

The display 450 shown includes this additional more specific information in a plurality of smaller window areas. An example of more specific information present in this additional area would be an identity of the products
5 in the machine, the location of the products within the machine, the location of the display within the machine, the communication parameters for the displayed machine, and physical location of the displayed machine. A further example additional information might include the date and
10 time of last service, the servicer's name and pager number, listing of the most recent alarms, and other detailed information.

In the specific embodiment shown, an area 474 shown describes the particular product maintained in each
15 column of the vending machine. This identifies to the operator the items represented by the various columns, preferably together with brand names. This information typically has to be manually entered. This allows an operator to better comprehend the graphic display. For
20 example, if one column contained a red bar indicating a critically low inventory of Diet Pepsi, while two other columns contained green bars indicating an adequate inventory, the operator and system would know that the red bar alarm could be ignored with relative impunity. Also,
25 the operator could order the required product items to fill the various columns from the display alone if desired. In this respect, it is noted that most items are shipped and/or packed in multiple item containers (for example 24 cans of pop per box). It is possible for the
30 inventory to be managed in multiples of these multiple item containers so as to avoid odd lot inventory. This would be typically done for pop.

A window 476 shown defines where the particular vending machine is located together with other
35 information. In the embodiment shown, the information includes the identity of the service route of which the machine is a part (the link name), the method to contact

this machine (the link ID), the exact type of machine (manufacturer and model number), and the physical location of the machine (street address and location thereat).

This information allows the operator to handle any problem
5 with the machine.

The window 478 keeps track of the most recent alarms experienced by the particular vending machine shown in the display 450. This allows the operator to verify that the problems represented thereby have been handled
10 appropriately. This information is generated automatically.

This is an example of further information that can be provided by this additional area of the display.

The information which produces the display 450
15 is stored in the database 22 which is maintained by the central computer system. Each time a data packet is received from the remote vending machine, the database is updated and used to change the configuration of the display 450 next time displayed. Therefore, a user can
20 easily identify any problems which may exist in a particular vending machine by viewing the display 450. The old data is preferably stored in a separate database for use in creating additional value based information. Examples include product trend analysis, eminent machine
25 breakdown, aging of inventory, and other conditions over time based information.

For cost considerations, it is preferred that all of the displays be generated at the computer, this to simplify data transmission. In specific, once initial
30 programming has taken place, normally only the number of vend cycles per item would be communicated across the network: The rest of the data would preferably be deemed to remain stagnant (i.e., no signal, programmed condition to remain).

35 In addition to the specific machine displays, it is preferred that there also be a master alarm display of all machines on a particular route and/or vending

territory. An example of this type of graphical display provided by the central computer is shown in FIGURE 15. This display 500 indicates to a user all the vending machines contained on a particular route. These routes
5 may be assigned to one or more service technicians. On the display is shown a window 502 which shows the particular route number and the number of each vending machine contained on that particular route. Next to the number of each particular vending machine is a dot 504
10 which is color coded to indicate an alarm condition within the vending machine. If the dot is green, no alarm exists. An alarm condition is displayed as a red dot. This provides the operator with an instant full route status report as to any critical conditions. Therefore,
15 when the user opens a window 502, it is easy to detect which vending machines have alarm conditions. The display 500 also contains smaller icons 506 at the bottom which represent each route maintained on the database. By selecting one of the smaller icons 506, the window 502 is
20 produced showing each vending machine on the route selected.

In the upper left-hand portion of the display 500 is a dot 510. The dot indicates to the user whether an alarm packet has been received for any vending machine
25 in contact with the central computer system. The dot 510 is red and can be accompanied by an audible alarm if a vending machine transmits an alarm data packet. The user can see which vending machine has activated the alarm by opening the window 502 and looking for the dot 504 next to
30 the number of the vending machine that transmitted the alarm data packet.

As can be seen, the present invention allows a user to monitor the operation of a plurality of vending machines from a central computer system. Each vending
35 machine is periodically interrogated by the central computer and the pertinent information regarding the amount of money in the machine, the amount of product left

in the machine and any alarm conditions which may have occurred in the machine is graphically illustrated to the user. Thus, the present invention can allow a user to efficiently schedule service visits, to repair problems and make sure the machine is fully stocked. Furthermore, the use of the modem provides a level of convenience and simplicity which was not previously available in remote monitoring systems.

