Development of "SANUPS PV Monitor E Model"

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1. Introduction

In recent years, rising concerns for planet environment protection and the nuclear accident in the wake of the Great East Japan Earthquake has resulted in much focus on renewable energies. In particular, the popularization of photovoltaic power generation is expanding the most, backed by enhanced governmental support measures.

Amidst this situation, the feed-in tariff system for renewable energy implemented in July 2012 has led to an increased number of electric utilities perators installing photovoltaic power systems, and greater requirements for maintenance and monitoring of such systems.

This paper provides an overview of the "SANUPS PV Monitor E Model" , a photovoltaic power system condition monitoring device developed in response to these requirements.

2. Background of the Development

Sanyo Denki developed the "SANUPS PV Monitor" in 2009 as a device capable of monitoring photovoltaic power systems via on-site LAN lines. However, we received feedback from our customers that the design had room for improvement so far as showing the power generation status on a large screen, along with requests to be able to store data

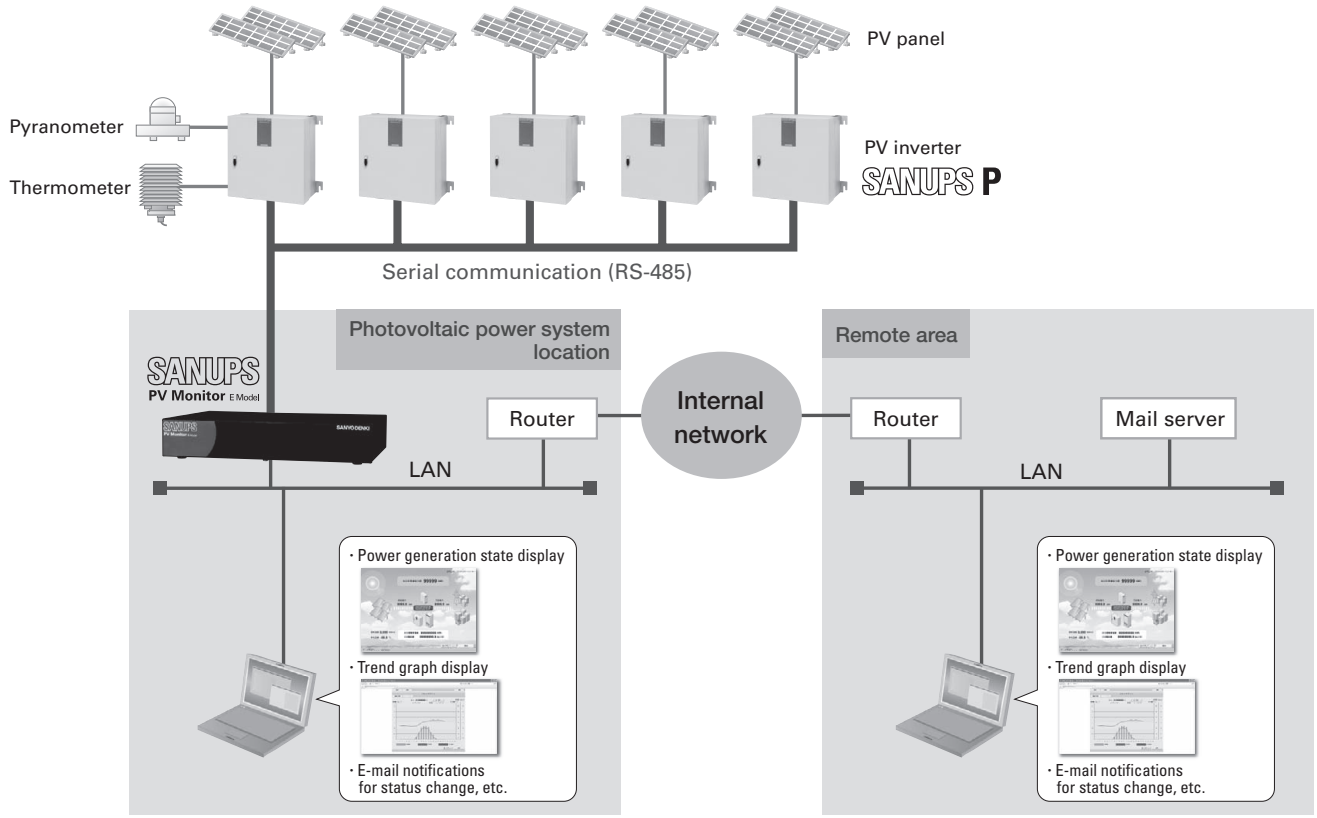


Fig. 1: Example of system configuration

for prolonged periods of time.

