

Product introduction for

PetitLOGGER

GL100 series

(Industry-specific software for Agriculture)

(vol 1, rev 1.0)



GRAPHTEC

Graphtec Corporation

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Situation of measurement in agriculture (Modernization and industrialization)

• Expansion of measurement in agriculture

Production of agricultural has been done by "intuition" and "experience". Large variation occurs in the yield and quality of crops.

Recently, capturing of the relationship between a yield/quality of crops and growth environment as temperature, humidity or sunlight scientifically is performed. For this reason, it has occurred to use instruments for measuring temperature, humidity and sunshine. It is able to stabilize a yield and quality of the crop by performing agricultural work based on scientific knowledge obtained therefrom.

Further progressing, it has been started to use the light controller or the blower actively adjusting the environment of cultivation place. So, it is become popular to check environment that is adjusted by each devices to best condition using measuring instrument.

Improvement of productivity and quality of crops is done by this action, and producing areas of crops have also been expanded.

Modernization and industrialization of agriculture

Agricultural work is done by
"intuition" and "experience"



Understanding the growth
environment based on the data



Agricultural work is done by "information"



Creating growth environment actively
Getting a better plants
(Improving quality and productivity)

First, knowing the environmental conditions of cultivation place. Then, environment that has been believed by the agricultural workers is recognized that may not be the best conditions for the cultivation of plants.

It increases to use
a measuring
instrument.

It is able to be stabilized yield and quality of the crop.

Preparing the environment of cultivation place.
Example: Protected horticulture
(Plant factory, Large horticulture facility, Plastic
greenhouse, etc.)

It increases to use
a measuring
instrument.

Application of GL100 in agriculture

• **Corresponding to the measurement of the agricultural**

In the GL100, it easily perform a wide range of measurement by replacing the input module. Measured data is able to monitor by using softwares.

Sensors for temperature, humidity and illuminance (sunlight) which are used to measure the growing environmental conditions of crops in agriculture are available.

At this moment, the ability to display the index for a better understanding of the growing environment condition in agriculture will be added to the softwares. Software calculates an index as the Dew-point temperature, humidity deficit, accumulated illuminance and accumulated UV based on measured data of temperature, humidity, illuminance and UV. It also display an index.

It is easy to perform measurement in the agricultural by using the GL100 and software, be able to get an index of the growth situation. It is able to contribute the modernization and industrialization in agriculture.

• **Softwares corresponding to the measurement of the agricultural**

Software for PC (New version of the GL100-APS)

It is able to display the current measurements and trends, it is also possible to control the settings for measurements and storage on the GL100.

- Able to switch the mode depending on the application.
- In the agricultural mode, be able to display an index in format of easy to understand.

Software for smart devices (New version of GL-Connect)

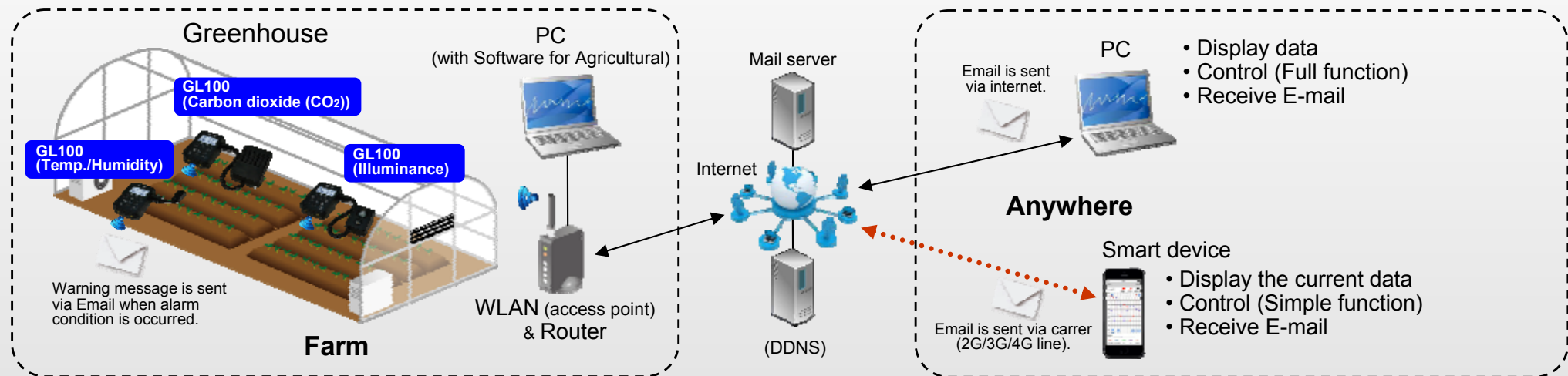
It is able to display the current measured data or the saved data, it is also possible to control the simple settings for measurement on the GL100.

