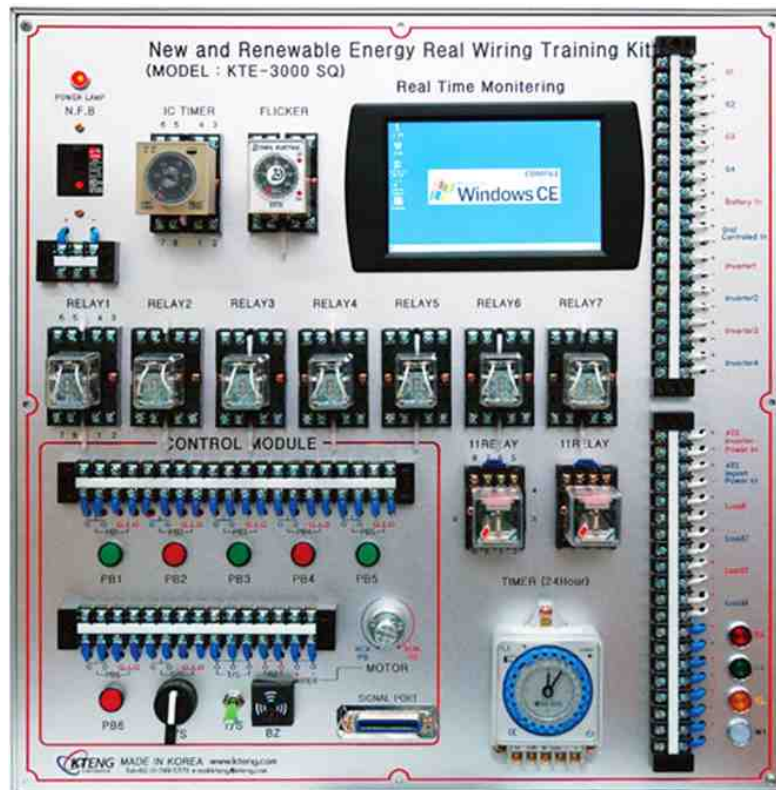


Model : KTE-7000SQ

**NEW-RENEWABLE ENERGY CIRCUIT WIRING TRAINING KIT
GUIDEBOOK Ver.1.1.0**



**Korea Technology Institute of Energy Convergence
Korea Technology Engineering Co.,Ltd.**

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Chapter 1. Feature and instruction

1. Introduction

(1) Feature

- 1) It is the thread wiring sequence control test system for controlling renewable energy generating test system, it can conduct the basic electric circuit practice, national skill certificate circuit practice, and also renewable energy generating system sequence control can be practice, and throughout screen, generating power can be monitored in real time.
- 2) Basic sequence education : Connects the thread wire with various new renewable device and banana jack, and by using sequence, after programming, it can be operated.
- 3) Various circuit sequence design practice : It uses relay (ry), push button switch (pb), select switch (s/sw), toggle switch (t/s), buzzer (bz), power lamp (pl), run lamp (rl), stop lamp (gl), so you can experience various new recycle device control sequence.
- 4) Safety : Dc24v input power is selected for safety thread wiring test and practice.
- 5) Simple wiring practice using banana jack : Not only wiring using wires, but inserting banana jack, easy and simple wiring practice is available.

(2) Product and checking accessories

- 1) Tool box
- 2) Crimp Tool
- 3) The Stripper
- 4) The driver set
- 5) Multi-tester
- 6) Practice materials

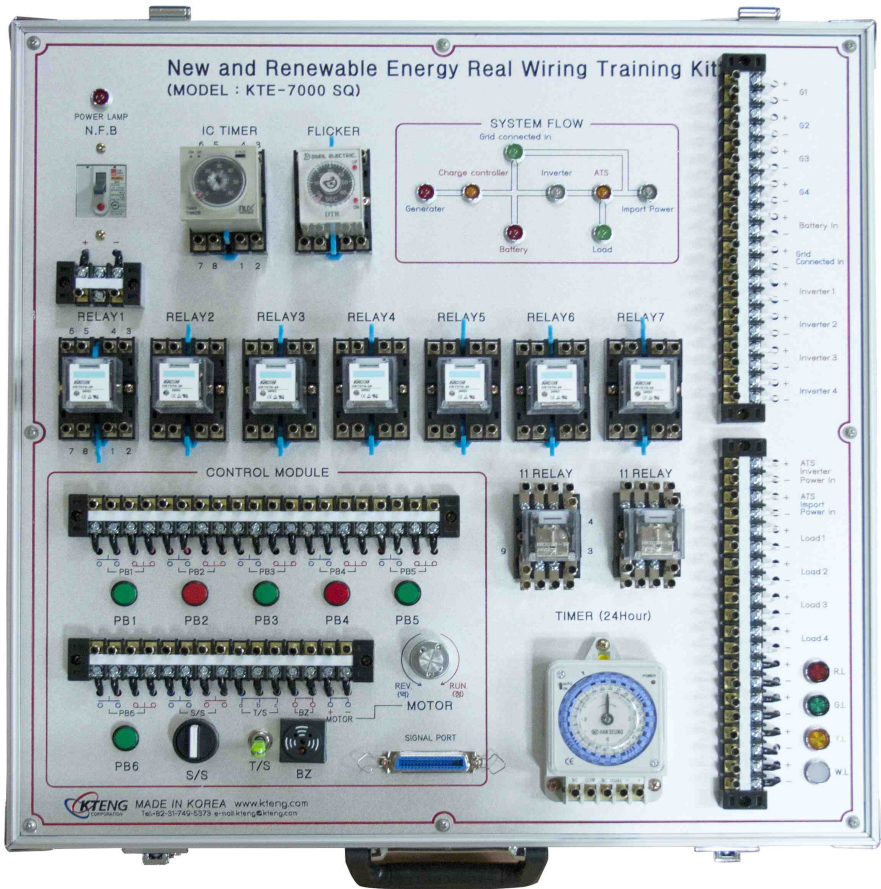
New and Renewable Energy Real Wiring Training Kit

2. Each part name

(1) Basic unit

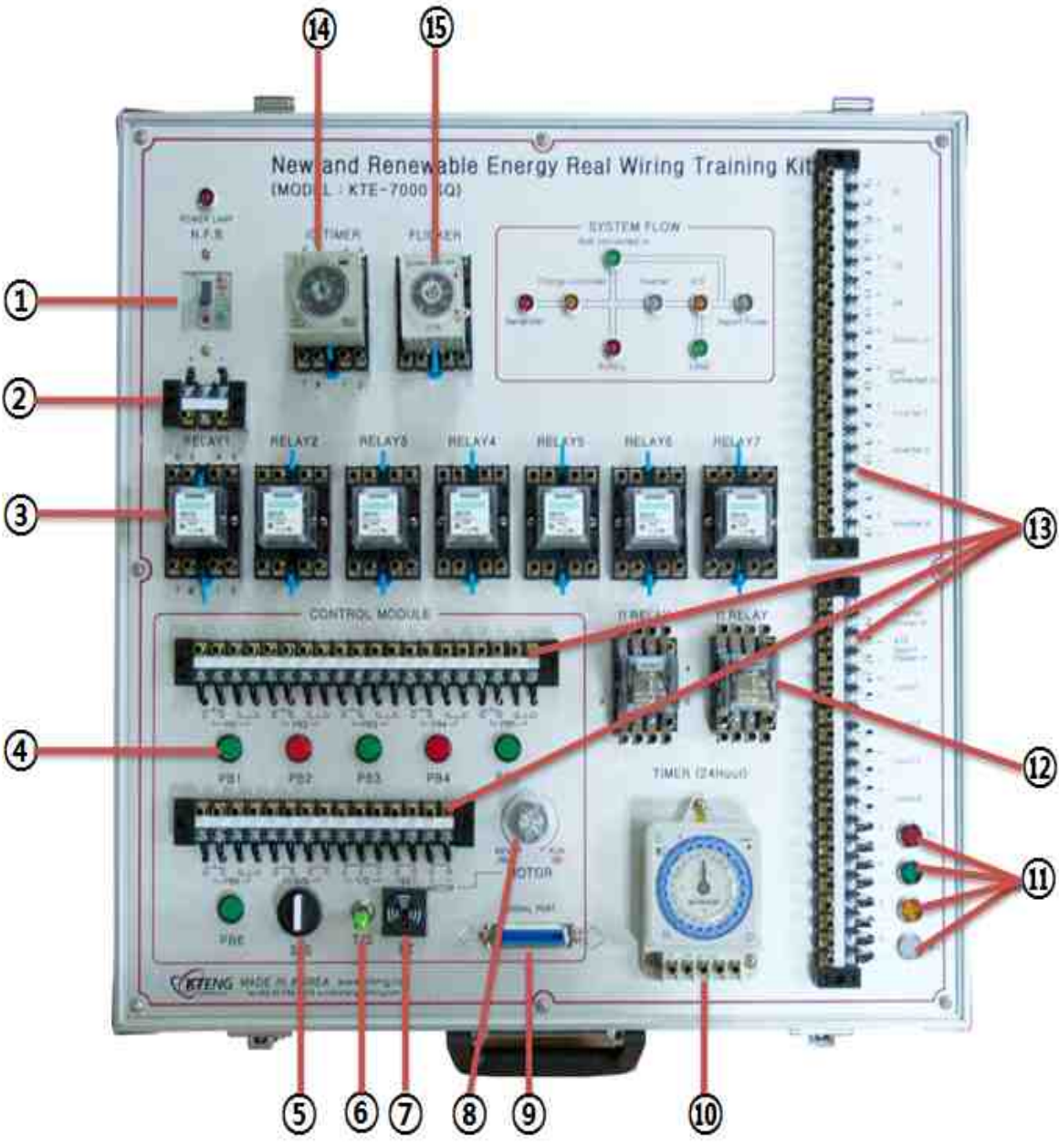
Composition	Quantity	Composition	Quantity
N.F.B(30A, Single)	1	Terminal Base (20Pin)	3
Relay (DC24V, 8Pin)	7	Terminal Base (15Pin)	1
Relay Base(DC24V, 8Pin)	7	Terminal Base (3Pin)	1
Relay (DC24V, 11Pin)	2	Lamp (DC24V)	4
Relay Base(DC24V, 11Pin)	2	Buzzer (DC24V)	1
IC Timer (DC24V, 60sec, 8Pin)	1	Toggle Switch	1
IC Timer Base (DC24V, 8Pin)	1	Push Switch (1a1b)	6
Flicker (DC24V, 60sec, 8Pin)	1	Select Switch	1
Flicker Base (DC24V, 8Pin)	1	DC24V moter	1
Timer (DC24V, 24Hour)	1	Touch Screen	1
Aluminum bag	1	Signal port	1

(2) New&Renewable energy sequence device KTE-7000SQ



New and Renewable Energy Real Wiring Training Kit

(3) KTE-7000SQ Part Names



1	N.F.B	7	Buzzer	13	Terminal Base
2	N.F.B Terminal Base	8	24V DC Motor	14	IC Timer (DC24V, 60sec, 8Pin)
3	8pin Relay	9	Signal port	15	Flicker (DC24V, 60sec, 8Pin)
4	1a1b Push Switch	10	Timer (DC24V, 24Hour)		
5	Select Switch	11	Lamp		
6	Toggle Switch	12	11pin Relay		

3. Function each device

(1) Switch section



NFB(Over current breaker) : For AC220V power input, push upper direction, for cut off below.



Toggle switch : For closing of A-contact, push up, and for closing of B-contact, push below.



Select switch : selection of AUTO , stop, or MAN.



A-contact Push-button
None-holding A-contact



Lamp : For checking any error or operation status on running equipment by lighting lamp.



DC Motor : It's can practice the reverse and run spin operation.



Buzzer : For checking any error or operation status on running equipment by sound.

(2) Control part



8-pin: For control of compressor motor, condenser fan motor, solenoid valve, and evaporator fan motor of standard refrigeration.



60-sec delay timer :
After passing some determined time, the contact open or close.



60-set flicker relay :
For the determined time, the contact keep opening or closing.



24-h timer :
For the determined time, the contact keep opening or closing.

4. How to set up wiring

(1) Handling Precautions

- 1) Connect to banana plugs with each DC power +(red) or -(black) for power supply with caution.
- 2) After testing with a tester, input power.

(2) How to connect to each apparatus

- 1) Automatic control of air conditioning refrigeration circuit in practical materials specified in the PLC input / output ports are configured as a schematic.
- 2) Each device in the port terminal 4000PLC equipment connected to the port terminals are connected using a port.(PLC internal SMPS 24V or DC 24V output by the output load of each device can be controlled.)



Portable cable pin



Portable cable

3) Testing begins.

