosed or otherwise contained in a protective enclosure system.

Often times, in conventional remote enclosure systems, some components will be easy to access, swap out and repair; but other components will be difficult, if not impossible, to access without moving other components around or removing them altogether. The process of repairing, replacing or accessing difficult to access components can be made more difficult depending on the site location of the remote enclosure system and the environmental conditions surrounding the remote enclosure system. In addition, components in remote enclosure systems, such as power components, may be provided by different companies and may have different connections, such that hooking up various power components may be difficult in the remote enclosure cabinet or another enclosure system holding multiple power components.

Based on the drawbacks, disadvantages and cost issues of combining and running multiple components from various sources, such as power components, it would be useful to develop and implement a universal power system that a) consolidates various manufacturers' power products in one system; b) comprises a DC distribution system that is designed for remote enclosure systems and outdoor cabinet applications; c) provides a "universal controller' that not only can communicate and control the rectifiers, but also the DC distribution and all other devices inside the cabinet, including those manufactured by different vendors and/or having different user/operating protocols; and d) provides an accessible user interface for the increased functionality of the cabinet.

SUMMARY OF THE SUBJECT MATTER

A universal power system, as described herein, comprises: a) at least one DC power distribution system, b) at least one universal controller connected to at least part of the at least one power distribution system and c) at least one user interface connected to at least part of the at least one universal controller.

A method of producing a universal power system, as described herein, comprises a) providing at least one DC power distribution system, b) providing at least one universal controller, c) connecting at least part of the at least one universal controller to the at least one power distribution system, d) providing at least one user interface, and e) connecting at least part of the at least one user interface to the at least one universal controller.

BRIEF DESCRIPTION OF THE FIGURES

Figure 1 shows a contemplated universal power system architecture.

Figure 2 shows a contemplated universal controller system architecture.

Table 1 shows contemplated power system requirements for a contemplated embodiment.

DETAILED DESCRIPTION

Surprisingly, a universal power system that combines and runs multiple components from various sources, such as power components, has been developed that a) consolidates various manufacturers' power products in one system; b) comprises a DC distribution system that is designed for remote enclosure systems and outdoor cabinet applications; c) provides a "universal controller' that not only can communicate and control the rectifiers, but also the DC distribution and all other devices inside the cabinet, including those manufactured by different vendors and/or having different user/operating protocols; d) provides an accessible user interface for the increased functionality of the cabinet; and e) is cost effective.

A universal power system 100, as described herein, comprises: a) at least one DC power distribution system 130, b) at least one universal controller 120 connected to at least part of the at least one DC power distribution system 130 and c) at least one user interface 110 connected to at least part of the at least one universal controller 120.

In addition, a method of producing a universal power system 100, as described herein, comprises a) providing at least one DC power distribution system 130, b) providing at least one universal controller 120, c) connecting at least part of the at least one universal controller 120 to the at least one power distribution system 130, d) providing at least one user interface 100, and e) connecting at least part of the at least one user interface 100 to the at least one universal controller 120.

A contemplated universal power system 100 may accept a variety of different manufactures' rectifiers, power shelves and controllers. The connectivity is three fold. Contemplated universal power systems are able to electrically accept these devices on both the AC and DC side. Contemplated universal power systems are be able to mechanically accept these devices so little or no change is required to mount the devices into an enclosure system, such as those previously mentioned. Lastly, contemplated universal power systems will have a "universal controller" that can digitally communicate to either the rectifiers or to the rectifier controller.

In contemplated embodiments, at least one universal controller provides monitoring and control functionality for elements in the cabinet. Specifically, battery

monitoring, temperature monitoring, intrusion protection, potential failure detection, etc. This device will also digitally communicate directly to either the rectifiers or to the rectifiers controller. Rectifiers are primarily utilized for power or signal conditioning in a variety of applications, which can range from high power output rectifier applications to very low power signal or switching rectifier diode requirements. They can also be used in other applications, such as "catch diodes", "freewheeling diodes" or "clamp diodes". (See MicroNotes, MicroNote Series 301, Microsemi Scottsdale, Kent Walters; http://www.microsemi.com/micnotes/301.pdf). This connectivity provided by the components disclosed herein will allow the complete cabinet and all equipment housed in it to be to be controlled and monitored from a single customer user interface.