While the preferred embodiment of the invention has been illustrated and described, it will be appreciated that various changes can be made therein without deviating from the spirit and scope of the invention. The embodiments of the invention in which an exclusive property or privilege is claimed are defined as follows:

Claims

Claim 1. A system for monitoring one or more machines and transmitting data from the machines to a remote computer comprising:

5 a plurality of sensors disposed in the machine, each sensor producing a data signal that is indicative of an operation of the machine;

a controller circuit coupled to each of the plurality of sensors including means for reading the data signals produced by the sensors; and,

10 a communications circuit coupled to the controller circuit that transmits the data signals produced by the sensors to the remote computer over a network.

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Claim 2. The system as in Claim 1 wherein the remote computer further comprises:

means for producing a graphical display that represents the machine, the graphical display including one or more icons that correspond to a data signal produced by the sensors in the machine; and,

20 means disposed in the remote computer for updating the icons to correspond to changes in the data signals produced by the sensors.

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Claim 3. The system as in Claim 2 further comprising:

means disposed in the machine for formatting the data signals produced by the sensors into one or more digital data packets; and,

30 means for causing the communications circuit to transmit the digital data packets over a network.

Claim 4. The system as in Claim 2 wherein the machine is a vending machine and the one or more icons produced on the remote computer include:

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a representation of a vending machine having a plurality of columns; and,
each column being represented as a bar graph having a height that varies in proportion to a data signal received from the vending machine.

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Claim 5. The system as in Claim 4 wherein the one or more icons include:

10 a representation of a power outlet; and,
said representation being displayed by the central computer as a flashing icon if a data signal received from the vending machine indicates that the vending machine has lost electrical power.

15 Claim 6. The system as in Claim 4 wherein the one or more icons include:

20 a representation of a compressor; and,
said representation being displayed by the central computer as a flashing icon if a data signal received from the vending machine indicates that the compressor has cycled too few or too many times in a predefined time period.

25 Claim 7. The system as in Claim 4 wherein the one or more icons include:

30 a representation of a coin; and,
said presentation being displayed by the central computer as a flashing icon if a data signal received from the vending machine indicates the vending machine requires exact change.

Claim 8. The system as in Claim 4 wherein the one or more icons include:

35 a representation of a key; and,
said representation being displayed by the central computer as a flashing icon if a data signal

received from the vending machine indicates a door of the vending machine has been opened by an unauthorized person.

5 Claim 9. The system as in Claim 1 further comprising:

a first serial port coupled to the controller circuit; and,

10 a handheld data entry terminal including a second serial port for communicating with the controller circuit through the first serial port wherein said handheld data entry terminal further includes means for entering service data into the controller circuit that is indicative of a service operation performed by a service technician.

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Claim 10. The system as in Claim 9 further comprising:

means for detecting when a door to the machine is opened;

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means disposed in the controller circuit for determining if an identification code is received from the data entry terminal; and,

25 means for getting an internal alarm if an identification code is not received in a predefined period after a door is opened.

30 Claim 11. The system of Claim 9 wherein said data entry is accomplished through infrared communications signals between said data entry terminal and said controller circuit.

35 Claim 12. The system of Claim 9 further including a data cable removably connected to said first and second serial ports so as to transfer data between said handheld data entry terminal and said controller circuit.

Claim 13. In a system for monitoring two or more vending machines at one location and transmitting data from the machines to a remote computer,

5 the improvement of means for one master machine to communicate data to the remote computer and means for the other slave machine to communicate to said master machine.

10 Claim 14. The system of claim 13 characterized in that said means for said other slave machine to communicate with said master machine includes a dedicated wire.

15 Claim 15. The system of claim 13 characterized in that said means for said other slave machine to communicate with said master machine includes a dedicated serial bus.

20 Claim 16. The system of claim 13 characterized in that said means for said other slave machine to communicate with said master machine includes a short range radio.

25 Claim 17. The system of claim 13 characterized in that said means for said other slave machine to communicate with said master machine includes an X-10 power line signal transfer system.

30 Claim 18. The system of claim 13 characterized in that there are multiple locations and multiple master/slave units.

35 Claim 19. A system for remotely monitoring some operational elements of vending machines that have certain electrical signals;

said system including sensor means to produce a signal representative of the certain electrical signals,

network means to pass said signal to a remote monitoring location;

decoding means at said remote monitoring location to process said signal to decode same into meaningful operational element data; and,

remote monitoring means to process said data to allow remote monitoring of the operational elements of the vending machine.

