

For Photovoltaic Generation

HBE-Green-ETS-Solar



- Understand Technology of Solar Panel
- Understand Total System Configuration for Photovoltaic Generation
- PC Application Program for Generation Monitoring provided
- Platform to operate actual Appliance provided
- Test Photovoltaic Generation Application using various Load Devices

Introduction

- Green Technology Products by Hanback Electronics Co.,Ltd. are Education Product group developed by recent Industrial trend related with Green Energy and Low Carbon Green Growth.
- Green Technology Products understand Generation using Photovoltaic, Wind Power and Fuel Cell, and handle all processes from the basic to application for technology related with the generation method and Power Generation process.
- Green Technology Products are systematically composed with devices from those for basic technology experiences to those for applications for taking advanced technology. And this provides the best education environment to all the institutes and subjects which educate the development of IT convergence technology and alternative energy.
- HBE-Green-ETS-Solar is a device which we can learn the basic concept of Photovoltaic Generation. So we can understand characteristics of Solar Cell through its connection, and changing the position of Artificial Sun, we can do various tests for Effectiveness and Development of Solar Cell.
- HBE-Green-ETS-Solar is designed to understand various applications which can alternate currently used Power with using Photovoltaic through various Loads. And this provides Monitoring program using PC or Embedded system so we can understand the configuration of actual Photovoltaic system, and how to use it.

Features

- Composed of technological elements to understand Photovoltaic System
- Uses 12W Solar Panels(2 ea) and generates AC to operate Appliance
- Tests the properties of Solar Panel
- Tests Conversion process of generated Energy(Power Generation and Processing)
- Tests Energy Effectiveness by the process of Energy Generation and Conversion
- Performs Load Characteristic Test using various Loads, and Separate Test by Modules
- Tests Various Applications through Rearrangement by function modules and Cable Rewiring
- Makes up Industrial PC System for independent Monitoring Test
- Provides Monitoring System and PC Application Program using PLC(only Stand-alone System)and USN