In contemplated embodiments, at least one DC power distribution system provides the battery interface, DC protection for customer equipment and optional low voltage disconnects and current measurement for the DC power system. The DC power distribution system can connect to a variety of DC power rectifiers and power shelves to facilitate easy installation and low cost deployment. It is contemplated that the DC power distribution system can connect to and support DC power rectifiers and power shelves from a number of various vendors, which is one of the primary benefits of the system described herein. Therefore, it should be understood that this distribution system can connect universally to several systems and could be available to connect with a number of components both initially and going forward in the life of the application. For example, if new wireless standards or wireless components are introduced, the DC power distribution system, along with the universal controller system, are designed to adapt and handle those new and/or modified standards or components.

Also, in contemplated embodiments, at least one customer user interface is provided that will either be software, hardware (or combination of both) so the customer can monitor and control the complete cabinet and all the equipment it protects from a single interface. It should be understood that the customer user interface may be wireless, such as on a hand-held device or cell phone, may be conventional, such as a laptop or desktop computer or a combination of both. Information and alerts from the customer user interface may be presented by any

suitable software or application, including electronic mail, instant messaging, databases, word processing documentation, etc or any combination thereof. It should be understood that the customer user interface is designed to provide the customer user with as much information as needed at any remote or onsite location. This information can take the form of on-demand requests or can be provided and saved in a database or file until future review by the customer user.

As used herein, the term "connected" means that at least two components are connected utilizing wires or cables, wirelessly or a combination of both. For example, the universal controller may be connected to the power components and power distribution system by coax cables and power cables and further connected to the customer user interface wirelessly, such as by infrared wireless signals, bluetooth wireless systems, Wi-Fi and Wi-Max communications standards and systems, radio signals and/or any conventional or suitable wireless transmission system or signal and a combination thereof. It should be understood that the wireless communication does not need to only be between the customer user interface and the universal controller, but may also be between the DC power distribution system and the universal controllers and/or between some or all of the components connected to the DC power distribution system and the distribution system. The interface to these devices may be one-way, as in the case of a device that must be controlled using infrared signals, or two-way, as in the case of a device that contains a computer compatible connection such as an RS-232C port.

As used herein, the phrase "at least part" means that components may be connected to all or part of another set of components. For example, as contemplated at least one universal controller may be connected to at least part of the at least one power distribution system. In practical terms, there may be one universal controller and 3 power distribution systems. In contemplated embodiments, the universal controller may be connected to 1, 2 or all of the power distribution systems, which shows that the universal controller may be connected to at least part of (or all of) the at least one power distribution system. In other contemplated embodiments, there may be 2 universal controllers in order to divert control of specific components to separate controllers. One of the two universal controllers may be connected to some of the power distribution systems and the other universal controller may be connected

to the remaining power distribution systems. In addition, there may be overlap, in that the two universal controllers may control some or all of the power distribution systems for different reasons. Therefore, it should be obvious what the phrase "at least part" means with respect to the present subject matter.

Contemplated universal power systems may be utilized with any suitable enclosure system (such as a remote enclosure system, another electronic cabinet or electronic component system arrangement). Contemplated remote enclosure systems are disclosed in commonly-owned PCT Application Serial No.: PCT/US02/34800 filed on October 30, 2002 and US Application Serial Nos.: 10/481306 (filed on December 17, 2003), 10/988145 (filed on November 12 2004, which is a divisional application of 10/481306) and 10/793619 (filed on March 4, 2004, which is a continuation in part of 10/481306), all of which claim priority to US Provisional Application Serial No.: 60/379480 filed on May 10, 2002 and which are all incorporated herein by reference in their entirety. But, it should be understood that the contemplated universal power system may be utilized in a number of enclosure system arrangements, including those that are designed to be completely outdoors, completely indoors, or a combination of both outdoors and indoors.

EXAMPLES

Overview of Architecture 200 (Shown in Figure 2 and Table 1)

In this contemplated embodiment, the controller architecture 200 is modular. Therefore, the controller has applications from simple low functionality systems that can also be expanded to handle larger more costly systems. The system blocks communicate via a Local Area Control Network (LACN). This network can use several physical mediums such as a CAN bus, serial bus, USB bus, Ethernet bus etc. The gateway is the heart of the system and provides the software translations required to connect to any third party products and to any user/customer interfaces required. The gateway also provides the ability to define the inputs and outputs via software of all the connections to equipment required. The customer will have the option of many different interfaces for communication of data to and from the controller, as shown in Figure 2. A brief description of each block on the architecture diagram is shown below.