10 Claim 20. The system of claim 19 wherein the vending machine has a wiring harness and characterized in that said sensor means includes a data acquisition unit; a tap cable assembly, and said tap cable assembly connecting said data acquisition unit to the

15 wiring harness.

Claim 21. The system of claim 19 wherein there are two vending machines, each with differing certain electrical signals, and characterized by the addition of

20 said system further including second sensor means to produce a further signal representative of the certain electrical signals of the second vending machine;

said network means passing said further signal to said remote monitoring location;

25 second decoding means at said remote monitoring location to process said further signal to decode same into meaningful operational data for the second vending machine; and,

30 said remote monitoring means processing said data for said second vending machine to allow remote monitoring of the operational elements of said second vending machine.

35 Claim 22. The system of claim 21 characterized in that said decoding means and said second decoding means produce a common type signal.

Claim 23. The system of claim 21 characterized in that said sensor means and said second sensor means include a common type universal data acquisition unit.

5 Claim 24. The system of claim 21 wherein the vending machine and second vending machine each have wiring harnesses and characterized in that said sensor means includes a tap cable assembly;

said tap cable assembly connected to the wiring
10 harness of the vending machine and said second sensor means includes a second tap cable assembly;

said second tap cable assembly connected to the
wiring harness of the second vending machine, and said
second tap cable assembly being different than said tap
15 cable assembly.

Claim 25. In a vending machine monitoring system for a vending machine having a parameter, the monitoring occurring at a remote location;

20 the improvement of an alarm means, said alarm means being activated dependent on the parameter; and, adjust means to adjust said alarm means in respect to the parameter at the remote location.

25 Claim 26. The system of claim 25 characterized in that said alarm means can be selectively disabled.

30 Claim 27. The system of claim 25 wherein the parameter has a varying value and characterized in that said adjust means varies the activation of said alarm means based on the value of the parameter.

35 Claim 28. The system of claim 27 characterized in that said alarm means has an upper limit value activation.

Claim 29. The system of claim 27 characterized in that said alarm means has a lower limit value.

5 Claim 30. The system of claim 27 characterized in that the parameter is a number.

Claim 31. The system of claim 27 characterized in that the parameter is a level.

10 Claim 32. A system for remotely monitoring some operation elements of varying types of vending machines that have electrical and mechanical differences;
said system including an acquisition means to produce a common type signal for the operational elements
15 of a particular vending machine;
network means to pass said common type signal to a remote monitoring location; and,
remote monitoring means to process said common type signal to allow remote monitoring of the operational
20 elements of the particular vending machine.

Claim 33. The system of Claim 32 wherein the vending machine has a wiring harness and characterized in that said acquisition means includes a data acquisition
25 unit;

a tap cable assembly, and said tap cable assembly connecting said data acquisition unit to the wiring harness.

30 Claim 34. A system for remotely monitoring some operational elements of varying types of vending machines that have electrical and mechanical differences;
said system including an data acquisition unit,
means to connect said data acquisition unit to a
35 particular vending machine, means for said data acquisition unit to produce a common type signal for the operational elements of the particular vending machine;

network means to pass said common type signal to a remote monitoring location; and,

remote monitoring means to process said common type signal to allow remote monitoring of the operational elements of the particular vending machine.

Claim 35. The system as in Claim 34 characterized in that at least two types of vending machines are being remotely monitored; and,
each particular vending machine has a different data acquisition unit.

Claim 36. The system as in Claim 34 wherein at least two types of vending machines are being remotely monitored, each having its own differing circuitry;

and characterized by the addition of a first tap cable assembly, said data acquisition unit being a first data acquisition unit, said first tap cable assembly connecting the circuitry of one type of vending machine to said first data acquisition unit;

a second tap cable assembly, a second data acquisition unit, said second tap cable assembly connecting the circuitry of the second type of vending machine to said second data acquisition unit, and said second tap cable assembly being different than said first tap cable assembly.

Claim 37. The system as in Claim 36 characterized in that said second data acquisition unit is different than said first data acquisition unit.

Claim 38. The system as in Claim 34 characterized by the addition of a universal bus means to interconnect said data acquisition unit to said network means.

Claim 39. The system as in Claim 34 wherein the particular vending machine contains an item with an inventory; and,

5 characterized in that said remote monitoring means includes a graphic display indicating the relative amount of remaining inventory.

Claim 40. The system as in Claim 39 wherein the particular vending machine contains at least two items with inventories having a differing maximum; and,

10 characterized in that said remote monitoring means includes a graphic display indicating the relative amount of remaining inventory respectively, with such indication providing a similar relative indication of maximum inventory.

