Part 02

Developing Techniques for Monitoring Battery Operations

Improving Maintenance Efficiency using Wireless Communication

Smart devices (i.e., mobile information terminals) such as smart phones and tablets are growing more secure. There is also a greater demand for using smart devices in business. Some industries are also evaluating whether to have maintenance technicians use portable smart devices when taking care of storage-enabled devices(●Fig. 1).
In 2014 GS Yuasa released a network card specifically for supporting an energy management system, the Acroware-iGYnetworkAgent. The Acroware-iGYnetworkAgent is equipped with a wireless communication interface that can be used exclusively for maintenance. This article discusses some technical concepts that can be used to improve efficiency and reduce the work involved when maintaining a storage-enabled device.

1. A Practical Use for a Storage-Enabled Device

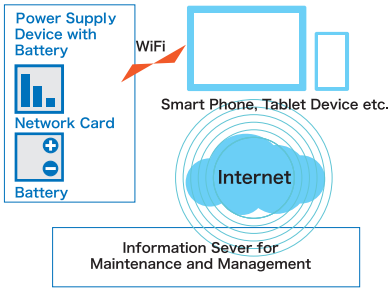
●Fig. 2 depicts an example of where a UPS may be installed. For instance, load devices that require backup power during a power outage (load device 1 and load device 2), an air conditioner (load device 3) and a lighting device (load device 4) are connected to a power line that supplies alternating current. The UPS may be connected to load 1 and load 2. The UPS, along with loads 3, 4 are connected to an EMS controller via an end user's network (LAN). A signal from the power management server controls the operation of UPS, and loads 3, 4. The power management server determines the optimal operational state of the load devices according to the state of demand and supply of power, and directs operations of a load device via the EMS controller. The UPS is capable of performing peak shifting; more specifically, the UPS reduces the gap in supply and demand for power depending on the time of day.

As illustrated in ●Fig. 3, the UPS rectifies the A.C. power from an electrical power line via a rectifier and charges the storage battery through a two-way converter. The power stored in the storage battery is supplied to an inverter via the two-way converter and converted to A.C. power; this converted power is supplied to the load via an inverter bypass switch. The inverter bypass switch may be used to turn off the inverter during an inspection of the UPS. In this case, the inverter bypass switch switches the system to supplying power directly from the electrical power line to the load device.

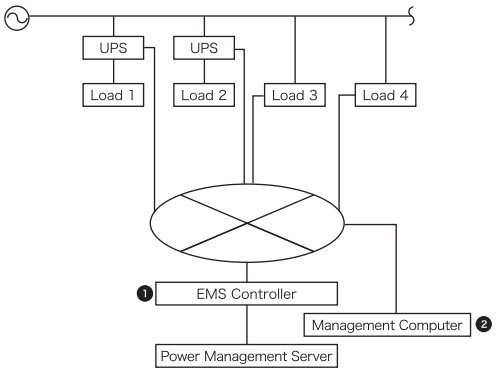
A storage battery may be configured from multiple storage cells. The UPS control device will measure or calculate the voltage, state of charge (SOC), and the like for each storage cell and store this information. The UPS control device also stores the temperature and the operation state of the UPS as information used to manage the device.

The network device, e.g., the network card in the UPS communicates with an EMS controller or the like via a LAN.

●Fig. 1 Using a smart device to maintain the storage-enabled device[1]

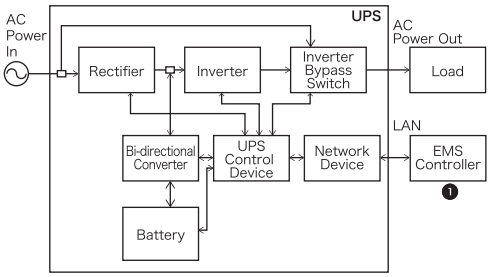


●Fig.2 Example of UPS Installation



As illustrated in ●Fig.4, the network device is equipped with wired and wireless LAN communication units. The wired LAN communication unit includes a connector for wired connection to an end-user's local area network to which the EMS controller is connected. A computer may also be connected to this LAN as a dedicated device that allows the end user to manage and monitor operations of a storage-enabled device. Thus, the operation and monitoring of the storage-enabled device take place via the EMS controller and the management computer.

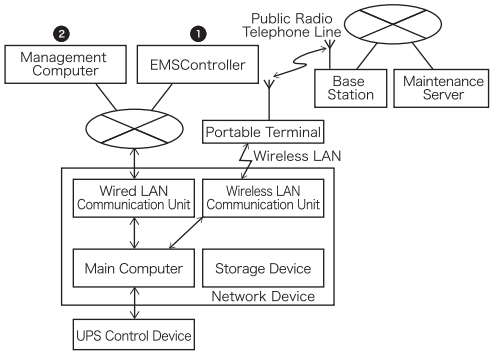
●Fig. 3 Internal Configuration of a UPS (Example)



2. Improving Maintenance Efficiency using Wireless Communication

A maintenance technician headed for a storage-enabled device installation will need information on the storage-enabled device to efficiently carry out maintenance work; this information may include an operation log for the storage cells. However, recently, an outside maintenance technician is restricted from accessing an end user's LAN. Therefore, it can be assumed that a maintenance technician will not be able to access the aforementioned operation log.

●Fig. 4 Improving Maintenance Efficiency using Wireless Communication[2]



Thus, the maintenance technician may use the wireless LAN communication unit provided in the storage-enabled device during maintenance work. A maintenance technician arriving at the installation carries out a predetermined authentication process through a portable information terminal connected via wireless LAN; the maintenance technician thereby establishes a data connection between the portable information terminal and the wireless LAN communication unit. The maintenance technician may thus acquire the log file for the storage-enabled device and read the file on the portable information terminal. A significant amount of information may be sent via the wireless LAN; however, this transfer does not affect the power management server monitoring and operating the EMS or the storage-enabled device since the wireless LAN is independent of the end user's LAN.

The portable information terminal can connect to the internet via a public radio telephone line and forward the log file or management information to a maintenance server. The remote maintenance server analyzes the state of the device based on the information forwarded and presents the maintenance technician with the required maintenance tasks. This can reduce the amount of time taken to perform maintenance work and improve the accuracy in the work performed.

In this article, we presented some concrete examples of operating a storage-enabled device and discussed some technical concepts that can be used to improve efficiency and reduce the work involved when maintaining a storage-enabled device. Part Three will introduce the techniques we use to estimate deterioration of the storage battery.

1. GS Yuasa Technical Report Volume 11, No. 2, published 2014
2. Japanese Patent No. 6402925 (Filed in 2014)

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