Furthermore, the "SANUPS NET" which uses cloud services was developed in 2013, as well as a "mobile communication pack" for outdoor installation which comprises of a "SANUPS PV Monitor" and mobile router in a waterproof box in order to acquire data in places where it is difficult to install dedicated lines such as outdoor erection or rooftop lending.

However, due to limitations of the "SANUPS PV Monitor" , the mobile communication pack could only be used in a temperature range of 0 to 40˚C. As the mobile communication pack was specifically for outdoor use, it was imperative that we expand its operating temperature range.

Sanyo Denki developed the "SANUPS PV Monitor E Model" , a photovoltaic power system condition monitoring device in response to such requirements.

3. Product Overview

Fig. 1 shows the system configurations of this product.

This product is connected with a Sanyo Denki PV inverter via RS-485 communication in order to receive information necessary for the service and monitoring of photovoltaic power system and collect data. This product can be connected to a maximum of 27 PV inverters. By connecting this product, it is possible to monitor the power generation of a photovoltaic power system and operational status of the PV inverter from a network device through a LAN interface.

4. Features

4.1 Operating temperature range

The circuit of this product has been revised, expanding the operating temperature range from -25 to +60˚C. This is the same as the operating temperature range of outdoor PV inverters of SANYO DENKI.

By using this product, the operating temperature range of the mobile communication pack can also be expanded.

4.2 Strengthened security

As prevention against spam mail, there are an increasing number of cases where e-mail cannot be easily sent to Internet or mobile phone e-mail addresses.

This product supports both the SMTP over SSL/TLS[*1] or STARTTLS[*2] encryption method, making it possible to send e-mails to Internet or mobile phone e-mail addresses, which use a high level of security.

Furthermore, in regards to receiving inquiry e-mails, the "SANUPS PV Monitor E Model" also supports POP3 over SSL/TLS[*3] or STLS[*4].

*1, 2: SSL is the abbreviation for Secure Socket Layer. TLS is the abbreviation for Transport Layer Security. When sending e-mail, the method of encryption with either SSL or TLS from the beginning is called "SMTP over SSL/TLS" , while the method of encryption with SSL or TLS from mid-way through is called "STARTTLS" .

*3, 4: When receiving e-mail, the method of encryption with either SSL or TLS from the beginning is called POP3 over SSL/TLS, while the method of encryption with SSL or TLS from mid-way through is called STLS.

4.3 Strengthening of data collection and aggregation functions

This product can tally and store the data collected from a power conditioner. The conventional model could save 42-days' worth of daily reports (data taken every hour).

This product can tally monthly reports (data taken every day) in addition to the conventional daily reports. The data storage period is 42 days for daily reports and 25 months for monthly reports.

Fig. 2 shows the daily report display screen, while Fig. 3 shows the monthly report display screen.

Furthermore, the conventional model tallied the average value per unit of the measurement, however this product is also capable of tallying the naximum and minimum values.

4.4 Strengthened e-mail function

As a strengthened e-mail monitoring function, this product can send power generation and other data tallied every hour, as well as information on the power conditioner status, via e-mail at a specified time and to a specified e-mail address.

With the e-mail monitoring function of the conventional model, an upper server device had to periodically request the Sanyo Denki product to provide data in order to acquire data.

With this product however, data can be collected automatically using the report e-mail function, making monitoring of a photovoltaic power system easy.

Fig. 4 shows a configuration example of the report e-mail function.