5. The application of each instrument

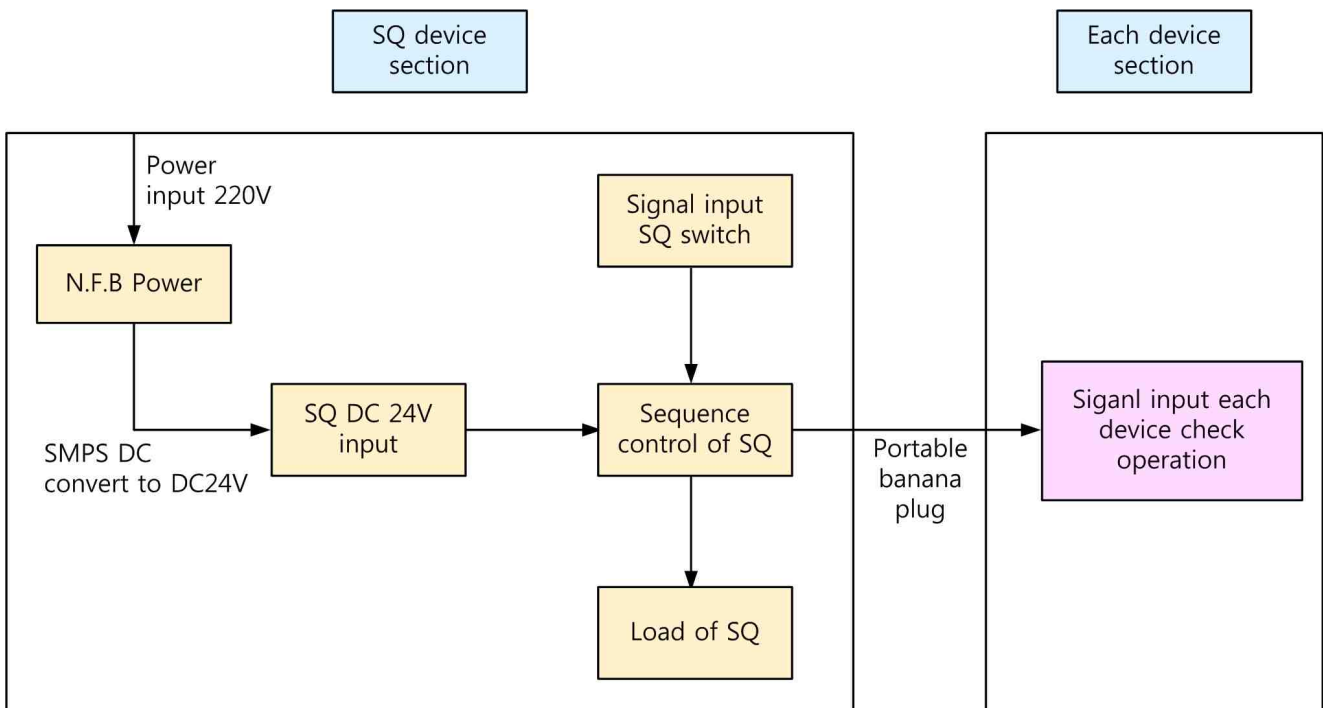
(1) Base sequence Education

- 1) Available training and practicing of sequence control through load part (Lamp, Buzzer, and motor) that is installed interior of a air-conditioning refrigeration wiring training kit.

(2) In case of each apparatus is connected

- 1) Each refrigeration apparatus can work by connecting of a air-conditioning refrigeration wiring training kit that had been set up sequence circuit with real wire or banana plugs.

(3) Equipment configuration diagram



6. Troubleshooting

(1) When power input can not be

- 1) Check if DC 24V is supplied from NFB output after connection power supply contactor of air-conditioning refrigeration wiring training kit.
- 2) Check the status of banana plugs connection.
- 3) Input power again after trying again configuration of circuit and testing with a multi tester.

(2) When any load device can not work by pushing button after configuration circuit

- 1) When wiring error, for protection equipment the interior SMPS of apparatus is shut down automatically. And then it restarts by itself in 10 min..
- 2) How to apply for AS : Available using 'CONTACT BOARD' in 'CONTACT' on Web-site <http://www.kteng.com/> (Click English web site)

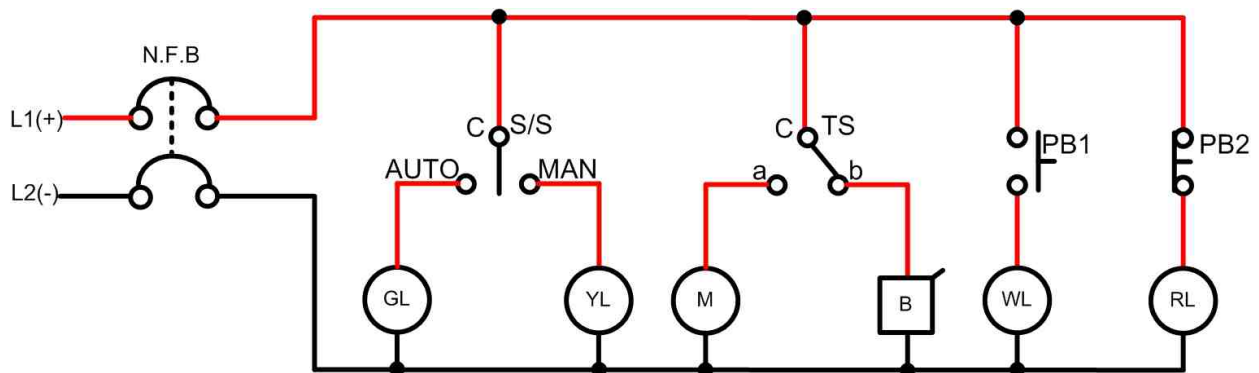
Head Office: 133-1, Sinhyun-Li, Opo-Eup, Gwangju-City, Gyeonggi-Do, Korea
Tel: +82-31-749-5373 Fax : +82-31-749-5376
Homepage: <http://kteng.co.kr> Email: kteng@kteng.com

Chapter 2. Practice to configure and operation as circuit

Experiment name	1. Practice to configure switch circuit	Required time	
		4	
The Object of Experiment	① Understand the principle of a push button S/W, and configuration operation circuit. ② Understand the principle of a toggle S/W, and configuration operation circuit. ③ Understand the principle of a select S/W, and configuration operation circuit.		
Experiment Equipment	Tool and Material	Spec of Tools	Q'nty
• Hybrid Generation Experiment Equipment (KTE-CP520) • New & Renewable Energy Real Wiring Training Kit (KTE-7000SQ)	• Screw driver set • Nipper • Wire Stripper • Hook Meter	• #2× 6× 175mm • 150mm • 0.5~6mm ² • 300A 600V	1 1 1 1/group

Control circuit

1. Control Circuit

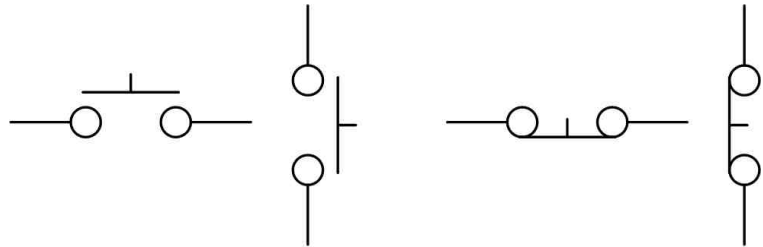


- (1) GL is on when S/S is operated as AUTO.
 YL is on and GL off when S/S is operated as MAN.
- (2) Buzzer is on when TS is operated as b.
 Motor works and buzzer is off when TS is operated as a.
- (3) WL is on when A-contact of PB1 is pushed.
 WL is off when leaving hand from PB1.
- (4) RL is off when PB2 is pushed.
 RL is off when leaving hand from PB2.

2. Push button S/W

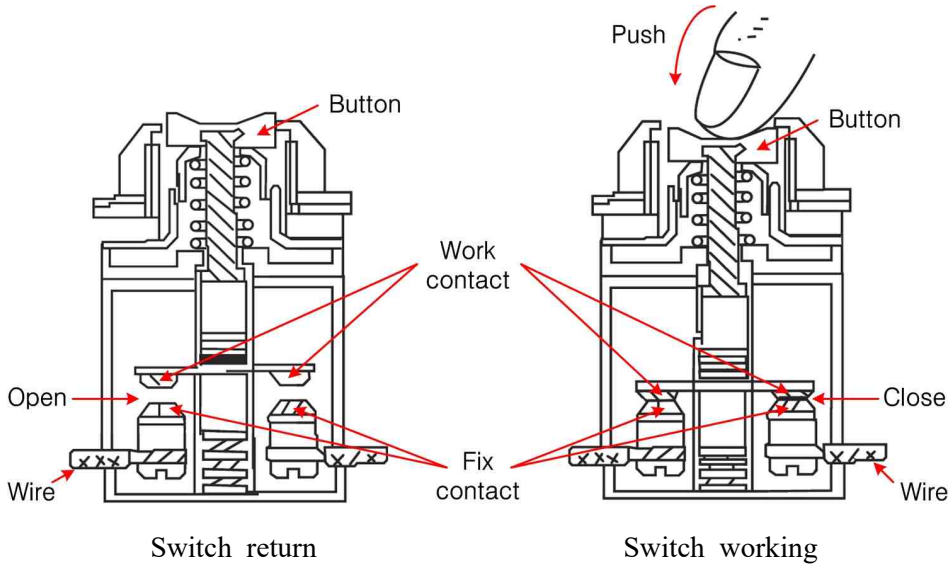


Push button S/W



a-contact

b-contact



Switch return

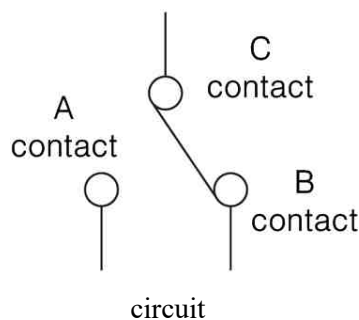
Switch working

(1) Switch is used as control order device. shows a push button switch. This switch (PB :Push Button switch) works as open/close of electric by pushing force, returns to the proper place by spring force.

3. Toggle switch



Toggle Switch



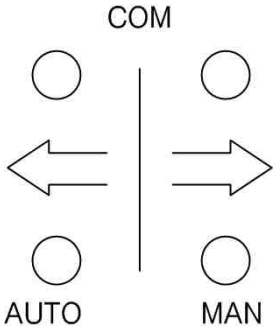
circuit

(1) Toggle switch is a kind of switch as like push button. shows a goggle switch (it is called as snap switch.) Switches are distinguished manual operation auto return contact and lock up contact as working status of contact. Push button switch is a manual operation auto return contact, toggle switch is lock up contact, each has their symbol for clear distinguish.

4. Select switch



Select S/W



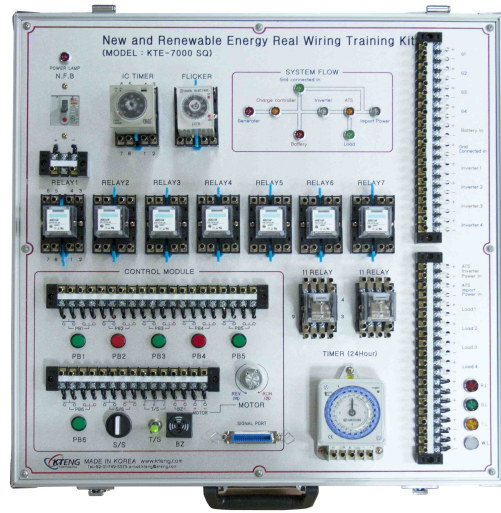
Circuit

(1) shows a select switch (it is called as rotary switch.). After operation and though leaving hand the contact and operation section keep working. By switching lever it is selected AUTO or MAN.

New and Renewable Energy Real Wiring Training Kit



Hybrid Generation Experiment Equipment (KTE-CP520)



New & Renewable Energy Real Wiring Training Kit (KTE-7000SQ)

• Check Point

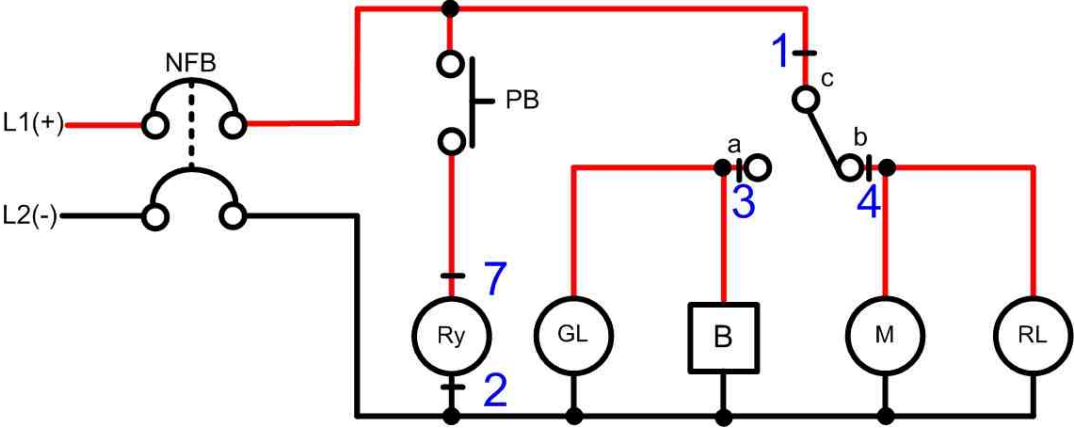
1. Check and prepare of apparatus, tools, and material.
2. Make configuration control circuit with banana plugs by using apparatus, tools, and material.
3. Understand the working function of circuit.
 - (1) Explain the working process when a toggle S/W is on(a) or off(b).
 - (2) Explain the working process when a push button S/W is pushed.
 - (3) Explain the working process when a select S/W is put AUTO or MAN.
4. Make real wiring circuit and operate system by using apparatus, tools, and material.

