



ED-9710 \_ NEW & RENEWABLE ENERGY TRAINER NEW

ED-9720 \_ NEW & RENEWABLE ENERGY TRAINER NEW

ED-9731 \_ 5W WIND GENERATOR KIT NEW

ED-9732 \_ 300W WIND GENERATOR KIT NEW

ED-9740 \_ FUEL CELL TRAINER FOR STUDENTS NEW

ED-9741 \_ FUEL CELL TRAINER FOR LECTURERS NEW

# New & Renewable Energy

# New ED-9710

## NEW & RENEWABLE ENERGY TRAINER

- Conversion processing experiments on the produced energy(power production / processing)
- Energy efficiency experiments followed by energy production and conversion
- Voltage and current characteristics curve
- Standalone or integrated operation of the energy experimental module
- Enriched teaching aids such as simulation software for power production



### > EXPERIMENTS

- Understanding of the solar cell energy
- Photo electricity simulation
- Ohm's Law and voltmeter/ammeter
- Characteristics of solar cell( $I_{sc}$ ,  $V_{oc}$ ,  $I_m$ ,  $V_m$ , Fill Factor)
- Light source's intensity and shadow
- Basic circuits for charge and Inverter
- Charge using the solar cell
- AC/DC Inverter(sine wave / pseudo sine wave)
- Standalone 12V solar cell system
- Optional hybrid experiments(Option: ED-9731 or ED-9732 model)

### > CONFIGURATION

- **Basic Module**
  - » ED-9710-01 Charging Controller Module- I
  - » ED-9710-02 DC/AC Inverter Module- I
  - » ED-9710-03 Energy Storage Module
  - » ED-9710-04 Central Communication Module
  - » ED-9710-05 AC Load Module
  - » ED-9710-06 DC Load Module
  - » ED-9710-07 DC/DC Converter Module- I
  - » ED-9710-10 Photovoltaic Module- I
  - » ED-9710-71 RS-485 Communication Board(8ea)
  - » ED-9710-73 Multi RS-485 Convert(1ea)
- **Integrated System(Option)**
  - » 5W Wind Generator Kit(ED-9731)
  - » 300W Wind Generator Ki(ED-9732)

### > SPECIFICATIONS

#### ACCESSORIES

- Experimental Rack : 1490(W) x 918(H) x 320(D)mm
- Cable(Power, Serial, Circuit Connection) : 1set
- Monitoring Software CD : 1ea
- User Manual : 1ea

#### OPTION

- Work Table
  - » Dimension : 1490(W) x 846(H) x 800(D)mm
  - » Material : MDF, wheel type with drawers

# NEW & RENEWABLE ENERGY TRAINER

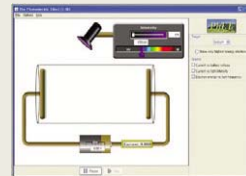
# ED-9710

## SOFTWARE

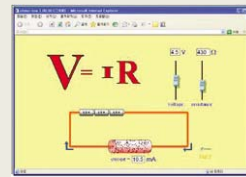


PC : LabVIEW Monitoring Program

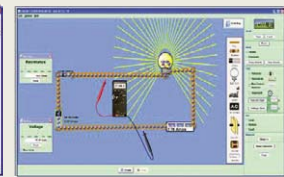
- Checks the voltage/current data per module(text and graph)
- Graph and data storage function
- I-V characteristics curve graph output for PV module



JAVA photo electricity simulation



JAVA Ohm's Law simulation



JAVA basic circuits simulation

- Photo electricity simulation
- Basic circuits and voltmeter/ammeter practices
- Ohm's Law simulation

## Experiments Module



### ED-9710-01 Charging Controller Module - I

- **Charge Controller**
  - » System Voltage : 12V
  - » Self Power Consumption : 6~9mA
  - » Charge Voltage : Floa-13.8V, Absorption-14.4V/14.4V
  - » Discharge Blocking Voltage : 11.4V
  - » Load Reconnecting Voltage : 12.4V
  - » Temperature Compensation : 20mV
- **Buzzer for Input Polarity**
  - » Operating Voltage : 5~12V