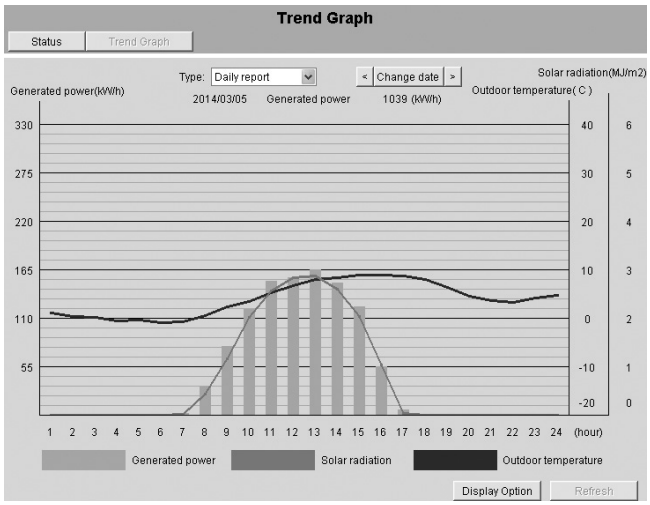


Fig. 2: Daily report display screen

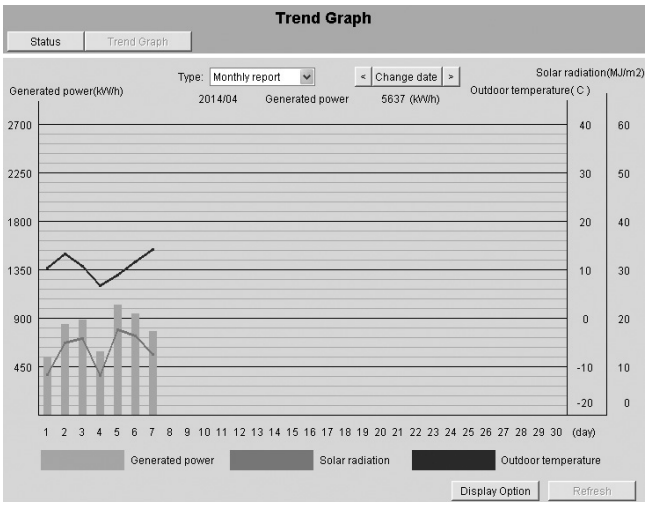


Fig. 3: Monthly report display screen

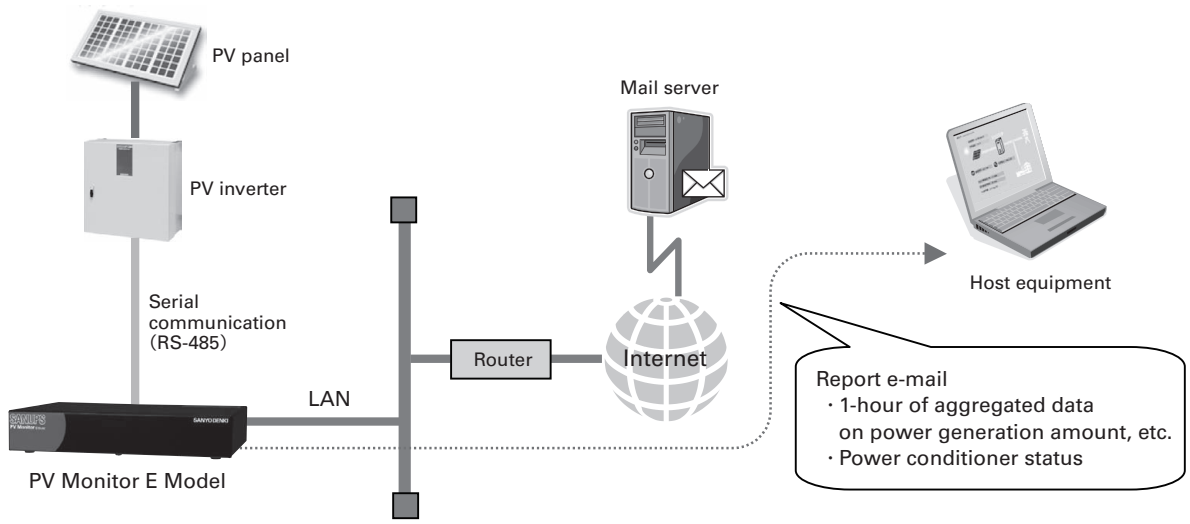


Fig. 4: A configuration example of the report e-mail function

4.5 Reduced power consumption

The control power circuit of this product has been revised from the conventional model, reducing the power consumption by 20%.

4.6 Power generation status

The display showing the power generation status of a photovoltaic power system in real time has been given a new look in order to promote Sanyo Denki's power conditioner "SANUPS P" series and emphasize its environment-friendliness.

Customers can access this product via a LAN line and display the power generation status.

It is also possible to promote the power generation status of their photovoltaic power system through display on a large screen.

Fig. 5 shows the power generation status.