- Able to switch the mode depending on the application.
- In the agricultural mode, be able to grasp immediately measurements by simple display.

The system configuration in agricultural applications

• Recommended configuration of the network

Remote monitoring of the environment of cultivation place is able to be performed efficiently when the GL100-WL that supports the wireless LAN is used. It is recommended to use the GL100-WL. It is able to monitor the environment of cultivation place for crops by using a PC or a smart device. When the following network including the Internet is created, it is able to monitor the measurement results at anytime and anywhere.



Requirements of network construction

A static global IP is set to the router in the farm.
(Requires contract with the Internet provider.)

or

The services of the DDNS (Dynamic Domain Name Server) is used.
(Router needs to have function to support the DDNS. Available DDNS provider varies by a router.)

Note: When the network is not created shown above, it is not able to monitor the measurement results using the Internet.
The PC or smart device is able to receive a warning message that is transferred by E-mail.

Measurement item in agricultural applications

• What item measured?, What contents understand from the measurement?

It is a measure for knowing the current status.

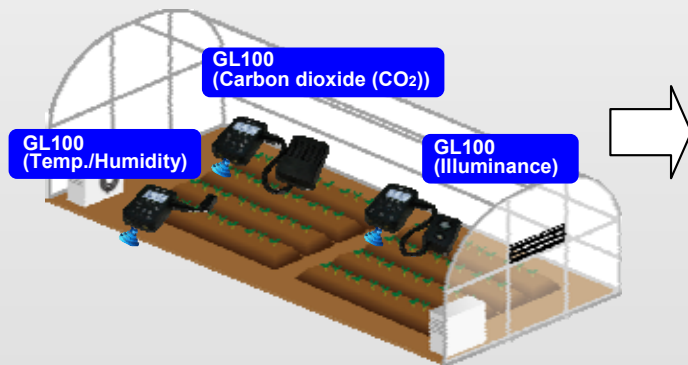
It is an index to determine the specific tasks.

Level	Measurement items	Indicators in agriculture	Meaning of indicators	Items recognized by indicators
1st (Main)	Temperature, Humidity	Dew-point temperature	Temperature of occurring the dewing (condensation of water vapor)	There is not occurring the dewing. Continuing the condition of dewing becomes a cause of disease.
		Humidity deficit	Indicators showing amount of water vapor that can be added to the air	There is a suitable humidity deficit. Best humidity deficit for the growth is the 3 to 6 g/m ³ .
		Accumulated temperature	Calculating formula (Measured temperature - Reference temperature) X Time	It is able to understand the timing of growth as flowering, fruiting. The growth is related with accumulated temperature.
2nd (Sub)	Carbon dioxide (CO ₂)	CO ₂ concentration	Carbon dioxide (CO ₂) concentration in the air	There is a suitable Carbon dioxide (CO ₂). It is required for photosynthesis in plants. In some cases, the CO ₂ is supplied actively for growth of the plants. (CO ₂ concentration of the air is approximately 400 ppm)
	Illuminance	Accumulated illuminance	Hours of sunshine	There is enough sunshine for necessary to growth.

Softwares corresponding to the measurement of the agricultural

• Needs for software that supports agriculture

Indicators that are required in agriculture is calculated from the measured temperature, humidity and illumination. When indicators are displayed along with the measured values by the software, worker can concentrate on work.