### ED-9710-02 DC/AC Inverter Module - I

- **Pseudo Sine Wave Inverter**
  - » Rated Continuous Output : 350W
  - » Max. Instant Output : 700W
  - » Input Voltage : 10~15VDC
  - » Output Voltage : 220VAC
  - » Low Voltage Alarm : 10.5V  $\pm$  0.5V
- **Sine Wave Inverter**
  - » Rated Continuous Output : 200W
  - » Max. Instant Output : 400W
  - » Input Voltage : 10~16VDC
  - » Output Voltage : 220VAC
  - » Low Voltage Alarm : 11.0V  $\pm$  0.5V,
  - » High Voltage Isolation : 16.0V  $\pm$  0.5V
- **Buzzer for Input Polarity**
  - » Operating Voltage : 5~12V

# NEW & RENEWABLE ENERGY TRAINER

# ED-9710



## ED-9710-03 Energy Storage Module

- **MF Battery**
  - » Voltage : 12V
  - » Capacity : 2.0AH
- **Battery Charger**
  - » Rated Input Voltage : 220V/60Hz/170mA
  - » Rated Output Voltage : DC 12V
  - » Rated Output Current : 1.6A
- **Buzzer for Input Polarity**
  - » Operating Voltage : 5~12V



## ED-9710-04 Central Communication Module

- **LED(10ea)**
  - » Operating Voltage : 5V
  - » Size :  $\varnothing 5$
  - » Color : Blue
- **COM Port(gea)**
  - » I/O Type : RS-485



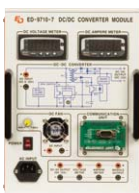
## ED-9710-05 Load Module

- **Fluorescent Lamp**
  - » Operating Voltage : AC 220V
  - » Rated Input Current : 0.09A
  - » Lighting Frequency : 42KHz
  - » AC Motor
  - » Operating Voltage : AC 110/220V
  - » Power Consumption : 3.5W
  - » Speed : 36rpm
- **220V Power Outlet**
  - » Allowable Voltage : 220V/15A



## ED-9710-06 DC Load Module

- **DC Lamp**
  - » Operating Voltage : 3~12VDC
- **DC Motor**
  - » Operating Voltage : 12V
  - » Power Consumption : 0.63W
  - » Speed : 6,100rpm
- **Buzzer for Input Polarity**
  - » Operating Voltage : 5~12V



## ED-9710-07 DC/DC Converter Module - I

- **DC/DC Converter**
  - » DC/DC Converter Input Voltage : 10~36V
  - » Output Voltage : 12V
  - » Output Current : 1.25A
  - » Output method : single
- **DC FAN**
  - » Operating Voltage : DC 12V
  - » Power Consumption : 0.7W
  - » Type : Ball Bearing
  - » Variable Resistance : 1K $\Omega$
- **Buzzer for Input Polarity**
  - » Operating Voltage : 5~12V

## NEW & RENEWABLE ENERGY TRAINER

# ED-9710



### ED-9710-10 Photovoltaic Module - I

- Max. Operating Power : 5W
- Open Voltage : 20.5V
- Short Circuit : 0.3A
- Operating Voltage : 17.64V
- Operating Current : 0.284A
- General Characteristics
- DC(AC) Voltage Meter, DC(AC) Ampere Meter
  - » Voltage : AC 100-240V 50/60Hz
  - » Power Consumption : 5VA
  - » Max. Indication Range : -1999 ~ 9999(4 lines)
  - » RS-485 Communication Output : 1200/2400/4800/9600bps
  - » Protocol : Modbus
- Communication Port
  - » No. of Pin: 32pin x 2