		Evaluation Item	Allot	Obtain	Remarks			
Valuation Basis	Item point (70)	Configuration Circuit and operation	20					
		Real wiring circuit configuration	20					
		Configuration state	10					
		Understanding and description for circuit	20					
	Work point (10)	Work attitude and safe	5					
		Usage and arrangement of tool	5					
Time point (20)	Subtract () point in every () minute excess				Item	Work	Time	Total

Experiment name	2. Practice to configure relay circuit	Required time	
		4	
The Object of Experiment	① Understand the working principle and composition of Relay device. ② Make mechanical refrigeration load device work by using a relay contact. ③ Explain operation circuit of “c”Contact.		
Experiment Equipment	Tool and Material	Spec of Tools	Q`nty
· Hybrid Generation Experiment Equipment (KTE-CP520) · New & Renewable Energy Real Wiring Training Kit (KTE-7000SQ)	· Screw driver set · Nipper · Wire Stripper · Hook Meter	· #2× 6× 175mm · 150mm · 0.5~6mm ² · 300A 600V	1 1 1 1/group

Control circuit

1. Control Circuit

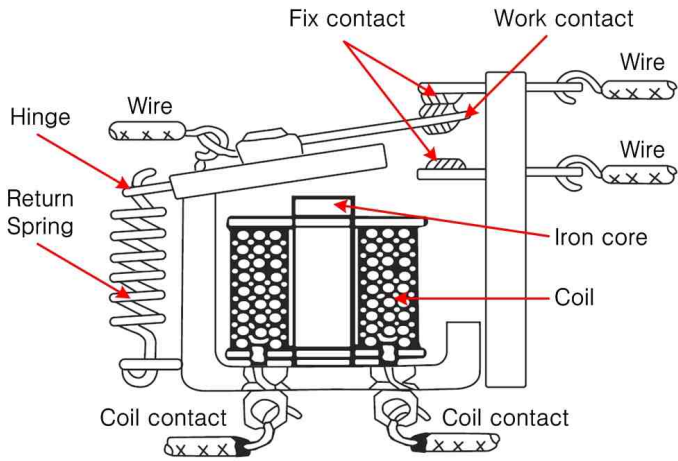


- (1) If NFB switch is ON, RY-b contact is closed and M and RL is ON , RY-a contact is opened, so that GL and Buzzer is OFF. (PB1 opening state)
- (2) If PB1 is pushed, Relay coil is current, so that RY-a is closed, GL and Buzzer is ON and M and RL are OFF.
- (3) Arbeit contact means 『working contact』 , so it'a initial is "a".
- (4) Break contact means 『Opening contact』 , so it's initial is "b".

2. Relay



Relay



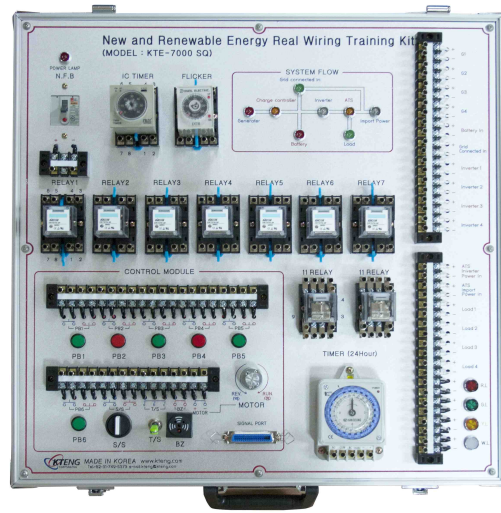
Relay composition

(1) In electric circuit a circuit separated by 2 piece, in one side a signal is made and the other side the circuit operates as the signal by open or close. Then the used device is called relay, this is a kind of electric switch.

New and Renewable Energy Real Wiring Training Kit



Hybrid Generation Experiment Equipment (KTE-CP520)



New & Renewable Energy Real Wiring Training Kit (KTE-7000SQ)

• Check Point

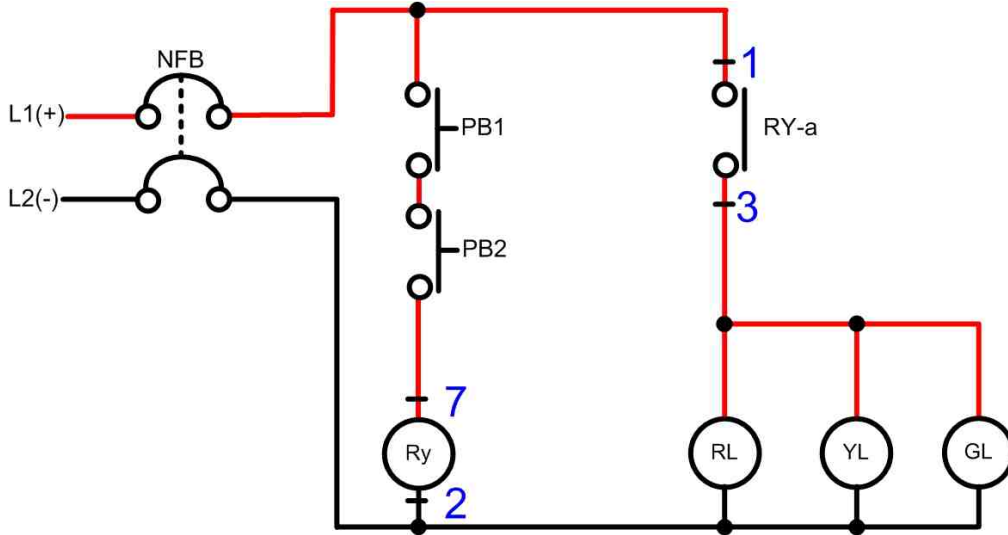
1. Check and prepare of apparatus, tools, and material.
2. Make configuration control circuit with banana plugs by using apparatus, tools, and material.
3. Understand the working principle and composition of a relay device.
4. Understand the working function of circuit.
 - (1) Explain the process when PB1 is pushed.
 - (2) Explain the process when PB2 is pushed.
5. Explain the contact “c” in the circuit.
6. Make real wiring circuit and operate system by using apparatus, tools, and material.

		Evaluation Item	Allot	Obtain	Remarks			
Valuation Basis	Item point (70)	Configuration Circuit and operation	20					
		Real wiring circuit configuration	20					
		Configuration state	10					
		Understanding and description for circuit	20					
	Work point (10)	Work attitude and safe	5					
		Usage and arrangement of tool	5					
Time point (20)	Subtract () point in every () minute excess				Item	Work	Time	Total

Experiment name	3. Practice to configure of AND circuit	Required time
		4
The Object of Experiment	① Understand and make configuration AND circuit	
Experiment Equipment	Tool and Material	Spec of Tools
<ul style="list-style-type: none"> • Hybrid Generation Experiment Equipment (KTE-CP520) • New & Renewable Energy Real Wiring Training Kit (KTE-7000SQ) 	<ul style="list-style-type: none"> • Screw driver set • Nipper • Wire Stripper • Hook Meter 	<ul style="list-style-type: none"> • #2× 6× 175mm • 150mm • 0.5~6mm² • 300A 600V
		Q`nty
		1
		1
		1
		1/group

Control circuit

1. Control Circuit



- (1) Power input
- (2) Pressing PB1
 - ① RL,YL,GL OFF
- (3) Pressing PB2
 - ① RL,YL,GL OFF
- (4) Pressing PB1 and PB2
 - ① RL,YL,GL ON

2. AND Logical operations

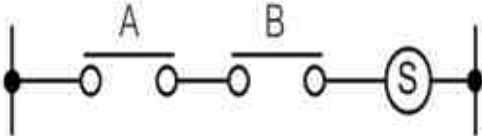
(1) AND gate ($\otimes = A \cdot B$)

① Both contact A and B have to operate for output of circuit.

Logical circuit



Sequence



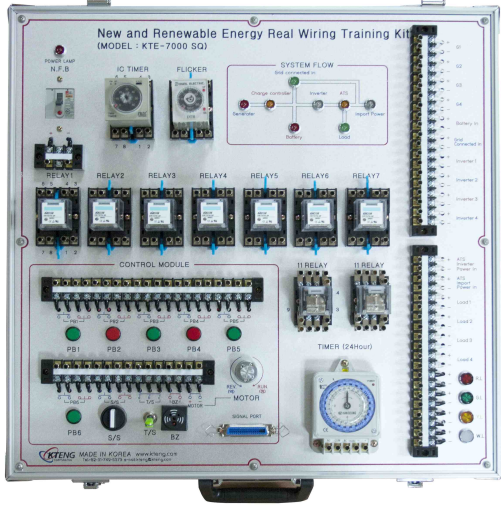
Fact table

A	B	S
0	0	0
0	1	0
1	0	0
1	1	1

New and Renewable Energy Real Wiring Training Kit



Hybrid Generation Experiment Equipment (KTE-CP520)



New & Renewable Energy Real Wiring Training Kit (KTE-7000SQ)

• Check Point

1. Check and prepare of apparatus, tools, and material.
2. Make configuration control circuit with banana plugs by using apparatus, tools, and material.
3. Understand the working function of circuit.
 - (1) Explain the process when PB1 is pushed.
 - (2) Explain the process when PB2 is pushed.
 - (3) Explain the process when both PB1 and PB2 are pushed.
4. Make real wiring circuit and operate system by using apparatus, tools, and material.

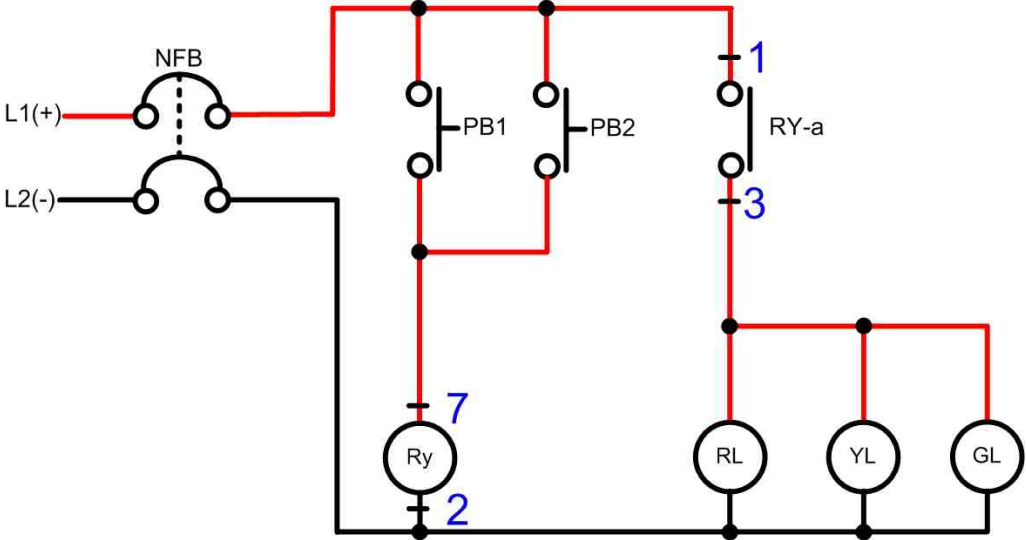
		Evaluation Item	Allot	Obtain	Remarks			
Valuation Basis	Item point (70)	Configuration Circuit and operation	20					
		Real wiring circuit configuration	20					
		Configuration state	10					
		Understanding and description for circuit	20					
	Work point (10)	Work attitude and safe	5					
		Usage and arrangement of tool	5					
Time point (20)	Subtract () point in every () minute excess				Item	Work	Time	Total

New and Renewable Energy Real Wiring Training Kit

Experiment name	4. Practice to configure of OR circuit	Required time	
		4	
The Object of Experiment	① Understand and make configuration OR circuit		
Experiment Equipment	Tool and Material	Spec of Tools	Q`nty
<ul style="list-style-type: none"> · Hybrid Generation Experiment Equipment (KTE-CP520) · New & Renewable Energy Real Wiring Training Kit (KTE-7000SQ) 	<ul style="list-style-type: none"> · Screw driver set · Nipper · Wire Stripper · Hook Meter 	<ul style="list-style-type: none"> · #2× 6× 175mm · 150mm · 0.5~6mm² · 300A 600V 	<ul style="list-style-type: none"> 1 1 1 1/group

Control circuit

1. Control Circuit



- (1) Power input
- (2) Pressing PB1
 - 1) RL,YL,GL ON
- (3) Pressing PB2
 - 1) RL,YL,GL ON
- (4) Pressing both PB1and PB2
 - 1) RL,YL,GL ON

2. OR Logical operations

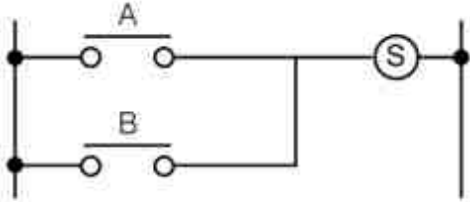
(1) OR gate($\otimes = A + B$)

1) Only one of the two contact output is still operating.