Claim 41. The system as in Claim 34 wherein said common type signal includes row and column information.

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Claim 42. The system as in Claim 34 wherein said system includes a remote link unit, said remote link unit being connected between said data acquisition unit and said network means, said remote link unit having a memory, said memory storing data representative of the changing operational elements of the vending machine; and,

25 means for said remote link unit to pass the data to said network means.

Claim 43. The system of Claim 34 characterized in that said common type signal is the existence of a signal within the vending machines together with simultaneous occurrence coding for at least some of said signals with said remote monitoring means converting said common type signals into utilizable information.

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Claim 44. The system of claim 43 characterized in that at least two types of vending machines are being remotely monitored and each particular vending machine having the same data acquisition unit.

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Claim 45. In a system for remotely monitoring the operation elements of vending machines, said system comprising sensors;

10 said sensors having signal outputs respectively, said signal outputs representing differing types of machine conditions depending on the length of said signals;

15 network means to pass said signals to a remote location for monitoring, said network means including an automatic transmission means; and,

said automatic transmission means being activated by said length of said signals outputs.

20 Claim 46. The system of claim 45 characterized in that said signal outputs include short length vend cycle signals and longer length alarm signals, and said automatic transmission means being activated by said longer length alarm signals.

25 Claim 47. The system of claim 46 characterized by the addition of memory means and said memory means storing said short length vend cycle signals for subsequent transmission.

30 Claim 48. The system of claim 46 characterized by the addition of trigger means to trigger the transmission over said network of said short length vend cycle signals from said memory means.

35 Claim 49. In a system for remotely monitoring the operational elements of varying types of vending

machines including operational elements having identifiable characteristics;

said system including generation means to generate a graphic image on a screen, and control means to control said generation means to produce an image representing the operational element having identifiable characteristics.

Claim 50. The system of Claim 49 wherein the identifiable characteristics include the type of vending machine and the available inventory items;

and characterized in that said control means includes a storage area having a limited number of images representing vending machines; and,

image select means to select the image most similar to the type of vending machine including available inventory items.

Claim 51. The system of Claim 49 wherein the identifiable characteristics include certain operational elements;

and characterized in that said control means includes a storage area having a limited number of icon images representing the certain operational elements; and,

icon image select means to select the icon image most similar to the certain operational element.

Claim 52. The system of Claim 51 wherein the identifiable characteristic for a particular machine include a power supply and characterized in that said control means includes an icon representing a power supply, and icon select means to select the power icon for display.

Claim 53. The system of Claim 51 wherein the identifiable characteristic for a particular machine include a compressor and characterized in that said

control means includes an icon representing a compressor, and icon select means to select the compressor for display.

5 Claim 54. The system of Claim 51 wherein the identifiable characteristic for a particular machine include a change supply and characterized in that said control means includes an icon representing a coin, and icon select means to select the coin for display.

10 Claim 55. The system of Claim 51 wherein the identifiable characteristic for a particular machine include a door open signal and characterized in that said control means includes an icon representing a key, and
15 icon select means to select the key for display.

 Claim 56. The system of claim 49 wherein the operational elements include an inventory of a certain type of item and characterized by the addition of said
20 control means includes an icon representing this item and item icon select means to select this icon representing this item for display.

 Claim 57. The system of Claim 56 wherein the
25 inventory is pop containers and characterized in that said item icon select means produces a circle.

 Claim 58. The system of Claim 57 wherein the
30 inventory of pop containers is a certain amount and characterized by stacking means to replicate said circles to a number reflecting the certain amount.

 Claim 59. The system of Claim 56 wherein the
35 inventory is a change and characterized in that said item icon select means produces a rectangle.

Claim 60. The system of Claim 59 wherein there is a certain amount of change in the machine and characterized by stacking means to replicate said rectangles to a number reflecting the certain amount of change.

Claim 61. In a remote vending machine monitoring system sending operational element information from a plurality of differing types of vending machines to a remotely located processor over a network, such machines including those using columns alone and not rows for inventory;

the improvement of the signal passing over the network being a common signal for differing machines; and, said signal including row and column information.

Claim 62. The system as in Claim 61 wherein the system is utilized with vending machines having maximum number of rows columns along with machines having lesser numbers and characterized in that said signal includes the maximum number of rows and columns for machines having lesser numbers.

Claim 63. The system as in Claim 61 characterized in that said row and column information is vend events.