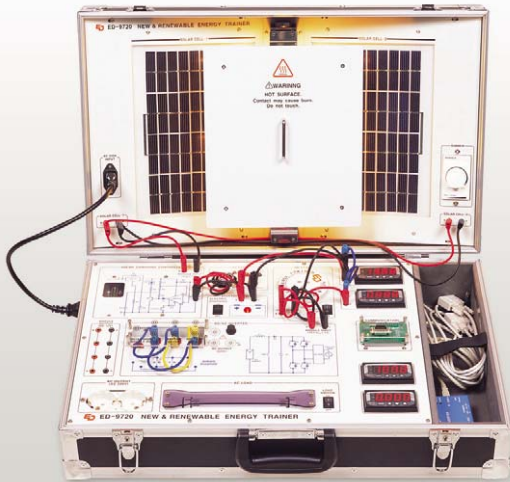
### ED9710-71 RS-485 Connector

- Communication Speed : 9600bps
- General Characteristics
  - » Input Voltage : AC 220V 60Hz

# New ED-9720

## NEW & RENEWABLE ENERGY TRAINER

- Conversion experiments on the produced energy(power production/processing)
- Characteristics of Solar Cell module's voltage and current
- Alarm beep for wrong wire placement
- Voltmeter and ammeter as included for measuring AC and DC
- Control by PC and waveform and graph output



### > EXPERIMENTS

- Understanding of the solar cell energy
- Photo electricity simulation
- Ohm's Law and voltmeter/ammeter
- Characteristics of solar cell(Isc, Voc)
- Light source's intensity and shadow
- Charge using the solar cell
- AC/DC Inverter
- Standalone-type 12V solar cell system

### > CONFIGURATION

- **Basic Module**
  - » Energy Production Module(in upper body)
    - › Solar Cell Panel
    - › Rheostat, Reflection Panel
  - » Energy Processing Module(in lower body)
    - › AC/DC Inverter
    - › Charge Controller
    - › Battery
    - › AC/DC Tester
  - » Communication Module
    - › Multi RS-485 Converter
    - › RS-485 Communication Board
- **Integrated System(Optional)**
  - » 5W Wind Generator Trainer(ED-9731)
  - » 300W Wind Generator Trainer(ED-9732)

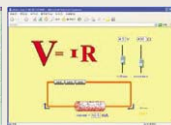
### SOFTWARE

#### • LabVIEW Software

##### Data Monitoring



##### DC Module AC(Inverter) Module



#### • Simulation Software

- » Photo electricity simulation followed by the voltage impressed onto a metal plate
- » Photo electricity simulation followed by the types of a metal plate
- » Photo electricity simulation followed by the light's wavelength
- » Basic circuit configuration
- » Understanding of the current flow
- » Simulation for the measured voltmeter/ammeter
- » Simulation by controlling voltage/current values
- » Simulation followed by the changes in voltage, current and resistance values