Smart devices

Software: GL-Connect



Monitor the measured value using smart device



PC

Software: GL100-APS



Check value of index using a PC



Advantage:

Indicators is able to see immediately without complicated calculation.

You will be able to concentrate on the work in order to create conditions close to the best growth environment in accordance with the varieties of the plant.

Mode in the new version of software

• Available functions in each mode of software

The software is updated, and then mode corresponding to agriculture is added.

Mode	Supported sensor or input terminal	Accumulated temperature	Accumulated illuminance	Accumulated amount of ultraviolet light	Accumulated power
Agriculture	Sensor of Temperature/Humidity Carbon dioxide (CO2) Illuminance/Ultraviolet	Supported	Supported	Supported	N/A
Standard	All of sensors and the input terminals	Supported (Trend graph only)	Supported (Trend graph only)	Supported (Trend graph only)	Supported (Trend graph only)
Simple	All items except GS-4VT (The logic or pulse input is not supported.)	Supported	Supported	Supported	Supported

Mode for agriculture in the new version of software

• Software for PC (GL100-APS)

Setting the mode

Selecting the mode when software is started

Standard mode

Agriculture mode

Friendly design. Measurement results will be displayed in a format that can be easily understood as an indicator for agriculture.

Screen format is tentative.



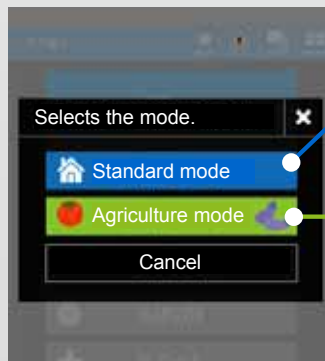
• Software for Smart devices (GL-Connect)

Setting the mode

Selecting the mode when software is started

Standard mode

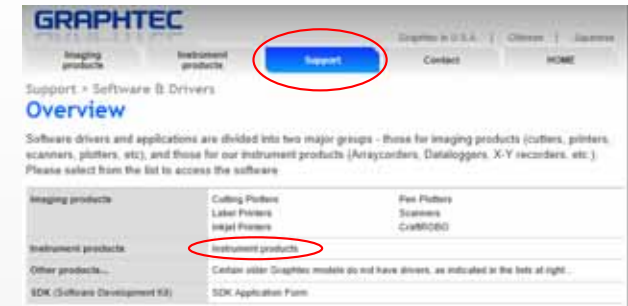
Agriculture mode (Friendly design)



Providing of software

Software for PC (GL100-APS): available for free download from the Website
<http://www.graphteccorp.com/support/software/instruments.html>

Available: February 2015 (supported language is English French, German, Korean, Chinese and Japanese)



Software for smart devices (GL-Connect) for the GL100-WL:

Android: A free download from Google Play



at January (Supported Android OS: 4.1 - 4.4)

iOS: A free download from App Store



at February (Supported OS: iOS7 and iOS8)

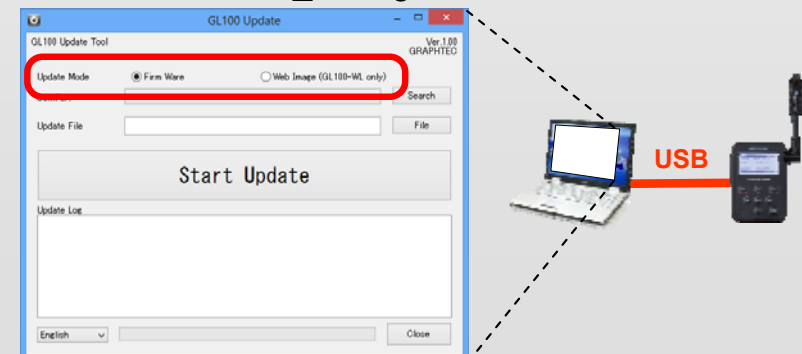
Available: January or February 2015 (supported language is English, French, German and Japanese)

Note: When new version of software is used, the firmware of the GL100 needs to be updated.