Logical circuit



Sequence



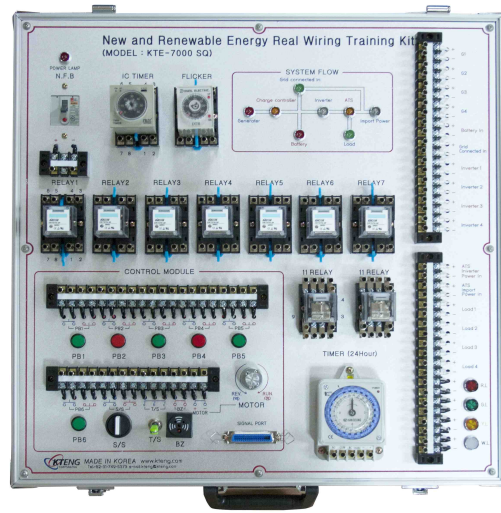
Fact table

A	B	S
0	0	0
0	1	1
1	0	1
1	1	1

New and Renewable Energy Real Wiring Training Kit



Hybrid Generation Experiment Equipment (KTE-CP520)



New & Renewable Energy Real Wiring Training Kit (KTE-7000SQ)

• Check Point

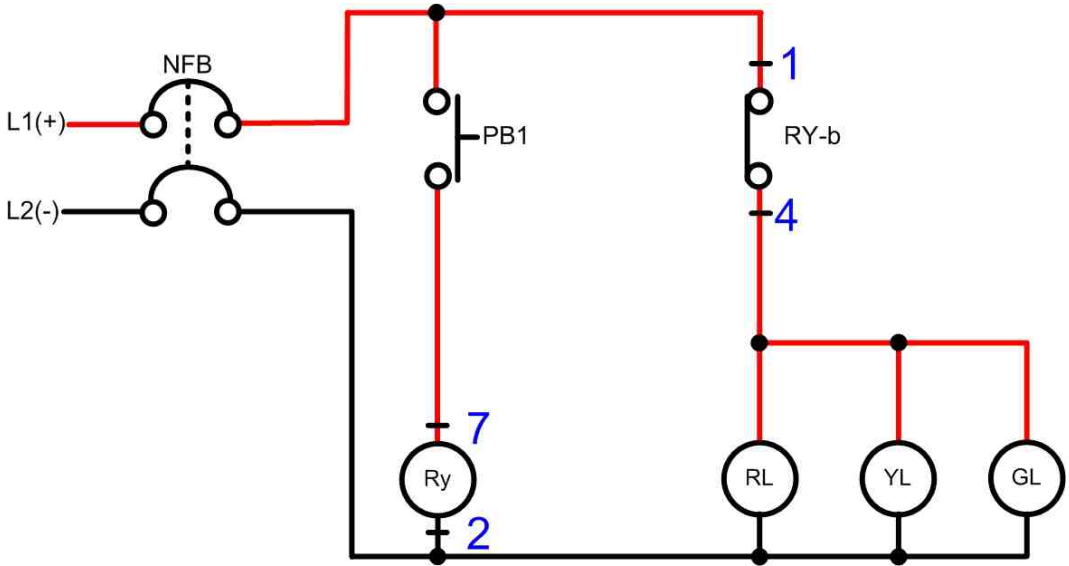
1. Check and prepare of apparatus, tools, and material.
2. Make configuration control circuit with banana plugs by using apparatus, tools, and material.
3. Understand the working function of circuit.
 - (1) Explain the process when PB1 is pushed.
 - (2) Explain the process when PB2 is pushed.
 - (3) Explain the process when both PB1 and PB2 are pushed.
4. Make real wiring circuit and operate system by using apparatus, tools, and material.

		Evaluation Item	Allot	Obtain	Remarks			
Valuation Basis	Item point (70)	Configuration Circuit and operation	20					
		Real wiring circuit configuration	20					
		Configuration state	10					
		Understanding and description for circuit	20					
	Work point (10)	Work attitude and safe	5					
		Usage and arrangement of tool	5					
Time point (20)	Subtract () point in every () minute excess				Item	Work	Time	Total

Experiment name	5. Practice to configure of NOT circuit	Required time	
		4	
The Object of Experiment	① Understand and make configuration NOT circuit		
Experiment Equipment	Tool and Material	Spec of Tools	Q'nty
<ul style="list-style-type: none"> • Hybrid Generation Experiment Equipment (KTE-CP520) • New & Renewable Energy Real Wiring Training Kit (KTE-7000SQ) 	<ul style="list-style-type: none"> • Screw driver set • Nipper • Wire Stripper • Hook Meter 	<ul style="list-style-type: none"> • #2× 6× 175mm • 150mm • 0.5~6mm² • 300A 600V 	<ul style="list-style-type: none"> 1 1 1 1/group

Control circuit

1. Control Circuit



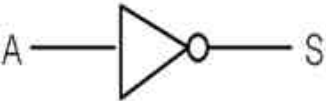
- (1) Power input
 - 1) RL,YL,GL ON
- (2) Pressing PB1
 - 1) RL,YL,GL OFF

2. NOT Logical operations

(1) NOT gate ($\otimes = \bar{A}$)

1) Negative input (NOT) is the output of the circuit.

Logical circuit



Sequence



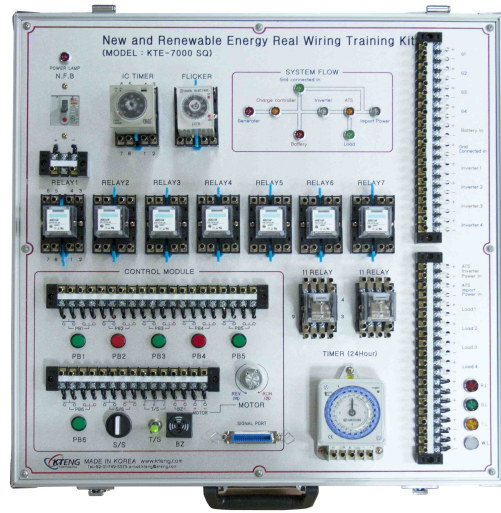
Fact table

A	$S = \bar{A}$
0	1
1	0

New and Renewable Energy Real Wiring Training Kit



Hybrid Generation Experiment Equipment (KTE-CP520)



New & Renewable Energy Real Wiring Training Kit (KTE-7000SQ)

• Check Point

1. Check and prepare of apparatus, tools, and material.
2. Make configuration control circuit with banana plugs by using apparatus, tools, and material.
3. Understand the working function of circuit.
 - (1) Explain the process when NFB ON.
 - (2) Explain the process when PB1 is pushed.
4. Make real wiring circuit and operate system by using apparatus, tools, and material.

		Evaluation Item	Allot	Obtain	Remarks			
Valuation Basis	Item point (70)	Configuration Circuit and operation	20					
		Real wiring circuit configuration	20					
		Configuration state	10					
		Understanding and description for circuit	20					
	Work point (10)	Work attitude and safe	5					
		Usage and arrangement of tool	5					
Time point (20)	Subtract () point in every () minute excess				Item	Work	Time	Total

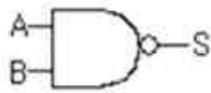
Experiment name	6. Practice to configure of NAND circuit	Required time
		4
The Object of Experiment	① Understand and make configuration NAND circuit	
Experiment Equipment	Tool and Material	Spec of Tools
<ul style="list-style-type: none"> • Hybrid Generation Experiment Equipment (KTE-CP520) • New & Renewable Energy Real Wiring Training Kit (KTE-7000SQ) 	<ul style="list-style-type: none"> • Screw driver set • Nipper • Wire Stripper • Hook Meter 	<ul style="list-style-type: none"> • #2× 6× 175mm • 150mm • 0.5~6mm² • 300A 600V
	Q'nty	
	1	1
	1	1
	1/group	
Control circuit		
<p>1. Control Circuit</p>		
<p>(1) Power input 1) RL,YL,GL ON</p> <p>(2) Pressing PB1 1) RL,YL,GL OFF</p> <p>(3) Pressing PB2 1) RL,YL,GL ON</p> <p>(4) Pressing both of PB1 and PB2 1) RL,YL,GL OFF</p>		

2. NAND Logical operations

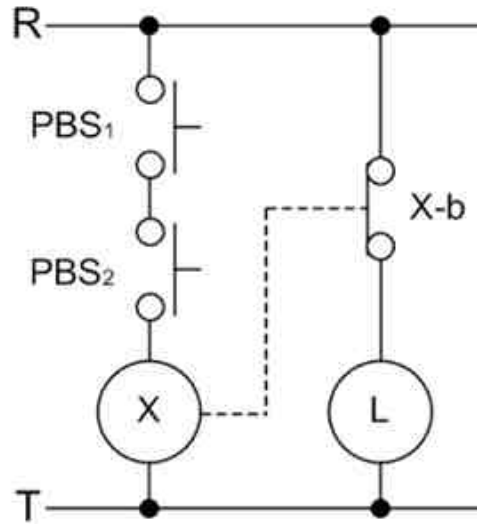
(1) NAND gate $\overline{A \cdot B}$

1) NAND gate is the negation of AND as AND gate to be taken NOT.

Logical circuit



Sequence



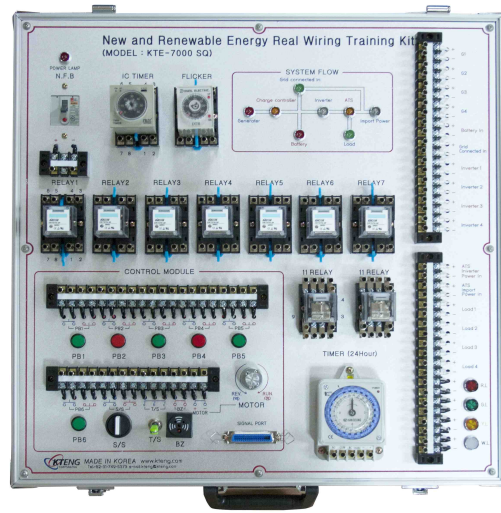
Fact table

A	B	S
0	0	1
0	1	1
1	0	1
1	1	0

New and Renewable Energy Real Wiring Training Kit



Hybrid Generation Experiment Equipment (KTE-CP520)



New & Renewable Energy Real Wiring Training Kit (KTE-7000SQ)

• Check Point

1. Check and prepare of apparatus, tools, and material.
2. Make configuration control circuit with banana plugs by using apparatus, tools, and material.
3. Understand the working function of circuit.
 - (1) Explain the process when NFB is pushed.
 - (2) Explain the process when PB1 is pushed.
 - (3) Explain the process when PB2 is pushed.
 - (4) Explain the process when both PB1 and PB2 are pushed.
4. Make real wiring circuit and operate system by using apparatus, tools, and material.

		Evaluation Item	Allot	Obtain	Remarks			
Valuation Basis	Item point (70)	Configuration Circuit and operation	20					
		Real wiring circuit configuration	20					
		Configuration state	10					
		Understanding and description for circuit	20					
	Work point (10)	Work attitude and safe	5					
		Usage and arrangement of tool	5					
Time point (20)	Subtract () point in every () minute excess				Item	Work	Time	Total

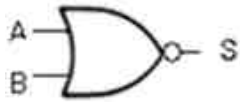
Experiment name	7. Practice to configure of NOR circuit	Required time		
		4		
The Object of Experiment	① Understand and make configuration NOR circuit			
Experiment Equipment	Tool and Material	Spec of Tools	Q`nty	
<ul style="list-style-type: none"> • Hybrid Generation Experiment Equipment (KTE-CP520) • New & Renewable Energy Real Wiring Training Kit (KTE-7000SQ) 	<ul style="list-style-type: none"> • Screw driver set • Nipper • Wire Stripper • Hook Meter 	<ul style="list-style-type: none"> • #2× 6× 175mm • 150mm • 0.5~6mm² • 300A 600V 	<ul style="list-style-type: none"> 1 1 1 1/group 	
Control circuit				
<p>1. Control Circuit</p> <p>(1) Power input 1) RL, YL, GL ON</p> <p>(2) Pressing PB1 1) RL, YL, GL OFF</p> <p>(3) Pressing PB2 1) RL, YL, GL OFF</p> <p>(4) Pressing both PB1 and PB2 1) RL, YL, GL OFF</p>				

2. NOR Logical operations

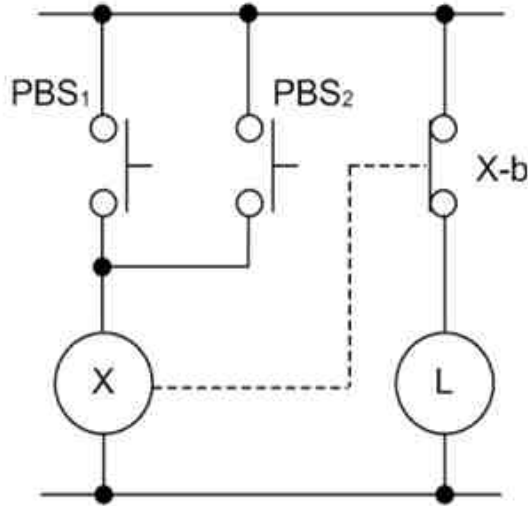
(1) NOR gate $\overline{(A+B)}$

1) NOR gate is the negation of OR gate to be taken NOT.