## > SPECIFICATIONS

- Solar Cel(Energy Production Part)
  - » Serial/parallel wiring
  - » Max. Operating Power : 5W
  - » Open Voltage : 20.5V
  - » Short Current : 0.3A
  - » Operating Voltage : 17.64V
  - » Operating Current : 0.284A
  - » Dimmer Switch : 1KW
  - » Halogen Lamp : 150W
- Charge Controller
  - » System Voltage : 12V
  - » Max. Charge Current : 10A/15A/20A
  - » Max. Load Current : 10A/15A/20A
  - » Self Power Consumption : 6~9mA
  - » Charge Voltage(Float) : 13.8V
  - » Discharge Blocking Voltage : 11.4V
  - » Load Reconnecting Voltage : 12.4V
  - » Temperature Compensation : 20mV
- AC/DC Inverter
  - » Rated Continuous Output : 350W
  - » Max. Instant Output : 700W
  - » Input Voltage : 10~15VDC
  - » Output Voltage : 220VAC
  - » Low Voltage Alarm : 10.5V  $\pm$  0.5V
- Energy Storage Module
  - » MF Battery
    - › Voltage : 12V
    - › Capacity : 2.0AH
  - » Battery Charger
    - › Rated Input Voltage : 220V/60Hz
    - › Rated Input Current : 170mA
    - › Rated Output Voltage : 12VDC
    - › Rated Output Current : 1.6A
- Buzzer for Input Polarity
  - » Operating Voltage : 5~12V
  - » Function : Alarm for wrong wire placement
- AC Voltage Meter(2ea), AC Ampere Meter(2ea)
  - » Voltage : 100~240VAC 50/60Hz
  - » Power Consumption : 5VA
  - » Max. Indication Range : -1999~9999(4 lines)
  - » RA-485 Communication Output : 1200/2400/4800/9600bps
  - » Protocol : Modbus
- AC Load
  - » Fluorescent Lamp
    - › Operating Voltage : 220VAC
    - › Rated Input Current : 0.09A
    - › Lighting Frequency : 42KHz
  - » 220V Power Outlet
    - › Allowable Voltage : 220V/15A
- DC Load
  - » DC Motor
    - › Operating Voltage : 12V,
    - › Power Consumption : 0.63W
    - › Speed : 6,100rpm
  - » DC Lamp
    - › Operating Voltage : 3~12VDC
- DC Voltage Meter, DC Ampere Meter
  - » Voltage : 100~240VAC 50/60Hz
  - » Power Consumption : 5VA
  - » Max. Indication Range : -1999~9999(4행)
  - » RS-485 Communication Output : 1200/2400/4800/9600bps
- Multi RS-485 Converter(ED9710-73)
  - » Processor : Atmega128, 8bit RISC
  - » Memory : 128k Program Flash, 64k SRAM
  - » Program Downloader : ISP
  - » Interface : RS-485, RS-232, USB
  - » 485 Driver Chip : ADM1485
  - » Power : 5V
- RS-485 Connector(ED9710-71)
  - » Communication Speed : 9600bps
  - » Interface : RS-485
  - » No. of Pin : 32pin x 2,
  - » High brightness Chip LED
  - » Operating Voltage : 3V
  - » Color : Yellow, Red

### GENERAL CHARACTERISTICS

- Input Voltage : AC 220V 60Hz
- System Dimension : 620(W) x 380(H) x 200(D)mm

### ACCESSORIES

- Cable(Power, Serial, Circuit Connection) : 1set
- User Manual : 1ea

## 5W WIND GENERATOR KIT

New  
ED-9731



- Can generate even at breeze(0.8m/s) and work as electric fan
- No noise design engaged with the magnetic levitation clutch method
- LED lighting at the time of rotation
- 360° rotation by the direction of wind
- Replaceable tail wing
- Configurable composite structure by adding optional modules in energy production such as solar cell and fuel cell
- Energy processing experiments in liaison with ED-9710 or ED-9720 model

### > EXPERIMENTS

- Understanding of the solar cell energy
- Photo electricity simulation
- Ohm's Law and voltmeter/ammeter
- Characteristics of solar cell(Isc, Voc)
- Light source's intensity and shadow
- Charge using the solar cell
- AC/DC Inverter
- Standalone-type 12V solar cell system

### > SPECIFICATIONS

- Generator
  - » Max. Operating Power : 6W(15m/s)
  - » Propeller diameter : 28cm(4 wings)
  - » Generation Method : Sync. type(12 poles)
  - » Starting Wind Speed : 0.6~0.8m/s
  - » Generating Wind Speed : 1.5m/s
  - » Operating Temperature : -20~50°C
  - » Weight : about 460g

#### GENERAL CHARACTERISTICS

- » Input Voltage : AC 220V 60Hz
- » Dimension : Wing's diameter 280mm, body : 350mm

#### ACCESSORIES

- Cable(Power, Serial, Circuit Connection) : 1set
- User Manual : 1ea

## 300W WIND GENERATOR KIT

New  
**ED-9732**



- 6 rotational wings as mounted
- Inverse current protection
- Built-in charge controller and built-in battery
- Overcurrent/electric discharge protection
- 360° rotation by the direction of wind
- Configurable composite structure by adding optional modules in energy production such as solar cell and fuel cell
- Energy processing experiments in liaison with ED-9710 or ED-9720 model