Green IT

HBE-Green-Energy

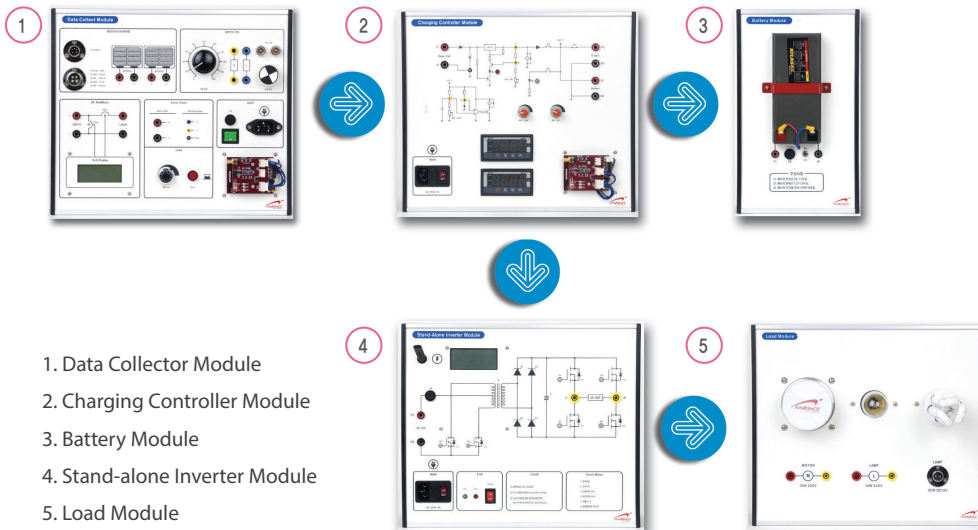
HBE-Green-HomeNet

HBE-Green-ETS-Solar

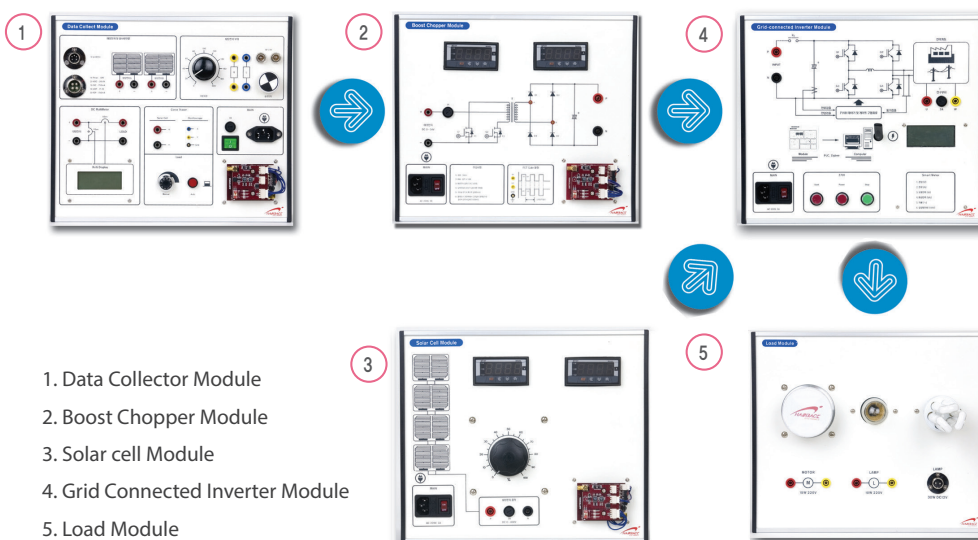
Configuration and Names

HBE-Green-ETS-Solar is composed of modules by function blocks, based on Green Energy Framework, and Stand alone System and Grid connected System. We can do Monitoring test using USN and PLC and test Consumption part through Load Devices.

• Stand-alone System




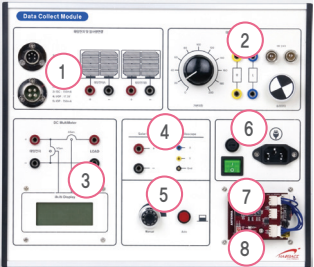
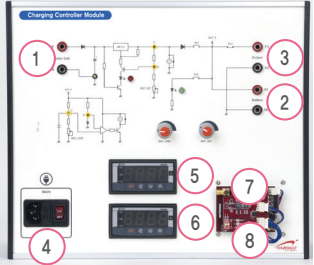
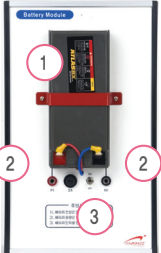
• Grid connected System



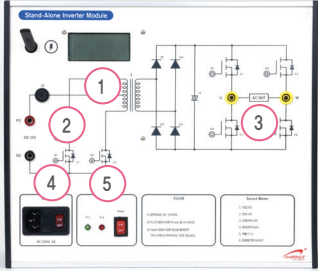
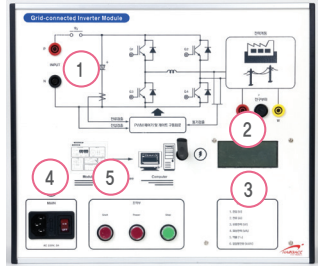
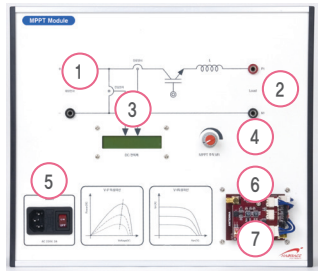
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Functions by Modules

Item	Description
 <p data-bbox="318 902 508 925">Light Control System</p>	<ul data-bbox="646 562 1227 682" style="list-style-type: none"> • Controls Photovoltaic with Controller automatically • Sets Lighting mode (manual/auto) • Changes Tilt Angle from 0° to 90° • Changes Height of Artificial Light Source by 4-joints equipment <ol data-bbox="662 709 984 870" style="list-style-type: none"> ① Halogen lamp ② Solar Cell ③ PYR sensor ④ Surface Temperature sensor(rear) ⑤ Control Box
 <p data-bbox="318 1288 508 1310">Data Collect Module</p>	<ul data-bbox="646 959 1105 1124" style="list-style-type: none"> • Checks Voltage and Current of Solar Cell • Checks Rear Temperature • Checks Solar Radiation • Tests Load Characteristic of Solar Cell • Curve Tracer • Transmits Data with USN and PLC communication <ol data-bbox="662 1143 1078 1369" style="list-style-type: none"> ① Connect Block for Solar Cell and PYR Sensor ② Solar Cell Load block ③ DC Multi Meter block ④ Curve Trace block ⑤ Load block ⑥ Power Connecting Block (PLC) ⑦ Zigbee block ⑧ PLC block (rear)
 <p data-bbox="285 1689 545 1712">Charging Controller Module</p>	<ul data-bbox="646 1401 1105 1515" style="list-style-type: none"> • Protects Battery • Prevents Countercurrent • Power Cutoff Toggle Switch embedded • Transmits Data with USN and PLC communication <ol data-bbox="662 1533 956 1759" style="list-style-type: none"> ① P, N Input Terminal ② P1, N1 Out Terminal ③ P2, N2 Out Terminal ④ Power Connecting Block (PLC) ⑤ Voltage Meter ⑥ Ampere Meter ⑦ Zigbee Block ⑧ PLC Block (rear)
 <p data-bbox="334 2059 480 2082">Battery Module</p>	<ul data-bbox="646 1850 902 1902" style="list-style-type: none"> • Current Limiter embedded • 12V/7Ah <ol data-bbox="662 1920 865 2004" style="list-style-type: none"> ① Battery ② P1, N1 Out Terminal ③ On/Off Switch