Required files	Description
Firmware file	Downloads from the Website.
GL100-Network_Config software (including the USB driver)	Used for updating the firmware. It is attached to the GL100 as the standard accessory. (It is also able to download from Website.)
Software GL100-APS for PC	Downloads from the Website.
Software GL-Connect for smart devices (it is able to use with GL100-WL)	For Android: Download from Google Play.
	For iOS: Download from App Store.

The firmware is able to update using the GL100-Network_Config software that is standard accessory.

GL100-Network_Config



Note: Refer the instructions for updating the firmware.

Software specification (1)

• GL100-APS (for PC)

Supported language: Supported language: English French, German, Korean, Chinese and Japanese

Item	Description		
Supported OS	Windows 8.1 / 8 / 7 / Vista (64/32bit)		
Supported interface	USB, Wireless LAN (IEEE802.11b)		
Settings control	Input settings, Capturing settings, Alarm settings, Trigger settings		
Mode	Standard mode	Simple mode	Agriculture mode
Functions	<ul style="list-style-type: none"> - Control the GL100 - Data capture in real-time - Replay the data - Data format conversion 	<ul style="list-style-type: none"> - Control the GL100 - Replay the data 	
Captured data	<ul style="list-style-type: none"> - Transfers data in real-time (in binary or CSV format) - Saved data in GL100 - Saved data in SD card on GL100 	<ul style="list-style-type: none"> - Saved data in GL100 - Saved data in SD memory card on GL100 	
Connectable number of units	10 units	10 units	10 units
Supported input modules	All of modules (sensors and terminals)	All modules except the Voltage/Temp terminal (GS-4VT), (The logic or pulse input of GS-4TRS is not supported.)	<ul style="list-style-type: none"> - Temp./Humidity sensor (GS-TH) - Carbon dioxide sensor (GS-CO2) - Illuminance/UV sensor (GS-LXUV)
Displayed informations	Analog data, Logic/pulse data	Analog data	
Display modes	<ul style="list-style-type: none"> - Digital values - Y-T waveforms - Statistics or history - X-Y graph (specified period data in data replay) 	<ul style="list-style-type: none"> - Digital values - Y-T waveforms - Accumulated values by bar graph. (It displayed on the report tab.) 	
File format conversions	Binary data is able to convert to CSV format (at between cursors, all data or each specified interval)	N/A (Captured data is transferred to PC in the CSV format. The format conversion to CSV from binary is not required.)	
Monitoring functions	<ul style="list-style-type: none"> - Sends email to specified address when the alarm occurred - Sends information periodically 	N/A (Message for warning and other are sent by GL100.)	
Report functions	Creates a daily or monthly report	N/A	

Software specification (2)

• GL-Connect (for Smart devices)

Supported language: English, French, German, Japanese

Item	Description		
Supported OS	iOS: iOS7 and iOS8, Android OS: version 4.1 to 4.4		
Supported interface	Wireless LAN (IEEE802.11b)		
Mode	Standard mode	Simple mode	Agriculture mode
Connectable number of units	10 units		10 units
Supported input modules	All of modules (sensors and terminals)		- Temp./Humidity sensor (GS-TH) - Carbon dioxide sensor (GS-CO2) - Illuminance/UV sensor (GS-LXUV)
Functions	- Displaying data in digital values format - Displaying data in Y-T waveform format (in data replay only) - Controls the start or stop of GL100 - Sets sampling interval - Sets conditions for sending email - Customize items displayed		- Displaying data in digital values format - Displaying data in Y-T waveform format (in data replay only) - Controls the start or stop of GL100 - Sets sampling interval - Sets conditions for sending email
Others	Based design (same as old version)		Friendly design, Adding dedicated button to menu for; - Start or stop of data capture - Open the saved data - etc.