### > EXPERIMENTS

- **Standalone Use**
  - » Principle of wind power generation(simulation)
- **In liaison with ED-9710 or ED-9720**
  - » Wind generation characteristics by the load
  - » Wind generation characteristics by the wind speed
- » Battery charge and inverse voltage protection
- » Composite configuration with solar cell modules
- » Interlocking experiment on Power Processing/Conversion Module
- » Monitoring on AC to DC conversion

### > SPECIFICATIONS

- **Generator**
  - » Max. Operating Power : 300W
  - » Propeller : 6 wings
  - » Rated Output : 100W(10m/s)
  - » Starting Wind Speed : 2 m/s
  - » Output Voltage : 12 V
  - » Rotational Diameter : 90.3 cm
  - » Turbine's Weight : 4.5kg
- **Charging Controller**
  - » Regulating cut-in Voltage : 13.8V
  - » Maximum charge Voltage : 14.4V(+/-2%)

#### GENERAL CHARACTERISTICS

- **Dimension**
  - » Wing's diameter : 903mm
  - » 680Body's length : 608mm

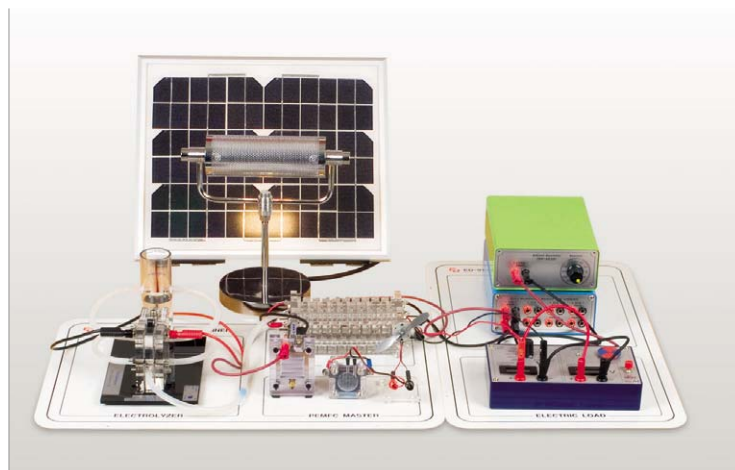
#### ACCESSORIES

- Cable(Power, Serial, Circuit Connection) : 1set
- User Manual : 1ea

New  
ED-9740

## FUEL CELL TRAINER FOR STUDENTS

- Fuel cell generation using the photovoltaic energy
- Electrical power production through PEM fuel cell or DM fuel cell
- Modularized of the processes covering electrical dissolution of water and drive of fuel cell
- Experiment on various types of load
- DMFC(methanol), PEMFC(hydrogen) generation
- Testing of load for maximum four fuel cells at the same time
- Monitoring through LabVIEW program



### > EXPERIMENTS

- Principles of fuel cell
- Complete disassembly and assembly of the fuel cell
- PEMFC energy saving methods
- Fuel cell serial/parallel experiment
- Current/voltage measurement for the stack of fuel cell
- Interlocking experiments with power processing/conversion module
- PC-connected monitoring and analysis(IV characteristics curve)

### > SPECIFICATIONS

- **Solar Module**
  - » Power : 10W
  - » Size : 310(W) x 368(H) x 18(D)mm
  - » Weight : 1.5kg
- **Solar H<sub>2</sub>/Air PEM Fuel Cell Stack x 10**
  - » Power per Cell : 200mW
  - » power(10Cells) : 2W
  - » Fuel : H<sub>2</sub>/Air
- **H<sub>2</sub>/Air Electrolyzer**
  - » Power : 15W
  - » Size : 180(W) x 140(H) x 120(D)mm
  - » Weight : 460g
- **Halogen Lamp**
  - » Power 220V/300W
  - » Size : 180(W) x 140(H) x 120(D)mm
  - » Weight : 460g
- **Motor Pan**
  - » Power : 10mW
  - » Size : 60(W) x 140(H) x 40(D)mm
  - » Weight : 45g
- **Electric Load**
  - » Motor : 1.5V/80mA
  - » Lamp : 1.5V/80mA
  - » Ammeter : 0~2A
  - » Voltmeter : 0~20V
  - » Size : 190(W) x 110(H) x 85(D)mm
- **DMFC Fuel Cell**
  - » Power : 10mW
  - » Fuel : Methanol Liquid/Air
  - » Size : 50(W) x 50(H) x 40(D)mm
  - » Weight : 60g
- **Monitoring Module**
  - » Adjust Resistor
    - › Allowable Voltage : DC 0V~10V
    - › Allowable Current: 10~50W, 1A~5A
    - › Load Impression: Analog type
    - › Load Error : ±1.2%
    - › Variable Resistance : 3.4~300Ω