Functions by Modules

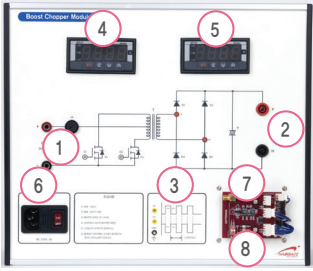
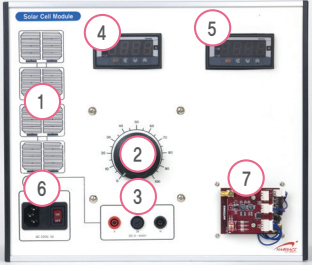


Item	Description
 <p>Stand-alone Inverter Module</p>	<ul style="list-style-type: none"> • Input Voltage : DC 11~14V • Output Voltage : AC 220V • Max.Power : 300W • Pure Sine Wave mode • DC conversion efficiency : over 95% • Displays Trip • Current Limiter embedded • Smart meter embedded • Transmits Data with USN and PLC communication <ol style="list-style-type: none"> ① Smart Meter ② P2, N2 Input Terminal ③ AC Output Terminal ④ Power Connectingblock (PLC) ⑤ Control Panel block
 <p>Grid-Connected Inverter Module</p>	<ul style="list-style-type: none"> • Max.Power : 1500W • Input Voltage : DC 0~350V • Output Voltage : AC 220V • Pure Sine Wave mode • DC conversion efficiency : over 95% • Displays Trip • Current Limiter embedded • Smart meter embedded • Transmits Data with USN and communication <ol style="list-style-type: none"> ① P, N Input Terminal ② Inverter Output Terminal ③ Smart Meter ④ Grid Connected Block ⑤ Control Panel Block
 <p>MPPT Module</p>	<ul style="list-style-type: none"> • Maximum Power Point Tracking • Self-Tracking by changed Range of Solar Cell Voltage Directive • Voltage, Current sensor embedded • Measures Pmax value <ol style="list-style-type: none"> ① Solar Cell Input Terminal ② P1, N1 Output Terminal ③ DC Wattmeter LCD ④ MPPT Tracking Potentiometer ⑤ Power Connecting block (PLC) ⑥ Zigbee Block ⑦ PLC Block (rear)

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Functions by Modules

Item	Description
 <p>Boost Chopper Module</p>	<ul style="list-style-type: none"> • Input Voltage : DC 0~34V, Max. DC 38V • Capacity : 200W • Current Limiter embedded • Magnification : over 11 times of Input • Measuring Point provided • Dischargeable Resistance embedded • Transmits Data with USN and PLC communication <ol style="list-style-type: none"> ① Solar Cell DC Input ② P, N Output Terminal ③ FET gate Waveform Measuring TP ④ Voltage Meter ⑤ Ampere Meter ⑥ Power Connecting Block (PLC) ⑦ Zigbee Block ⑧ PLC Block (rear)
 <p>Solar Cell Module</p>	<ul style="list-style-type: none"> • Capacity : 200W • Voltage/Current : 400V/0.5A • Current Limiter embedded • Transmits Data with USN <ol style="list-style-type: none"> ① Virtual PV Cell ② Volt Adjusting switch ③ P, N Solar Cell Output ④ Voltage Meter ⑤ Ampere Meter ⑥ Power Connecting Block ⑦ Zigbee Block
 <p>Load Module</p>	<ul style="list-style-type: none"> • Single Phase Induction Motor 220V, 25W/1EA • Lamp Load AC 220V 10W/1EA • Streetlamp Load DC 12V 20W/1EA <ol style="list-style-type: none"> ① Motor Load and Connection Terminal ② Lamp Load and Connection Terminal ③ Streetlamp Load and Connecting Terminal
 <p>Communication Module</p>	<ul style="list-style-type: none"> • Industrial PC embedded • Receives Data with USN and PLC communication • Ethernet Port • RS485, RS232 ports provided • USB Port <ol style="list-style-type: none"> ① 8.4" Touch Panel ② Power Connecting Block (PLC) ③ PC Port Block ④ Zigbee Block ⑤ PLC Block (rear)