Logical circuit



Sequence



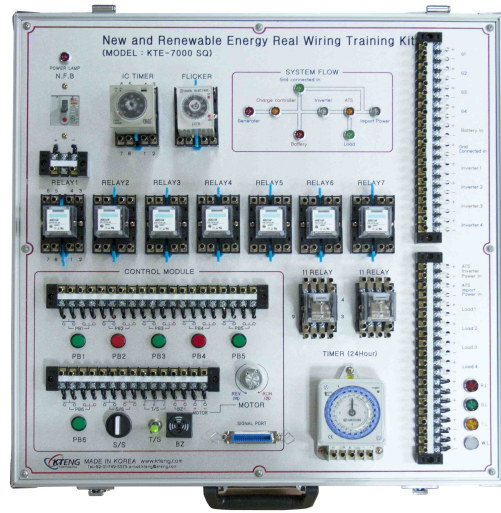
Fact table

A	B	S
0	0	1
0	1	0
1	0	0
1	1	0

New and Renewable Energy Real Wiring Training Kit



Hybrid Generation Experiment Equipment (KTE-CP520)



New & Renewable Energy Real Wiring Training Kit (KTE-7000SQ)

• Check Point

1. Check and prepare of apparatus, tools, and material.
2. Make configuration control circuit with banana plugs by using apparatus, tools, and material.
3. Understand the working function of circuit.
 - (1) Explain the process when NFB is pushed.
 - (2) Explain the process when PB1 is pushed.
 - (3) Explain the process when PB2 is pushed.
 - (4) Explain the process when both PB1 and PB2 are pushed.
4. Make real wiring circuit and operate system by using apparatus, tools, and material.

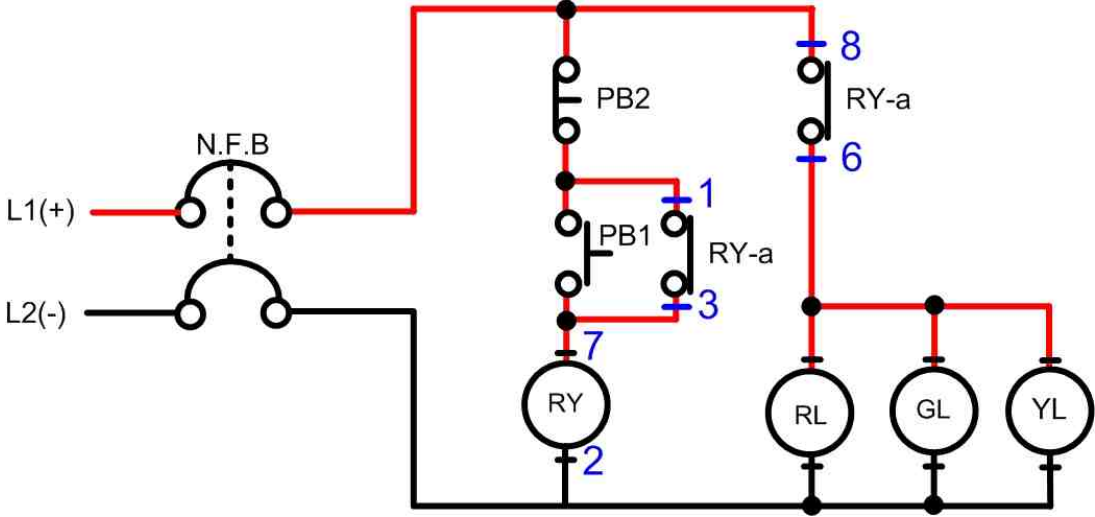
		Evaluation Item	Allot	Obtain	Remarks			
Valuation Basis	Item point (70)	Configuration Circuit and operation	20					
		Real wiring circuit configuration	20					
		Configuration state	10					
		Understanding and description for circuit	20					
	Work point (10)	Work attitude and safe	5					
		Usage and arrangement of tool	5					
Time point (20)	Subtract () point in every () minute excess				Item	Work	Time	Total

Experiment name	8. Practice to configure of lock up circuit	Required time
		4
The Object of Experiment	① Understand and make configuration lock up circuit	

Experiment Equipment	Tool and Material	Spec of Tools	Q`nty
• Hybrid Generation Experiment Equipment (KTE-CP520) • New & Renewable Energy Real Wiring Training Kit (KTE-7000SQ)	• Screw driver set • Nipper • Wire Stripper • Hook Meter	• #2× 6× 175mm • 150mm • 0.5~6mm ² • 300A 600V	1 1 1 1/group

Control circuit

1. Control Circuit



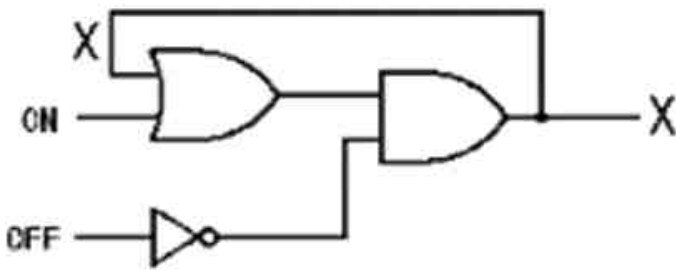
- (1) Power Input
- (2) Pressing PB1,
 - ① RL,YL,GL ON
- (3) Leaving hand from PB1
 - ① RL,YL,GL ON 유지
- (4) Pressing PB2
 - ① RL,YL,GL OFF

2. Self-holding circuit logical operations

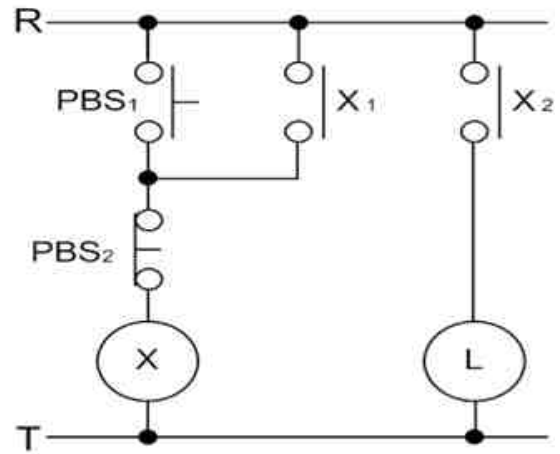
(1) Self-holding circuit

- ① Manual operation to ON automatically when you return to the PB1 is ON, but relay contacts X ⊗ continue until the PB2 and off work. Should remember for sure.

Logical circuit



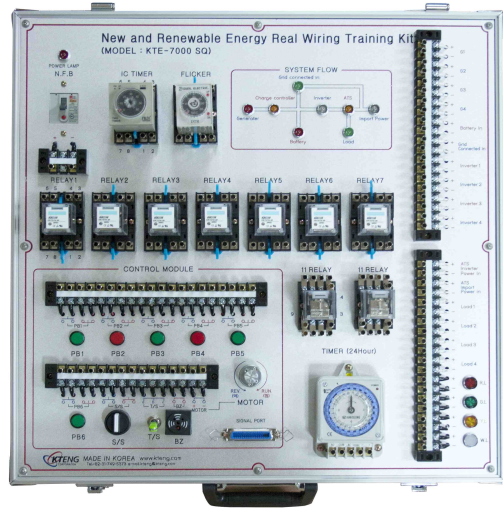
Sequence



New and Renewable Energy Real Wiring Training Kit



Hybrid Generation Experiment Equipment
(KTE-CP520)



New & Renewable Energy Real Wiring Training Kit
(KTE-7000SQ)

• Check Point

1. Check and prepare of apparatus, tools, and material.
2. Make configuration control circuit with banana plugs by using apparatus, tools, and material.
3. Understand the working principle and composition of a thermal relay device.
4. Understand the working function of circuit.
 - (1) Explain the process when NFB is pushed.
 - (2) Explain the process when PB1 is pushed.
 - (3) Explain the process when PB2 is pushed.
5. Make real wiring circuit and operate system by using apparatus, tools, and material.

		Evaluation Item	Allot	Obtain	Remarks			
Valuation Basis	Item point (70)	Configuration Circuit and operation	20					
		Real wiring circuit configuration	20					
		Configuration state	10					
		Understanding and description for circuit	20					
	Work point (10)	Work attitude and safe	5					
		Usage and arrangement of tool	5					
Time point (20)	Subtract () point in every () minute excess				Item	Work	Time	Total

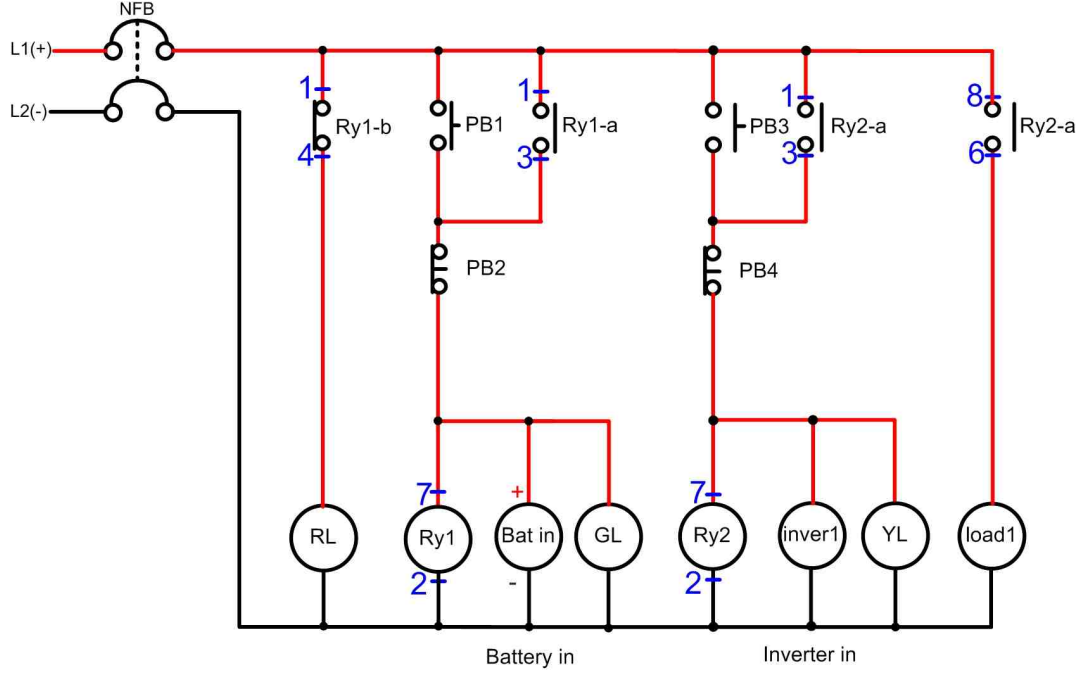
New and Renewable Energy Real Wiring Training Kit

Experiment name	9. The battery power input circuit training	Required time
		8
The Object of Experiment	① Wiring can be conducted based on designed circuit diagram. ② It uses the battery direct current voltage and inverter, so the process that convert to alternating power can be understood. ③ Differences between dc and ac can be understood.	

Experiment Equipment	Tool and Material	Spec of Tools	Q`nty
• Hybrid Generation Experiment Equipment (KTE-CP520) • New & Renewable Energy Real Wiring Training Kit (KTE-7000SQ) • New & Renewable Energy PLC Training Kit (KTE-7000PL)	• Screw driver set • Nipper • Wire Stripper • Hook Meter	• #2× 6× 175mm • 150mm • 0.5~6mm ² • 300A 600V	1 1 1 group1

Control Circuit

1. Control Circuit



- | | |
|----------------------------------|-------------------------------------|
| L1, L2 : Line Voltage | Ry: Relay |
| N.F.B : No fuse circuit breaker | PB1,3 : A contact pushbutton switch |
| Inver1 : Stand-alone inverters | PB2,4 : B contact pushbutton switch |
| RL, GL, YL : DC Lamp | Bat in : Battery input signal |
| load1 : Load power output signal | |

2. Battery



Battery converts the chemical energy in the chemical substance inside of it to electric energy by oxidation-reduction reaction, and if all electric energies are consumed, voltage will be getting lower due to discharge. Eventually, it cannot transport the electric charge, and at this time. It is divided into 1st battery and 2nd battery depending on charging possibility. 1st battery is disposable, and 2nd battery can be recycled throughout charging.

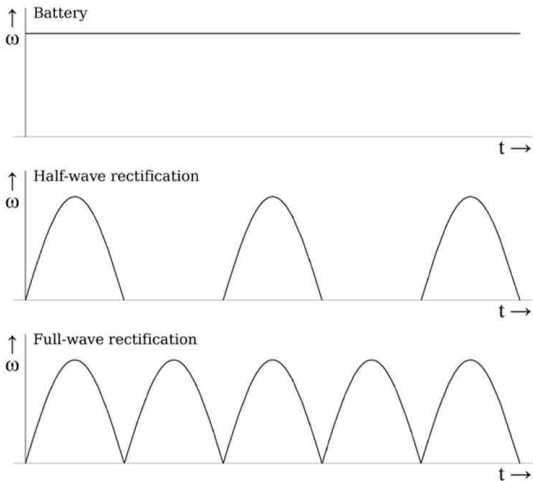
3. Inverter



Generally, inverter is the device that converts dc to ac, and its method and design varies with its use ranges. For example, it varies depending whether it is motor operation, it is ac voltage for house and electricity is exported with kopec, and in this specification, it is the inverter to use the house-purpose ac voltage. From here, it is also divided into modified sin wavelength and sin wavelength.