#### GENERAL CHARACTERISTICS

System Dimension : 718(W) x 231(H) x 431(D)mm

#### ACCESSORIES

- Cable(Power, USB, Circuit Connection) : 1set
- Monitoring S/W CD : 1ea
- Purified Water Bottle : 1ea
- User Manual : 1ea

#### SOFTWARE



- Graphical display of voltage and current and text based monitoring over solar cell and fuel cell
- Save and print functions for measured data having been accumulated
- Output function for the voltage and current characteristics curve

New  
ED-9741

## FUEL CELL TRAINER FOR LECTURERS

- Fuel cell generation using the photovoltaic energy
- Capable of testing load on up to four fuel cells
- Monitoring through LabVIEW program



### > EXPERIMENTS

- Principles and concepts of fuel cell generation
- Complete disassembly and assembly of the fuel cell
- Electrical power production through PEM fuel cell
- Measurement of voltage and current on each cell of the PEM fuel cell stack
- Electrical decomposition of water and drive of fuel cell
- Experiment on various types of load
- PEMFC(hydrogen) generation

### > SPECIFICATIONS

- ED-9741-1 PHOTOVOLTAIC MODULE- 1
  - » Solar Module
    - › Power : 10W
    - › size : 310(W) x 18(H) x 368(D) mm
    - › Weight : 1.5kg
  - » Halogen Lamp
    - › Power 220V/300W
  - » Dimmer
    - › Voltage : AC220V
    - › Rated Capacity : 1000KW
    - › Noise Terminal Voltage : below 74db, 45Mhz~30Mhz
    - › Size : 120(W) x 60(H) x 80(D)mm
- ED-9741-2 PEMFC FUEL CELL-1
  - » Solar H<sub>2</sub>/Air PEM Fuel Cell Stack x 10
    - › Power per Cell : 200mW
    - › power(10Cells) : 2W
    - › Fuel : H<sub>2</sub>/Air
  - » H<sub>2</sub>/Air Electrolyzer
    - › Power : 15W
    - › Size : 180(W) x 140(H) x 120(D)mm
    - › Weight : 460g
  - » Adjust Resistor
    - › Allowable Voltage : DC 0V~40V
    - › Allowable Current : 1A~5A
    - › Load Impression : Analog type
    - › Load Error :  $\pm 1.2\%$
    - › Variable Resistance : 3.4~300 $\Omega$
  - » Motor Pan
    - › Power : 10mW
  - » LED Ramp
    - › LED 8ea
    - › LED COLOR : Blue(basic) or Red, Green (optional)

- » DC Voltage Meter, DC Ampere Meter
  - › nput Voltage : 100~240VAC 50/60Hz
  - › Power Consumption : 5VA
  - › Max. Indication Range : -1999~9999(4 lines)
  - › RS-485 Communication : 4800/9600bps
  - › Input Channel : Max. 4 Channel

#### GENERAL CHARACTERISTICS

- Input Voltage : AC 220V 60Hz
- System Dimension : 595(W) x 1437(H) x 560(D)mm

#### ACCESSORIES

- Cable(Power, Serial, USB, Circuit Connection) : 1set
- Monitoring S/W CD : 1ea
- Purified Water Bottle : 1ea
- User Manual : 1ea

#### SOFTWARE



- Graphical display of voltage and current and text based monitoring over solar cell and fuel cell
- Save and print functions for measured data having been accumulated
- Output function for the voltage and current characteristics curve