Claim 64. The system as in Claim 61 wherein the vending machines included matrix coded operative elements and characterized in that said row and column information are the matrix coded operative elements and acquisition at the vending machine to decode such row and column information.

Claim 65. The system as in Claim 61 wherein the system is utilized with vending machine having differing

sensors not inventory related, the system utilized with vending machines having a maximum number of such sensors along with machines having lesser numbers; and,
characterized in that said signal includes the
5 maximum number of sensors for machines having lesser numbers.

Claim 66. The system as in Claim 61 wherein the system is utilized with vending machines having alarm
10 conditions; and,
characterized in that said signal includes such alarm conditions.

Claim 67. The system as in Claim 61 wherein the vending machines include an inventory; and,
15 characterized by means to track the amount of such inventory at the remotely located processor.

Claim 68. The system as in Claim 67
20 characterized by the addition of means to track the historical changes of the amount of such inventory at the remotely located processor.

Claim 69. The system of claim 61 characterized
25 in that said row and column information is matrix coded including simultaneous occurrence information, and the system additionally including decoding means to decode said information.

Claim 70. The system of claim 69 characterized
30 in that said decoding means is at the remotely located processor.

Claim 71. In a remote vending machine
35 monitoring system having sensor means relative to the operational elements of a vending machine and a

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communication network for passing signals representative of the operation elements to a remote monitoring location; the improvement of the remote monitoring location including a graphic display means; and,

5 said graphic display means including a graphic representation of at least one universal vending machine together with its operational elements.

10 Claim 72. The system as in Claim 71 wherein the operational elements include items with inventories; and, the further improvement of said graphic representation including graph means disclosing such inventories.

15 Claim 73. The system as in Claim 72 wherein the inventories have acceptably and not acceptable levels; and,

20 characterized in that said graph means indicates the acceptable and not acceptable levels with varying colors.

25 Claim 74. The system as in Claim 72 wherein the inventories have differing maximums and said graph means displaying the same relative indicators for differing maximums.

30 Claim 75. The system as in Claim 71 characterized in that said graphic representation includes a plurality of a generic representations of a type of vending machine.

35 Claim 76. The system as in Claim 71 wherein a vending machine has certain operational conditions producing an alarm; and, characterized by indication means to indicate the alarm condition on the graphic representation of a differing vending machine.

Claim 77. The system as in Claim 76 characterized by means to display the graphic representation of the vending machine with the alarm condition, such means utilizing said indication means.

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Claim 78. The system as in Claim 71 characterized in that said graphic representation is a single generic representation for differing types of vending machines.

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Claim 79. The system as in Claim 71 characterized by the addition of means for said graphic display means to provide historical trend type information relative to the operational elements.

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Claim 80. The system as in Claim 71 wherein the system is utilized with varying capability vending machines having differing parameters and characterized in that said graphic display means includes means to modify said graphic representation in line with the differing parameters.

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Claim 81. In a vending machine remote monitoring system to keep track of an inventory of an item in the vending machine; the improvement of a computer; means to program the computer with a number representing the inventory in the vending machine; means to transfer the number of actual vend cycles from the vending machine to the computer; and, means to subtract the number of actual vend cycles from the programmed number to represent the inventory at the remote vending machine.

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Claim 82. The system of claim 81 wherein the item is packed in certain multiples in bulk shipping containers and the inventory is depleted by a number in excess of the certain multiple; and,

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characterized by means for said computer to generate a report disclosing the needed inventory by the certain multiples.

5 Claim 83. The system of claim 82 characterized by update means for said computer to update the number representing the inventory at the remote vending machine by the certain multiples of needed inventory.

10 Claim 84. The system of claim 83 characterized by the addition of indicate means to indicate that the new inventory has been added to vending machine and said update means operating automatically on said indicate means.

15 Claim 85. In a unit system for monitoring a vending machine including transmitting data from the machine to a remote computer, the improvement of the data being transmitted in a data packet, said data packet
20 including a vending machine unit identification number signal, said vending machine unit identification signal being unique for every machine, a sequence number signal, said sequence number signal being an incremental number of the times data is sent by the link to the computer, and
25 said data signal carrying the subsequent information about the status of the vending machine.

 Claim 86. The improved data packet of Claim 85 characterized in that said data packet is preceded by a
30 marker byte signal, and said marker byte signal indicating the beginning of said data packet.

 Claim 87. The data packet of Claim 86 characterized in that said data packet includes a packet
35 length signal, and said packet length signal indicating the length of said data packet minus said marker byte.