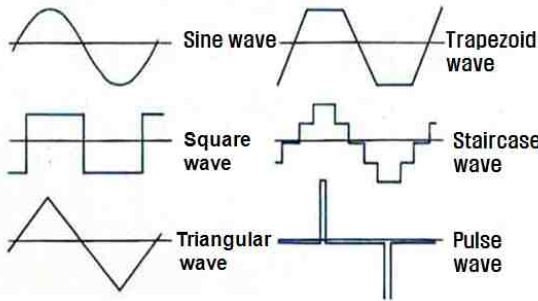
4. DC and AC voltages

* DC



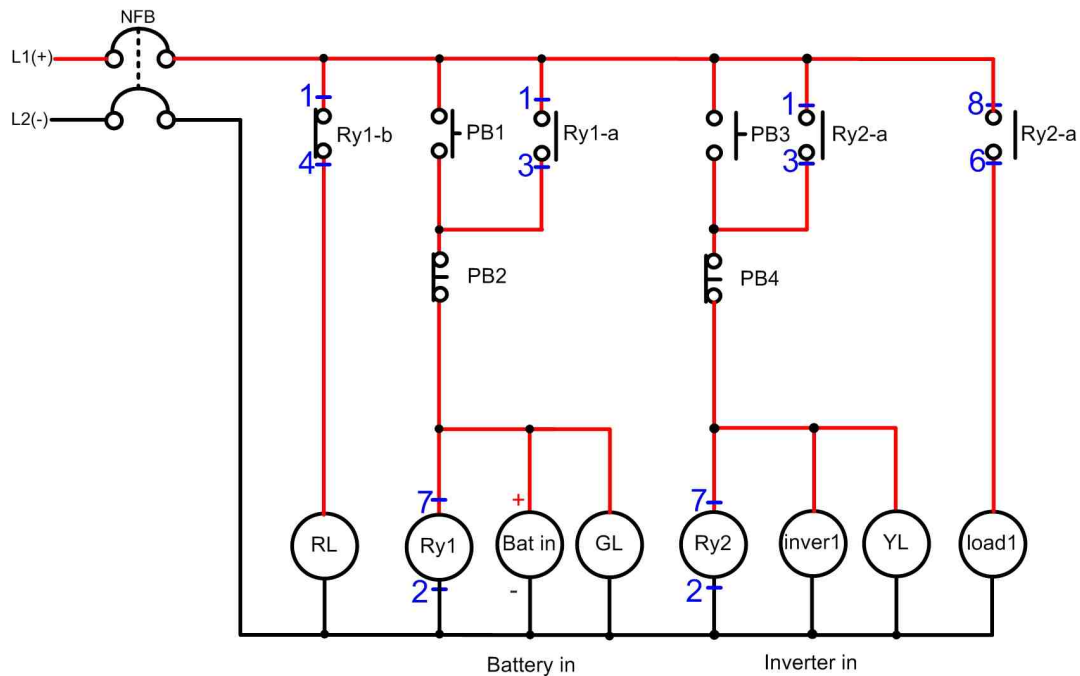
Current that flows to constant direction like current in battery is indicated as dc if + and - pole is not changed. The next shows the wavelength alternating of direct current.

* AC



Because it is current that changes its size and direction periodically, it is indicated as ac if there is + and -. The next shows the wavelength pattern of alternating current.

5. Explanation

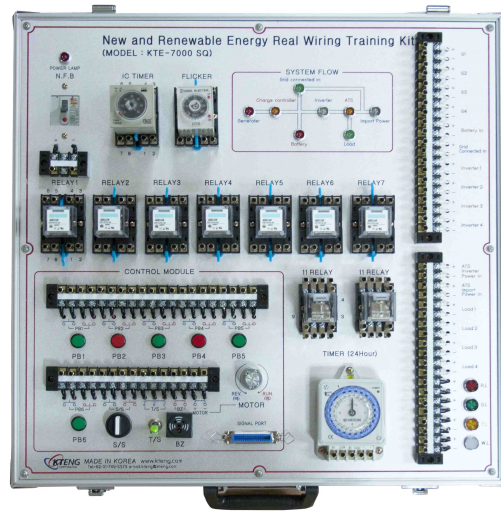


- (1) Turn on the nfb breaker, then red lamp will be on.
- (2) Push pb1, and then green lamp will be on while red lamp will be off. Also, relay one will be excited, and due to a contact point of relay one, it does self-maintain, and battery in mc will be also excited, so charging controller and battery is connected.
- (3) Push pb3, and then yellow lamp will be on, and relay two will be excited, so due to a contact point of relay two, it does self-maintain, and mc of inverter one will be excited, so charging controller and battery is connected. In same times, mc of load one will be excited, so load will be connected to each other.
- (4) Push pb4, and then relay two, inverter one and yellow lamp will be off, so connections between battery and inverter will be disconnected, and in same times, inverter and load connection will be blocked.
- (5) Push pb2, relay one, battery one and green lamp will be off, and red lamp will be on. Thus, connections between charging controller and battery will be blocked.
- (6) If turn off nfb breaker, red lamp will be off.

New and Renewable Energy Real Wiring Training Kit



Hybrid Generation Experiment Equipment (KTE-CP520)



New & Renewable Energy Real Wiring Training Kit (KTE-7000SQ)

• Requirement

1. Prepare and check the test devices, tools and materials.
2. Purpose and effect of battery connection can be explained.
3. Use the test devices, tools, and materials, create the circuit with thread wiring or banana jack.
4. Operation function of circuit can be explained.
 - (1) Explain the processes operated when pb1 is pushed.
 - (2) Explain the processes operated when pb2 is pushed.
 - (3) Explain the differences between ac and dc.
5. Roles of inverter can be understood and explained.
6. Use the test devices, tools, and materials, conduct thread wiring and operate.

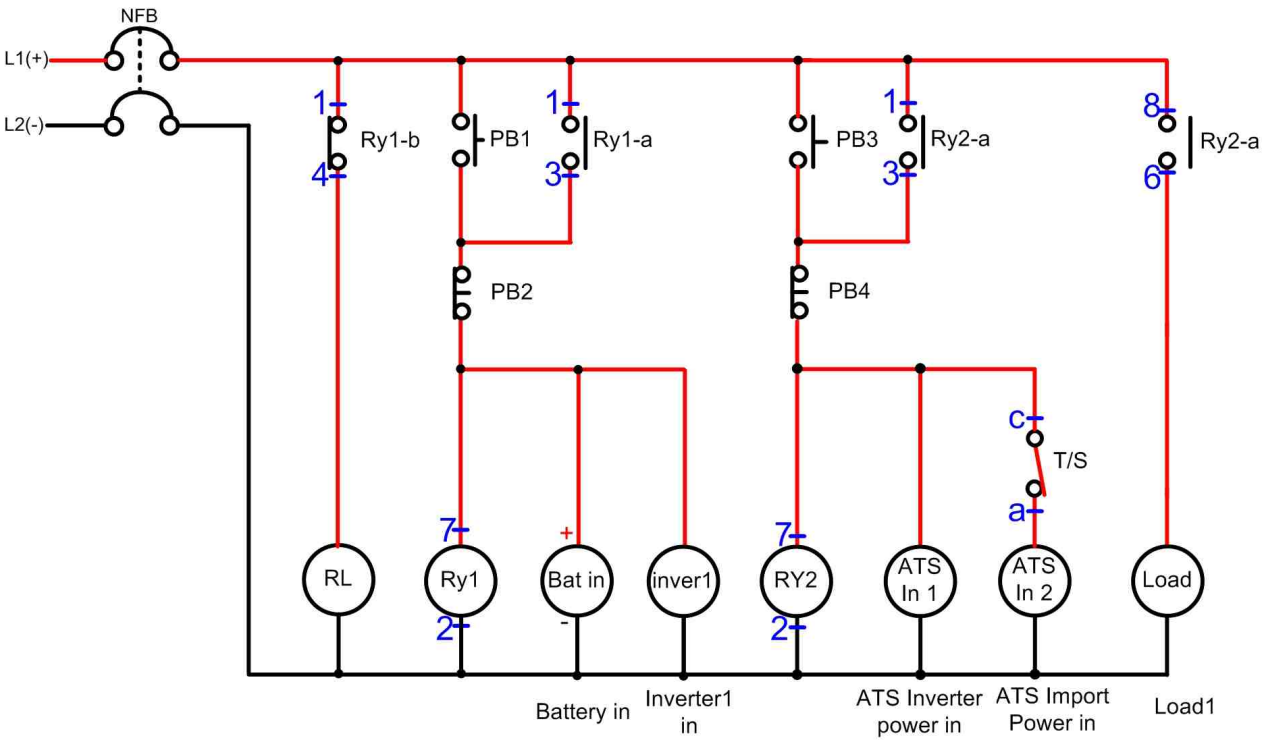
		Evaluation Item	Allot	Obtain	Remarks			
Valuation Basis	Item point (70)	Configuration Circuit and operation	20					
		Real wiring circuit configuration	20					
		Configuration state	10					
		Understanding and description for circuit	20					
	Work point (10)	Work attitude and safe	5					
		Usage and arrangement of tool	5					
Time point (20)	Subtract () point in every () minute excess			Item	Work	Time	Total	

Experiment name	10. Using ATS automatic switch circuit for uninterruptible	Required time
		8
The Object of Experiment	① Wiring can be conducted based on designed circuit diagram. ② Instruction of battery power and commercial power can be understood, and wiring can be conducted. ③ Function of ATS can be understood and explained.	

Experiment Equipment	Tool and Material	Spec of Tools	Q`nty
• Hybrid Generation Experiment Equipment (KTE-CP520) • New & Renewable Energy Real Wiring Training Kit (KTE-7000SQ) • New & Renewable Energy PLC Training Kit (KTE-7000PL)	• Screw driver set • Nipper • Wire Stripper • Hook Meter	• #2× 6× 175mm • 150mm • 0.5~6mm ² • 300A 600V	1 1 1 group1

Control Circuit

1. Control Circuit



- | | |
|---|---|
| L1, L2 : Line Voltage
N.F.B : No fuse circuit breaker
Inver : Stand-alone inverters
RL: Lamp
ATS in1 : ATS inverter input
ATS in2 : ATS import input | Ry :Relay
PB1 : A contact pushbutton switch
PB2 : B contact pushbutton switch
Bat in : Battery input signal
Load : Load power output signal |
|---|---|

2. ATS(Automatic transfer switch)

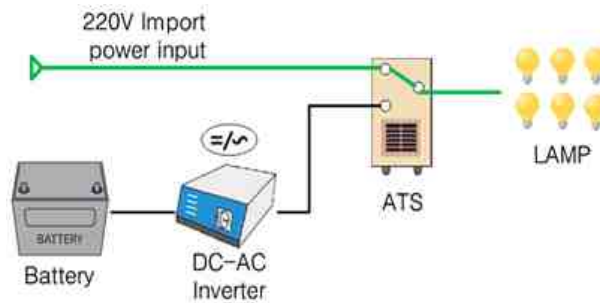


Automatic transfer switch secures the double or triple power, so when main power blackout or voltage is dropped less than standard value, it is converted to backup power automatically, so it is the device that makes customer receive constant power. Due to blackout of main power input, auxiliary power input is automatically converted, so it always supplies the uninterruptible power. Maintain the power supply by auxiliary power, and then if main power input is supplied again, it is converted automatically to main power.

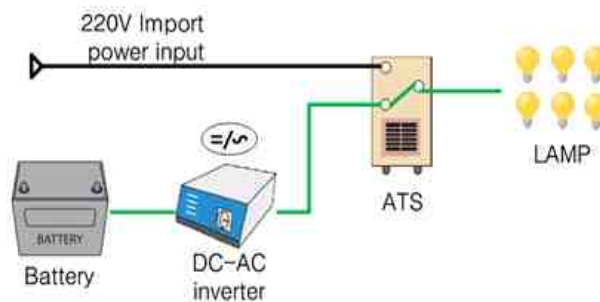
(1) Scope of various using purpose

Emergency generator, substitute for ups, place where power failure frequently, grid-connected solar street lamp, emergency power converter , and other place where stable electricity supply is required.