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- HBE-Green-ETS-Solar**

Contents

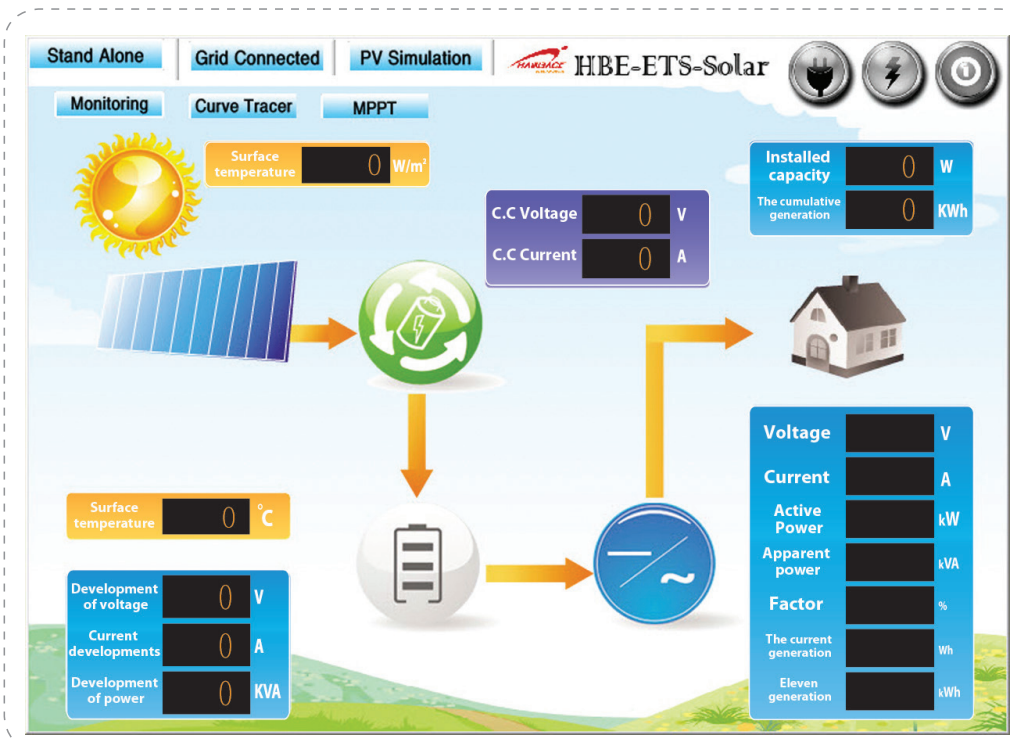
At first to understand Basic principle included in HBE-Green-ETS-Solar, we study basic understanding of Energy, then understand the pros and cons of Alternative Energy. Application includes advanced technologies; Inverter and Converter and Grid Connected. And it has various levels of difficulty in order to understand the basic technology through practice test and the advanced technology through application test.

Contents of Education

HBE-Green-ETS-Solar PV systems to the learning lab

- | | |
|--|--|
| <ul style="list-style-type: none"> Renewable Energy 1. Overview of Renewable Energy 2. Type and Characteristics of Renewable Energy | <ul style="list-style-type: none"> Appendix 1. Introduction & Installation of PC application Software 2. Glossography |
| <ul style="list-style-type: none"> Experiment using Solar Power Generation System 3. Introduction of HBE-ETS-Solar 4. Practice of Solar Power Generation System 5. Experiment using PC Application Program | |

Monitoring Software



Specification

• Light Control System

Solar Cell	Communication
Max. Power : 12Watt x 2EA Max.Voltage / Current: 17.3V / 750mA Open Circuit Voltage / Short Circuit Current : 20.8V / 755mA	ZigBee Module , Communication Speed : 19200bps PLC Module , Communication Speed : 4800bps
PV control device	Sensor
Halogen lamp 500W X 2EA(Lamp Protection device) Control Panel materials : Steel, Block Type Silk printing by Items Post Processing : EX8816 - D80830 powder	Rear Temperature measuring sensor embedded 1 Wire communication mode PYR sensor embedded