Analog Input (210)

The analog input section (210) would be able to accept inputs like voltages, currents, and temperatures. These parameters could be used to monitor and control a power system or batteries. In some embodiments, each analog board has one voltage input, one current input and one temperature input. For example, if you wanted to monitor and control a power system and two string of batteries you can use one analog board to measure battery/system voltage, load current and ambient temperature. You can then use two more analog boards to monitor the two battery strings. The voltage input can be used for symmetry measurement, the current input can measure battery current and the temperature input can measure battery temperature and be used for temperature compensated battery charging and thermal runaway indication. Analog outputs can be added if its needed to control rectifiers.

Digital Inputs (220)

The digital input section (220) would monitor failures from the equipment inside our cabinet. Example of equipment that would be monitored is, load distribution breaker, battery distribution breaker, air conditioner or heat exchanger, TVSS failure, door alarm, smoke alarm, hydrogen detector, engine generator failure, tower light failure, other third party equipment.

Digital Outputs (230)

The digital output section (230) would be used to control equipment inside of the cabinet. Changes that are monitored by the analog or digital inputs can trigger the digital outputs. Examples of equipment to control: emergency vent system triggered by the temperature input or engine generator startup triggered by prolonged ac failure. The digital input board can also be used for customer's form "C" contacts.

H/Digital Outputs (240)

The H/digital output section (240) actually stands for high current digital outputs. We may need to drive a device that requires a high current to turn it on of off. For example, contactors used as a low voltage disconnect. In a contemplated embodiment, the high current digital output board may accept up to two outputs and if more are needed just add another board.

Gateway (250)

The gateway section (250) is the "brains" of the controller. It provides the smarts needed to configure all the other blocks. For example, in software we would want to assign digital input one as the air conditioner failure. The gateway provides any connections to third party devices like a power system (260) or Avestor batteries (270). It would also provide the software translation to communicate to these devices. The gateway would provide the information needed to the user interface block. The gateway can also provide the memory needed to store data.

User Interface (280)

The user interface section (280) is how the customer (290) will connect into our system – by, for example, wireless antenna, cell phone, handheld device, computer and/or electronic mail or a combination thereof. Again, this section is modular and should be able to accommodate multiple interfaces in a single system. Some examples of user interfaces needed are: display and buttons, Analog modem, cellular modem, Ethernet with SNMP and TCP/IP protocols, serial connections, USB connections, etc. The architecture is set up so if a customer asks to provide a fiber connection, we can have someone design this interface and just plug it into our controller.

Environment Control Equipment

Air conditioner: A digital input to the controller can be used to monitor a failure. Most air conditioners come with own control functionality so no external controls are needed.

Heat Exchanger: as with the air conditioner, a single digital input to the controller is used to monitor a failure.

Emergency vent system: This device coexists with the two devices above. It can be triggered by a high temperature alarm. In some embodiments, one digital output to turn this device on is required.

Cabinet Equipment

Cabinet equipment in some contemplated embodiments comprises at least one door alarm, at least one smoke alarm, at least one hydrogen detector or a combination thereof. These components may have a single digital input.

Customer Alarm Relay

In contemplated embodiments, the goal is to transport the alarms digitally through one of the computer interfaces, but the customer can also have a small set of relays that can be defined for certain alarms. The controller can also input all alarms a customer might be interested in and then route them out on one cable and connector (greatly reduces integration time, error trouble-shooting, etc.). The maximum number of "External Alarm Inputs" for commonly used BTS's (Nokia, Ericsson, Nortel, etc.) is 16. That is usually a grouping of 8 alarms from the DC Plant and then a combination of cabinet and environmental alarms.

Control Functionality

In some examples, the LVD will be controlled by sensing the battery voltage and when the battery voltage gets too low, a high current relay will trip to turn off the contactor. The emergency vent system may be controlled from the controller and when the ambient temperature gets too high, the emergency vent system can be turned on with a relay.

There are several benefits to contemplated universal power systems. The system allows connection and utilization of a variety of different manufactures' power products within the same system, including those manufactured by different vendors and/or having different user/operating protocols. This necessary consolidation will not only save time in development, but also save cost in deployment. The user will have user interface for all functionality of cabinet. This consolidation allows for specific design of interfaces for the complete cabinet application and tailor these requirements to specific customer request.