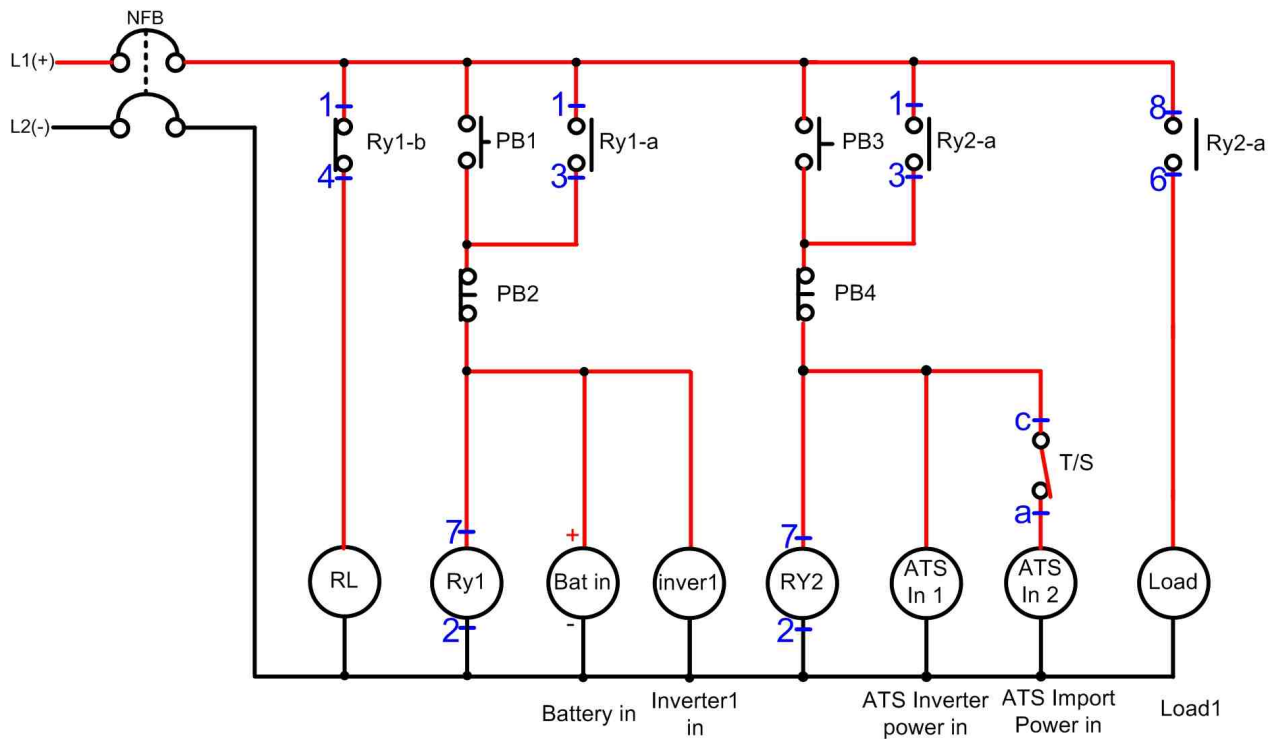
(2) Import power operation status



(3) Import power is interrupted status



4. Explanation

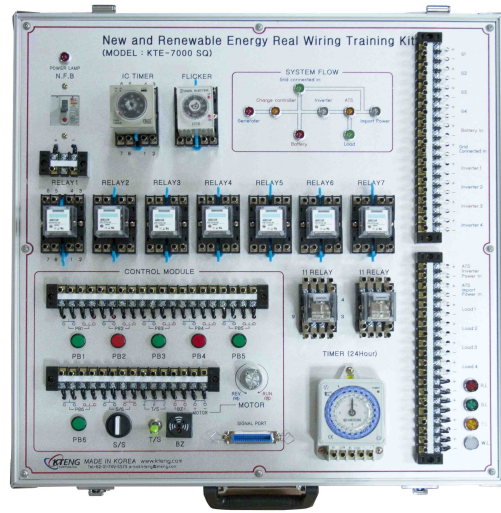


- (1) Turn on NFB breaker, and then red lamp will be on.
- (2) Push PB1, and then red lamp will be off. Also, relay one will be excited, and due to a contact point of relay one, it does self-maintain, and battery in mc and inverter one mc will be also excited, so charging controller and battery is connected, and in same time, dc is supplied from battery to inverter.
- (3) Push PB3, and then relay two will be excited, and due to a contact point of relay one, it does self-maintain, and ats in one mc and ats in two mc will be excited, as ac output of inverter and commercial power is supplied to ats in same time. Because relay two a contact point is closed in same time, mc of load one will be excited, so power is supplied to load.
- (4) When toggle switch is closed, power is supplied to load with commercial power.
- (5) Open toggle switch, and then mc of ats in tow will be demagnetized, so connections between commercial power and ats import power in will be blocked, and this will make virtual blackout state, so by ats, ups will supply the power to load with output power of inverter simultaneously.
- (6) Push PB4, and then relay twom ats in one, and ats in two mc will be excited, so inverter output and ats inverter power in connections will be blocked, and as same, commercial power and ats import power in connections will be blocked. In same times, load mc will be excited, so load connection will be blocked.
- (7) Turn off nfb breaker, and then red lamp will be off.

New and Renewable Energy Real Wiring Training Kit



Hybrid Generation Experiment Equipment (KTE-CP520)



New & Renewable Energy Real Wiring Training Kit (KTE-7000SQ)

• Requirement

1. Prepare and check the test devices, tools and materials.
2. Using purpose and effect of ats can be explain.
3. Use the test devices, tools, and materials, create the circuit with thread wiring or banana jack.
4. Operation function of circuit can be explained.
 - (1) Explain the processes operated when pb1 is pushed.
 - (2) Motion processes depending on changes of ats contact point can be explained.
 - (3) Explain the processes operated when pb2 is pushed.
5. Use the test devices, tools, and materials, conduct thread wiring and operate.

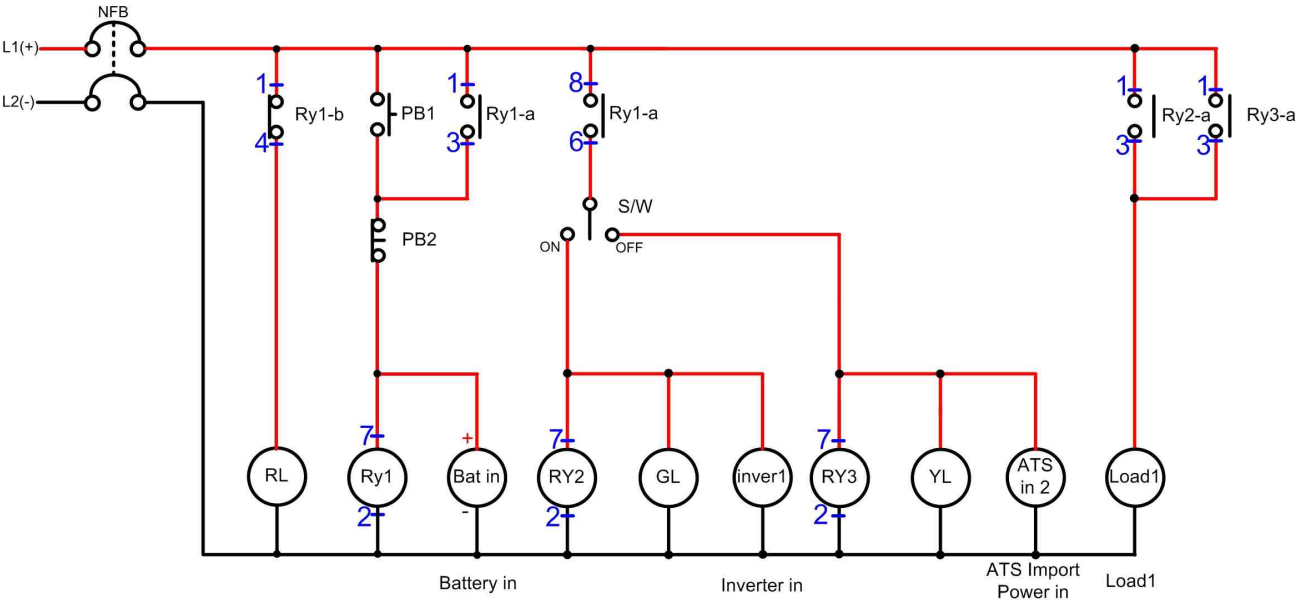
		Evaluation Item	Allot	Obtain	Remarks			
Valuation Basis	Item point (70)	Configuration Circuit and operation	20					
		Real wiring circuit configuration	20					
		Configuration state	10					
		Understanding and description for circuit	20					
	Work point (10)	Work attitude and safe	5					
		Usage and arrangement of tool	5					
Time point (20)	Subtract () point in every () minute excess			Item	Work	Time	Total	

New and Renewable Energy Real Wiring Training Kit

Experiment name	11. Practice to configure of commercial electric or battery power selection circuit	Required time
		8
The Object of Experiment	① Wiring can be conducted based on designed circuit diagram. ② Instruction of selector switch can be understood and wiring can be conducted. ③ Using selector switch, deploy circuit of commercial power and battery power can be understood, and wiring can be conducted.	
Experiment Equipment	Tool and Material	Spec of Tools
• Hybrid Generation Experiment Equipment (KTE-CP520) • New & Renewable Energy Real Wiring Training Kit (KTE-7000SQ) • New & Renewable Energy PLC Training Kit (KTE-7000PL)	• Screw driver set • Nipper • Wire Stripper • Hook Meter	• #2× 6× 175mm • 150mm • 0.5~6mm ² • 300A 600V
		Q`nty
		1 1 1 group1

Control Circuit

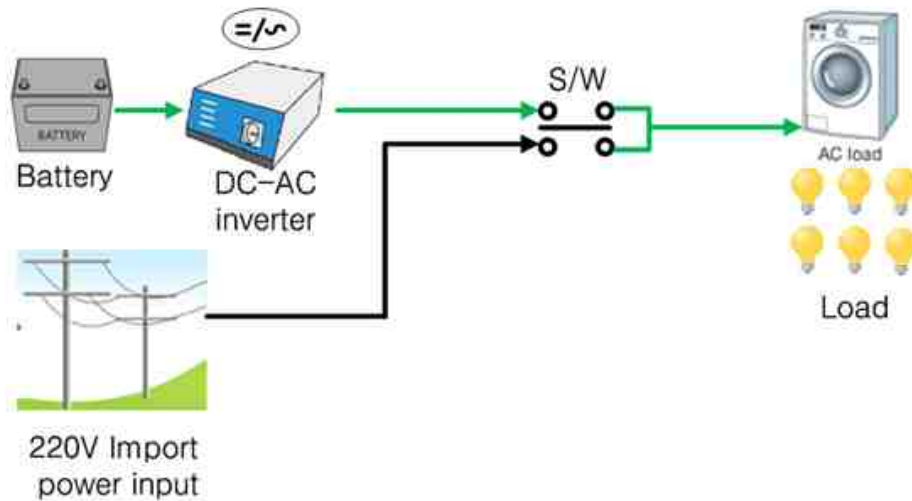
1. Control Circuit



L1, L2 : Line Voltage
 N.F.B : No fuse circuit breaker
 inver : Stand-alone inverters
 RL, GL, YL : DC Lamp
 ATS in2 : ATS Import power in
 T/S : Toggle Switch

Ry : Relay
 PB1 : A contact pushbutton switch
 PB2 : B contact pushbutton switch
 Bat in : Battery input signal
 Load : Load power output signal

2. Blocks of the system



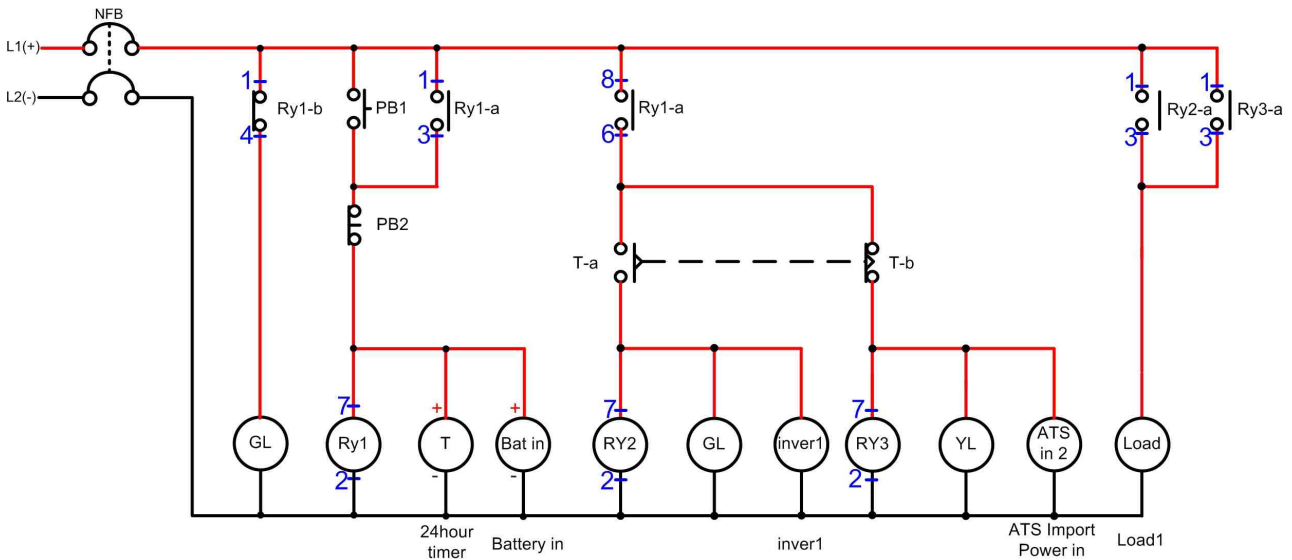
- (1) While charging the electricity generated from new renewable energy, such as solar and wind power, and if battery charging is completed, power supply using battery power is conducted. Using selector switch, if battery is discharged, commercial power line can be used, and when battery is charged completely, use the load using battery power again.
- (2) What is the commercial power? It is the power used in all the times, it is the main power supplied from electric power company.