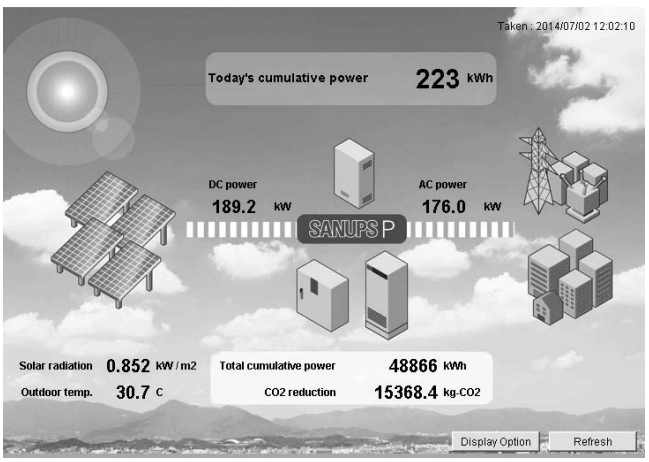


Fig. 5: Power generation status

4.7 Global support

Overseas markets require selection of a device which meets safety standards, making conformity with such standards essential. This product was designed to be compatible with the safety standard of Information-Processing Equipment (IEC60950-1) and EMC Directive. It has also acquired the CE Marking.

Moreover, considering utility power in countries around the world, we have given this product a rated input voltage of 100 to 240 V AC and allowable voltage range of 85 to 264 V AC. By using a detachable power cord, the “SANUPS PV Monitor E Model” can easily be plugged into the various countries’ power outlets.

5. Benefits for our Customers

Even in severetemoerature environments, it is possible to monitor the operational status og photovoltaic power systems remotely, therefore making it possible to discover malfunctions and other forms of trouble early on and maintain high system operational status. By using the report e-mail function, photovoltaic power systems can be easily monitored.

6. Specifications

Table 1 shows the specifications of the photovoltaic power system condition monitoring device “SANUPS PV Monitor E Model” , while Table 2 shows its functions.

Table 1: Specifications of the “SANUPS PV Monitor E Model”

Item		Specifications	Remarks
Input voltage		100 to 240 V AC	
Allowable input voltage range		85 to 264 V AC	
Input frequency		50/60 Hz	
Maximum power consumption		5 W	
External interface	**Power conditioner interface**	RS-485	Attachable terminal strip 3-pin
	LAN interface	100BASE-Tx / 10BASE-T	RJ-45
	Settings port	RS-232C USB	RS-232C D-Sub 9 Pin (male) MiniUSB
Operating environment	**Ambient temperature**	-25 to +60˚C	
	Relative humidity	90% max.	No condensation
Dimensions		220 x 150 x 40 mm (W x D x H)	Protruding parts not included
Mass		1.0 kg	

Table 2: Functions of the "SANUPS PV Monitor E Model"

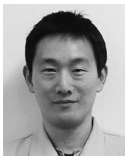
Item	Content
E-mail monitoring function	Event notification e-mails, request e-mail response, report e-mails
SNMP support	Standard MIB (RFC1213), Expansion MIB
WEB support	Power generation status diagram, trend graph (daily/monthly reports)
Measurement data collection	Information sampling interval: 10 sec, Connected devices: Max. 27 units
Measurement data tally	Holds 42-days' worth of 10-min aggregation data (system total value)
	Holds 42-days' worth of 1-hr aggregation data (individual machine x 27 units)
	Holds 25-months' worth of 1-day aggregation data (individual machine x 27 units)
DHCP support	Supportable
NTP support	Supportable
Data download using FTP	Measurement information, event information, settings information, aggregation information
Non-communication monitoring (alive monitoring)	E-mail monitoring, SNMP monitoring
Remote parameter settings	SSH, Telnet, WEB
Remote program updates	Supportable
Coexistence with data collection devices	Supportable

7. Conclusion

This paper has provided an overview of the "SANUPS PV Monitor E Model" photovoltaic power system monitoring device. The development of this product has made it possible to monitor photovoltaic power systems even in severe temperature environments.

It is predicted that more requirements will emerge relating to the maintenance and monitoring of photovoltaic power systems. Sanyo Denki intends to develop more sophisticated products to meet these requirements and continue to provide products which earn customer satisfaction.

We sincerely thank the many people involved in the development and realization of this product for their advice and support.



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