For Android: Download from Google Play

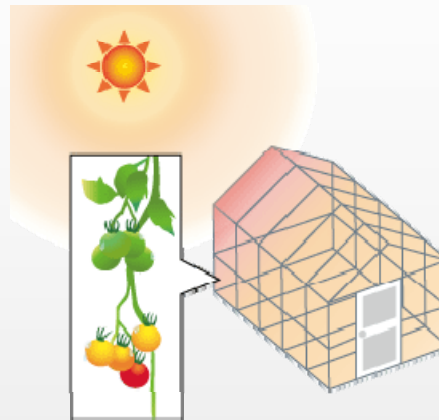
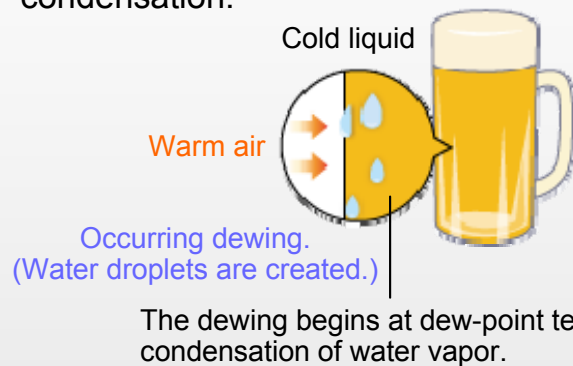
For iOS: Download from App Store

References (1)

Dew-point temperature

Temperature of occurring the dewing (condensation of water vapor)

The maximum amount of water vapor that is allowable in the air depends on temperature. When the temperature drops, water vapor becomes water droplets by condensation.



In the tomato, continuing the condition of dewing becomes a cause of disease.

Solutions

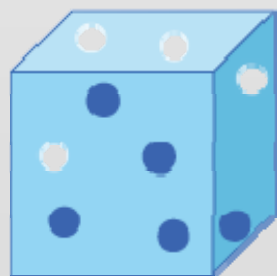
- Lowering the temperature.
- Lowering the humidity.
- Sending the air for moving water vapor.

The temperature in the greenhouse rises after the sun rises. However, temperature of tomatoes will not rise immediately because specific heat of the tomato is higher than the air. So, the dewing tends to occur by the temperature difference between the air of greenhouse and the tomatoes.

Humidity Deficit

Indicators showing amount of water vapor that can be added in the air

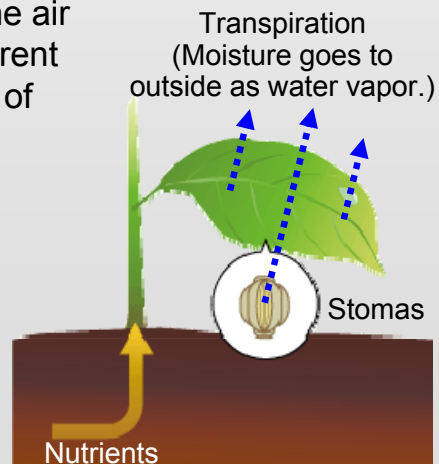
The maximum amount of water vapor that is allowed in the air depends on temperature. The difference between the current water vapor amount and the maximum allowable amount of water vapor is the humidity deficit.



Air

(The unit of humidity deficit is the g/m^3 .)

- Grain of water vapor.
- Able to include the grain of water vapor.



Best humidity deficit for the growth is the 3 to 6 g/m^3 . Growth of plants is in slow if the condition is not the best.

- When the humidity deficit is higher, stomas on plants are closed to prevent drying. (Plants do not have absorbing the nutrients from the ground by not having the transpiration, cannot be grow.)
- When the humidity deficit is lower, plants cannot make transpiration by the water vapor pressure difference in the air. (Plants do not have absorbing the nutrients from the ground by not having the transpiration, cannot be grow.)