Thus, specific embodiments and applications of compositions and methods to construct and produce universal power systems have been disclosed. It should be apparent, however, to those skilled in the art that many more modifications besides those already described are possible without departing from the inventive concepts herein. The inventive subject matter, therefore, is not to be restricted except in the spirit of the disclosure presented herein. Moreover, in interpreting the disclosure

presented herein, all terms should be interpreted in the broadest possible manner consistent with the context. In particular, the terms "comprises" and "comprising" should be interpreted as referring to elements, components, or steps in a non-exclusive manner, indicating that the referenced elements, components, or steps may be present, or utilized, or combined with other elements, components, or steps that are not expressly referenced.

CLAIMS

We claim:

1. A universal power system, comprising:

at least one DC power distribution system;

at least one universal controller connected to at least part of the at least one DC power distribution system; and

at least one user interface connected to at least part of the at least one universal controller.

2. The universal power system of claim 1, wherein the at least one DC power distribution system is connected to the at least one universal controller by cables, wirelessly or a combination thereof.

3. The universal power system of claim 1, wherein the at least one universal controller is connected to the at least one user interface by cables, wirelessly or a combination thereof.

4. The universal power system of claim 1, wherein the at least one DC power distribution system is connected to at least one rectifier.

5. The universal power system of claim 1, wherein the at least one DC power distribution system is connected to at least one power shelf.

6. The universal power system of claim 1, wherein the at least one DC power distribution system is connected to at least one rectifier and at least one power shelf.

7. The universal power system of claim 1, wherein the at least one universal controller monitors at least one element, controls functionality for at least one element, or a combination thereof.

8. The universal power system of claim 1, wherein the at least one element comprises at least one battery, at least one temperature control or monitor, at least one alarm system or intrusion monitoring system, at least one power failure detection system, or a combination thereof.

9. The universal power system of claim 1, wherein the at least one user interface comprises computer hardware, computer software or a combination of both.

10. The universal power system of claim 1, wherein the at least one user interface comprises wireless communications, conventional communications or a combination of both.

11. A method of producing a universal power system, comprising:

providing at least one DC power distribution system,

providing at least one universal controller,

connecting at least part of the at least one universal controller to the at least one power distribution system,

providing at least one user interface, and

connecting at least part of the at least one user interface to the at least one universal controller.

12. The method of claim 11, wherein the at least one DC power distribution system is connected to the at least one universal controller by cables, wirelessly or a combination thereof.

13. The method of claim 11, wherein the at least one universal controller is connected to the at least one user interface by cables, wirelessly or a combination thereof.

14. The method of claim 11, wherein the at least one DC power distribution system is connected to at least one rectifier.

15. The method of claim 11, wherein the at least one DC power distribution system is connected to at least one power shelf.

16. The method of claim 11, wherein the at least one DC power distribution system is connected to at least one rectifier and at least one power shelf.