• PV Generation Test Equipment

Body and Box	Frame
Type : wooden HPM Thickness : slab over 30mm, others over 18mm Dimension : 1200 X 600 X 700(W x D x H)	Type / Dimension : Aluminum Profile / 20 X 50 MS7309, A6063-T5, Anodizing surface treated Module Fixing : Up/Down Rail fixing mode Step : 2 step, BUS : 1 row

• Data Collector Module

Multi Display	Communication
Solar Output Volt(V), Solar Output Current(mA) Surface Temperature(°C), Solar Radiation(W/m²)	ZigBee Module , Communication Speed : 19200bps PLC Module , Communication Speed : 4800bps
Interface	Curve Tracer
Solar Cell, Solar Radiation, Temperature connecting Connector Solar Cell Terminal Solar Cell Load Characteristic Test	X-axis, Y-axis measuring Terminal Load precision Potentiometer Solar Cell Input Terminal

• MPPT Module

Max. Power Point Tracking Control	Communication
Self-Tracking by changed Range of Solar Cell Voltage Directive Voltage, Current sensor embedded Reactor for Current Limit, Tracking Control VR Pmax value Measuring Meter	ZigBee Module - Communication Speed : 19200bps PLC Module - Communication Speed : 4800bps

• Charging Controller Module

Charging Controller	Communication
System Voltage : 12V Solar Input : over 17V Self-Current Consumption : 6~10mA Charging Voltage : 10.7V ~12.2V LVD (variable by VR)	ZigBee Module / Communication Speed : 19200bps PLC Module / Communication Speed : 4800bps

• Battery Module

Energy Storage Module(Battery)
Rated Input Voltage : 12V / Rated Output Voltage : 12V/7Ah

• Stand-alone Inverter Module

Stand alone	Communication
Input Voltage : DC 11~ 14V Output Voltage / Mode : AC 220V / Pure Sine Wave Range of Overload : 300W ±50W Output Voltage Regulation / Frequency : 3% / 60Hz 3%	ZigBee Module , Communication Speed: 19200bps PLC Module , Communication Speed: 4800bps
Smart Meter	
Power Voltage : 100 ~ 250VAC 50/60Hz, AC Meter : Max. 250VAC/5A, Load Relay : 250VAC/7A, 1ch	

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• Grid-Connected Module

Grid connected	Communication
Max.Power : 1500W Input Voltage : DC 0 ~ 350V Output Voltage / Mode : AC 220V / Pure Sine Wave Output Voltage Regulation / Frequency : 3% / 60Hz 3%	ZigBee Module , Communication Speed : 19200bps
Smart Meter	
Power Voltage : 100 ~ 250VAC 50/60Hz, AC Meter : Max. 250VAC/5A, Load Relay : 250VAC/7A, 1ch	

• Boost Chopper Module

DC/DC converter	Communication
Input Voltage : DC 0 ~ 34V, MAX DC38V Capacity : 200W, Current Limited Fuse Diode 600V/3A Pulse Trans: for Harmonics amplification PWM gate circuit made Heat Sink mode applied Electric Shock preventing Double Insulation Jack used	ZigBee Module , Communication Speed : 19200bps PLC Module, Communication Speed : 4800bps

• Solar Cell Module

Virtual Solar Cell	Communication
Pmax Capacity : 200W Pmax DC 400V/0.5A Pmax DC Voltage Adjustable Pmax Current Limiter embedded	Pmax ZigBee Module , Communication Speed : 19200bps

• AC, DC Load Module

Load Module
Single Phase Induction Motor 25W 1EA, Lamp Load 10W 1EA, Streetlamp Load DC 12V, 20W 1EA

• Monitoring Module(Industrial PC)

Item	Description
Operating System(OS)	Embedded XP
Processor	1.6GHz Intel Atom N270 Processor with a 533MHz FSB
Memory	One 200-Pin 400 / 533MHz DDR2 SDRAM SO-DIMM Supported(1GB)
Ethernet	1xRealtek PCIe RT81111CP GbE Controller
I/O Interface	USB 2.0, CF Memory, RS-232, RS-485
Display	8.4" Color TFT LCD(with Touch screen, 800*600)
Communication	ZigBee Module, Communication Speed : 19200bps/PLCModule, Communication Speed : 4800bps

※ Specifications can be changed without notice