Solutions

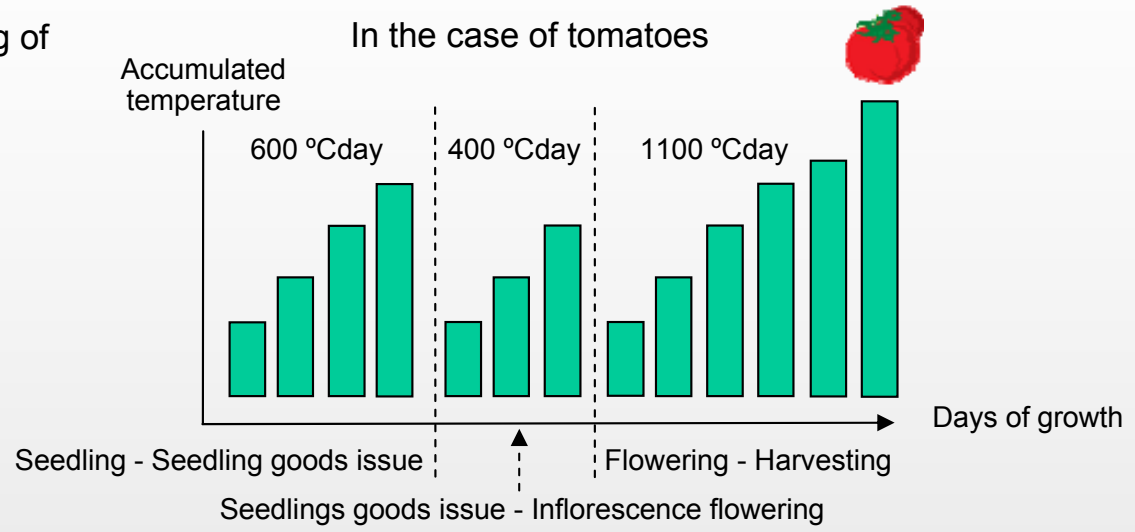
- Controlling temperature and humidity.

References (2)

Accumulated temperature

Calculating formula: (Measured temperature - Reference temperature) X Time

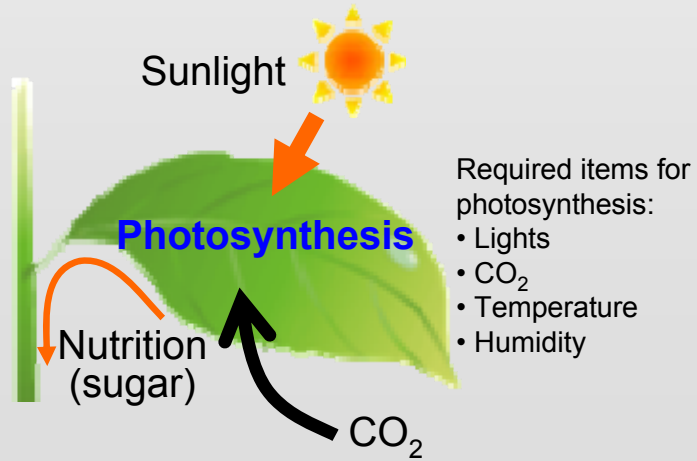
There is required to a certain number of days for maturing of fruits. In especially, accumulated temperature is more important than the number of days.



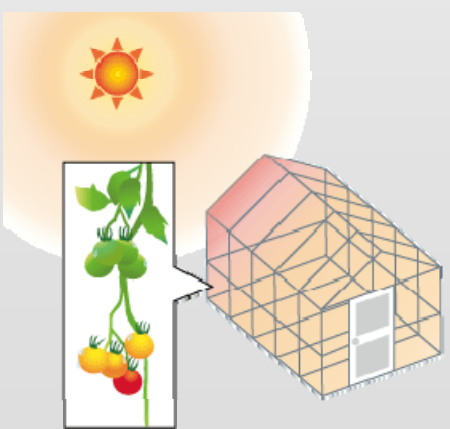
CO₂ concentration

Carbon dioxide concentration in the air

The photosynthesis in plants need carbon dioxide (CO₂).



Generated nutrition is stored to fruits or bulbs of plant.



When photosynthesis is proceeded, carbon dioxide concentration in the greenhouse is lower. It will be cause of inhibiting photosynthesis.

- Solutions
- Supplying the CO₂ to the greenhouse. (Promoting of photosynthesis)