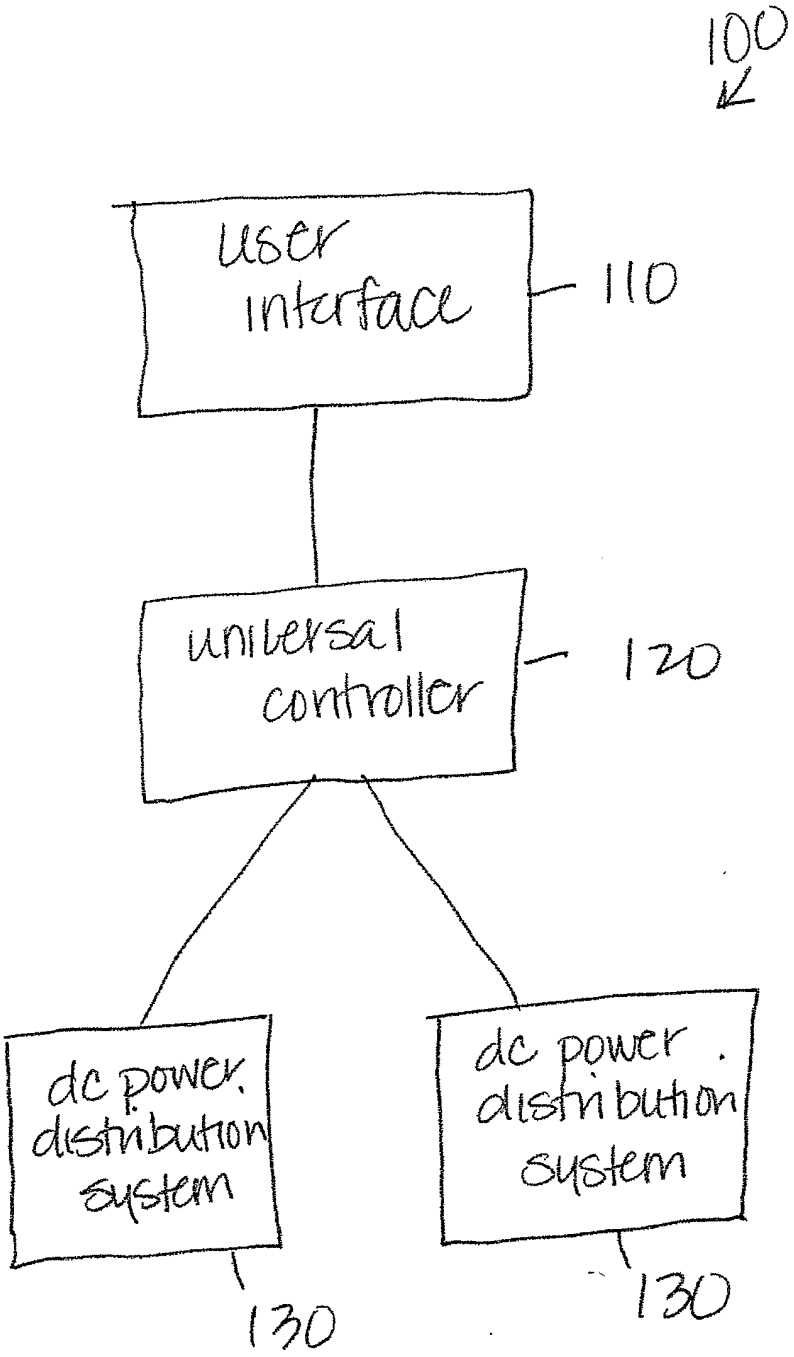
17. The method of claim 11, wherein the at least one universal controller monitors at least one element, controls functionality for at least one element, or a combination thereof.

18. The method of claim 11, wherein the at least one element comprises at least one battery, at least one temperature control or monitor, at least one alarm system or intrusion monitoring system, at least one power failure detection system, or a combination thereof.

19. The method of claim 11, wherein the at least one user interface comprises computer hardware, computer software or a combination of both.

20. The method of claim 11, wherein the at least one user interface comprises wireless communications, conventional communications or a combination of both.

Figure 1


100
user interface
110
universal controller
120
dc power distribution system
130
dc power distribution system
130

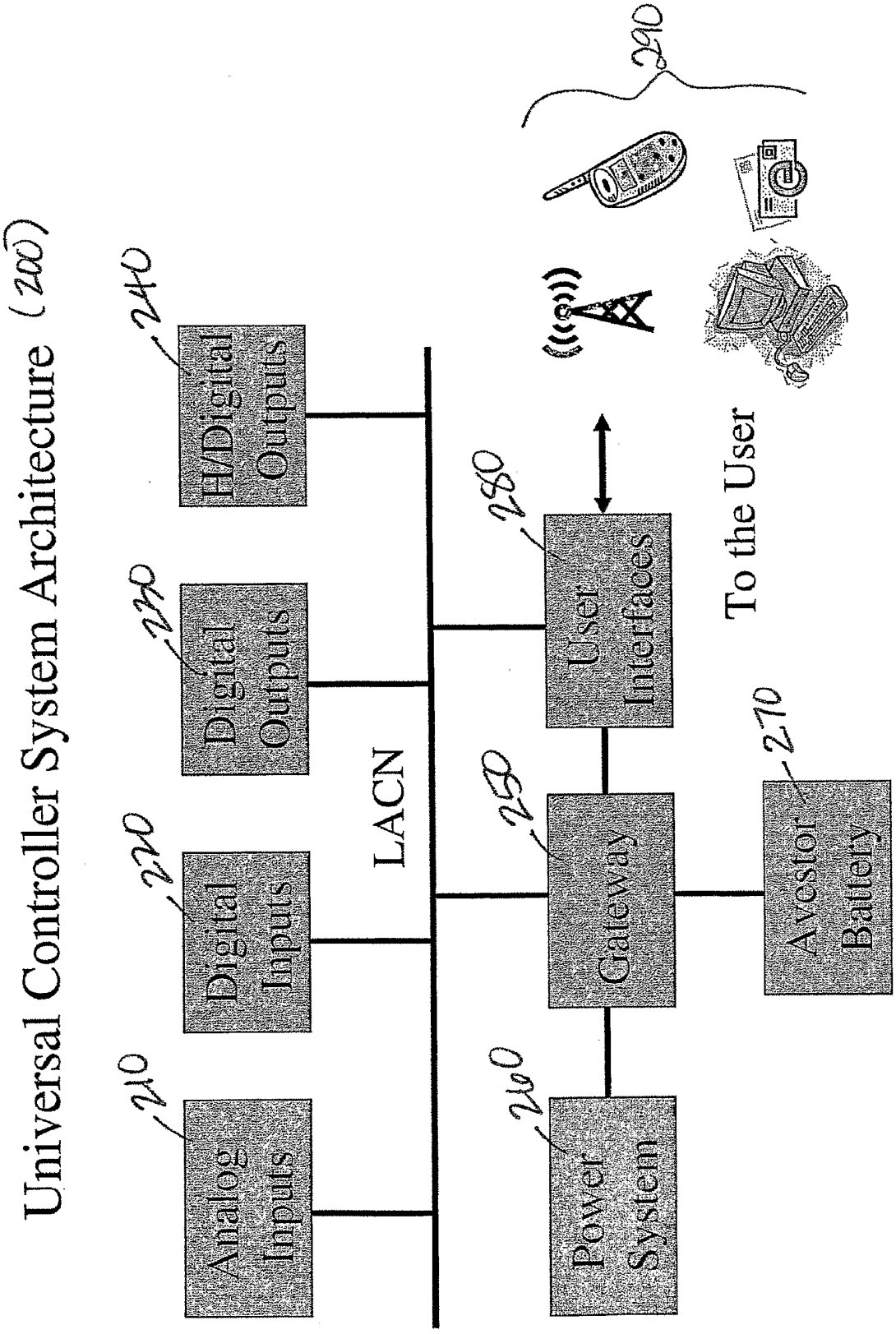

Universal Controller System Architecture (200)
Analog Inputs
210
Digital Inputs
220
Digital Outputs
230
H/Digital Outputs
240
LACN
Power System
260
Gateway
250
Avestor Battery
270
User Interfaces
280
To the User
290

Figure 2

Table 1 (page1)

Power System Requirements			
Function	**I/O**	**Type**	**Range**
System Voltage	Input	Analog	0-65vdc
Load Current	Input	Analog	0-60mv
Total Battery Current	Input	Analog	0-60mv
Load Distribution alarm	Input	Digital	60v
Battery Distribution alarm	Input	Digital	60v
Low Voltage Contactor control 1	Output	Digital	60v,5A
Low Voltage Contactor control 2	Output	Digital	60v,5A
Ambient Temperature	Input	Analog	

Rectifier Control/Monitoring			

Battery Lead Acid			
Midpoint voltage 1	Input	Analog	0-32Vdc
Midpoint voltage 2	Input	Analog	0-32Vdc
Midpoint voltage 3	Input	Analog	0-32Vdc
Midpoint voltage X	Input	Analog	0-32Vdc
Batt Temp 1	Input	Analog	
Batt Temp 2	Input	Analog	
Batt Temp 3	Input	Analog	
Batt Temp x	Input	Analog	

Avestor Batteries			
Digital interface?	Input	Digital	

Cabinet/Site Monitor			
Air conditioner	Input	Digital	
Door alarm	Input	Digital	
AC Input voltage	Input	Digital	
AC Load Center	Input	Digital	
TVSS	Input	Digital	
Emergency Vent System	Input	Digital	
5-10 Additional dry-contacts	Input	Digital	

User Interface			

Table1 (page 2)

Relays	Output		
Display and Keypad	Output		
RS232	Output		
RS485	Output		
Ethernet	Output		
Optical	Output		
Wireless Modem	Output		

INTERNATIONAL SEARCH REPORT

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PCT/US06/00845

A. CLASSIFICATION OF SUBJECT MATTER
IPC: **H02J 7/00**(2006.01);**H01H 47/00**(2006.01)

USPC: 320/138;307/149,132
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)
U.S. : 320/138; 307/149,132

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

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

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category *	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	US 6,459,175 B1 (POTEGA) 1 October 2002 (01.10.2002), the whole disclosure	1-20

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

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