3. 24 hours time

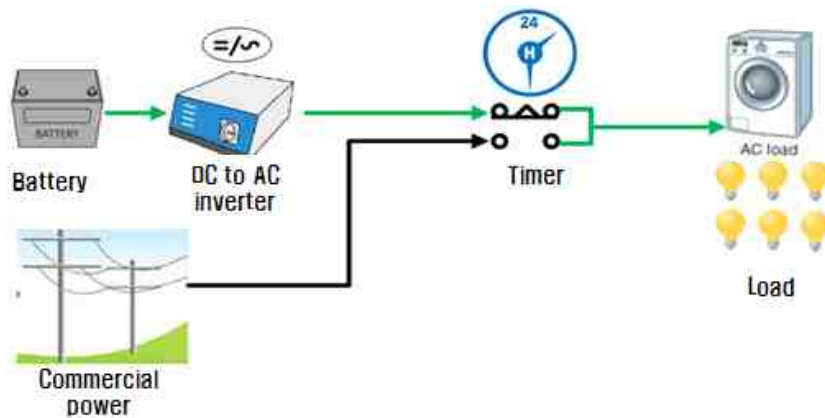


24 hours timer: that contact point is closed or opened during fixed time.

4. Application Circuit



5. Blocks of the system

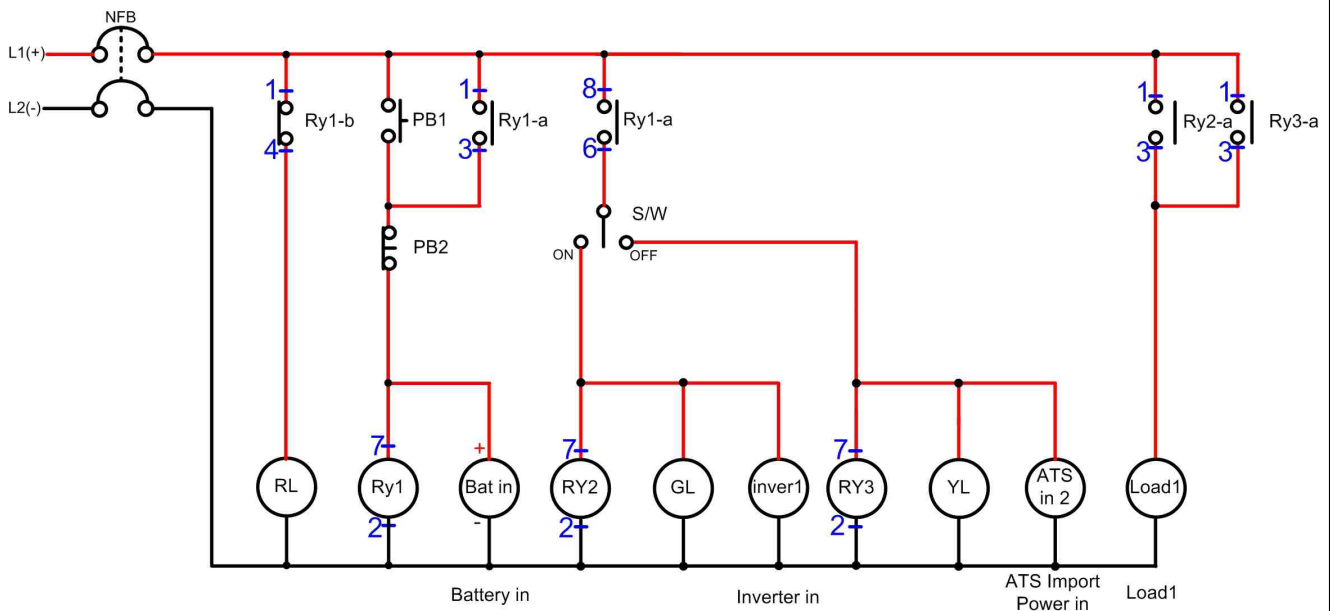


(1) Use the timer instead of selector switch, so commercial power is used in night time that electric cost is not expensive, and during daylight that electric cost is expensive, battery power can be used. Replace the selector switch with 24 hours timer, smart grid can be realized by setting up that power line is selective depending on times.

(2) Smart Grid

- Smart grid is based on combination of information technology (it) to existing power grid, and it is the next generation power grid that exchanges the information between supplier and customer in real time to optimize the energy efficiency.
- ex) Washing machine in home will be operated in the time that electric cost is most inexpensive, and charge the electric mobile in the night, even it is parked during day.

3. Explanation

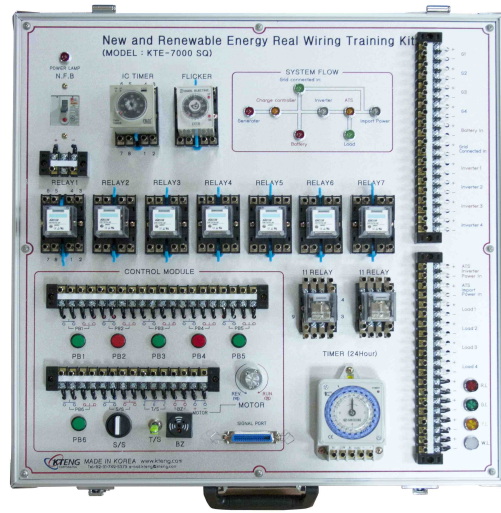


- (1) Turn on the NFB breaker, then red lamp will be on.
- (2) Push PB1, and then green lamp will be on while red lamp will be off. Also, relay one will be excitation, and due to a contact point of relay one, it does self-maintain, and battery in mc will be also excitation, so charging controller and battery is connected.
- (3) Turn on the selector switch, and then relay two and green lamp will be on, and mc of inverter one will be excited, so battery and inverter is connected. In same times, because relay two a contact point is closed, mc of load one will be excited, so power is supplied from output power to load.
- (4) Put selector switch to middle, and then relay two and mc of inverter one will be excited, so battery and inverter connection will be blocked, and green lamp will be on. Because relay two a contact points are open in same times, mc of load one will be excited, so power supply of load will be blocked.
- (5) Turn off the selector switch, and then relay three and mc of ats in two will be excited, so commercial will be approved, and yellow lamp will be on. Because relay three a contact point is closed in same time, mc of load one will be excited, so power is supplied to load with commercial power.
- (6) Put selector switch to middle, and then relay three and mc of ats in will be excited, so battery and inverter connection will be blocked, and green lamp will be on. Because relay two a contact point is opened in same times, mc of load one will be demagnetized, so power supply to load will be blocked.
- (7) Push PB2, and then relay one and battery one will be excited, and green lamp and yellow lamp will be on. Also, relay two, inverter one, relay threem ats in two, and load one will be demagnetized, so all connection will be blocked.
- (8) Turn off the NFB breaker, and then red lamp will be off.

New and Renewable Energy Real Wiring Training Kit



Hybrid Generation Experiment Equipment (KTE-CP520)



New & Renewable Energy Real Wiring Training Kit (KTE-7000SQ)

• Requirement

1. Prepare and check the test devices, tools and materials.
2. The purpose of the selector switch, and may explain the effect.
3. Use the test devices, tools, and materials, create the circuit with thread wiring or banana jack.
4. Operation function of circuit can be explained.
 - (1) Explain the processes operated when pb1 is pushed.
 - (2) The advance of the operation of the selector switch contacts to explain the process.
 - (3) Explain the processes operated when pb2 is pushed.
5. Use the test devices, tools, and materials, conduct thread wiring and operate.

		Evaluation Item	Allot	Obtain	Remarks			
Valuation Basis	Item point (70)	Configuration Circuit and operation	20					
		Real wiring circuit configuration	20					
		Configuration state	10					
		Understanding and description for circuit	20					
	Work point (10)	Work attitude and safe	5					
		Usage and arrangement of tool	5					
Time point (20)	Subtract () point in every () minute excess			Item	Work	Time	Total	

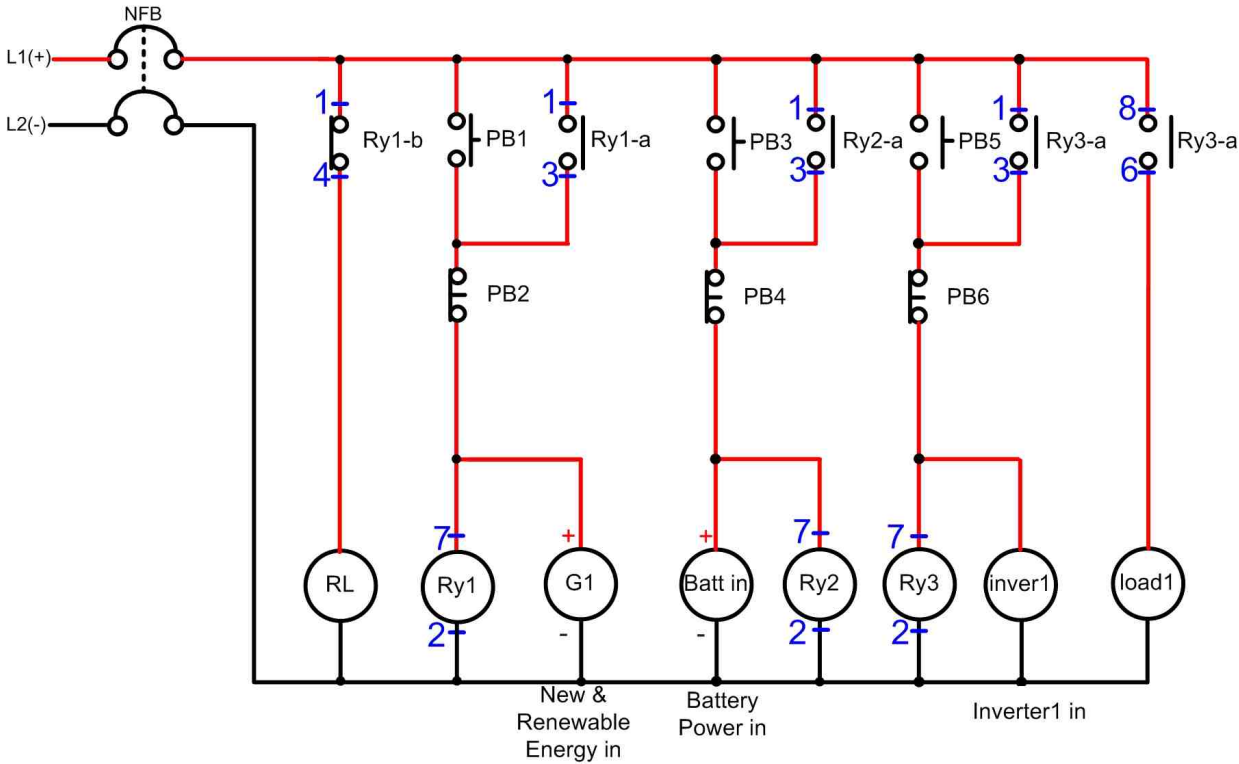
Experiment name	12. Stand-alone inverter circuit configuration training 1	Required time
		8

The Object of Experiment	① Wiring can be conducted based on designed circuit diagram. ② Stand-alone inverter circuit can be understood and wiring can be conducted.
---------------------------------	---

Experiment Equipment	Tool and Material	Spec of Tools	Q`nty
• Hybrid Generation Experiment Equipment (KTE-CP520) • New & Renewable Energy Real Wiring Training Kit (KTE-7000SQ) • New & Renewable Energy PLC Training Kit (KTE-7000PL)	• Screw driver set • Nipper • Wire Stripper • Hook Meter	• #2× 6× 175mm • 150mm • 0.5~6mm ² • 300A 600V	1 1 1 group1

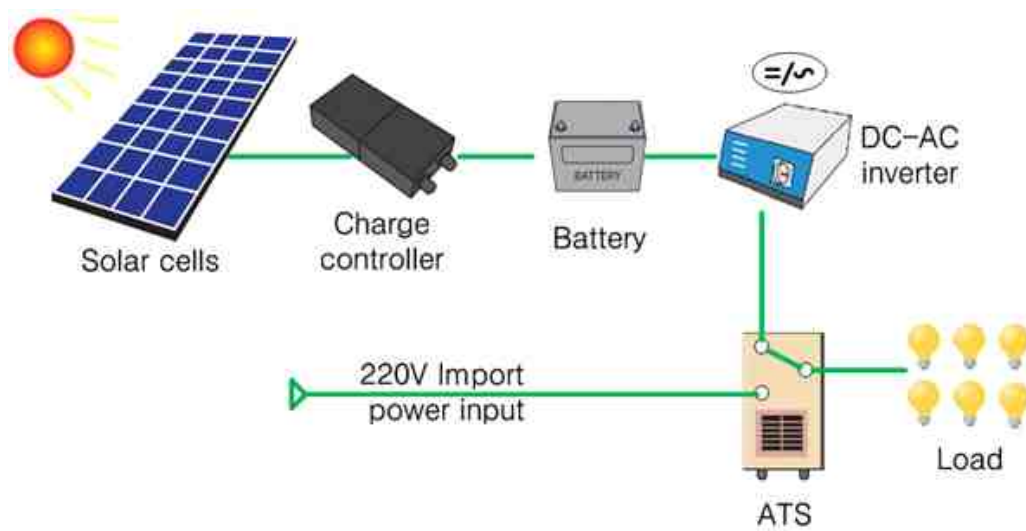
Control Circuit

1. Control Circuit



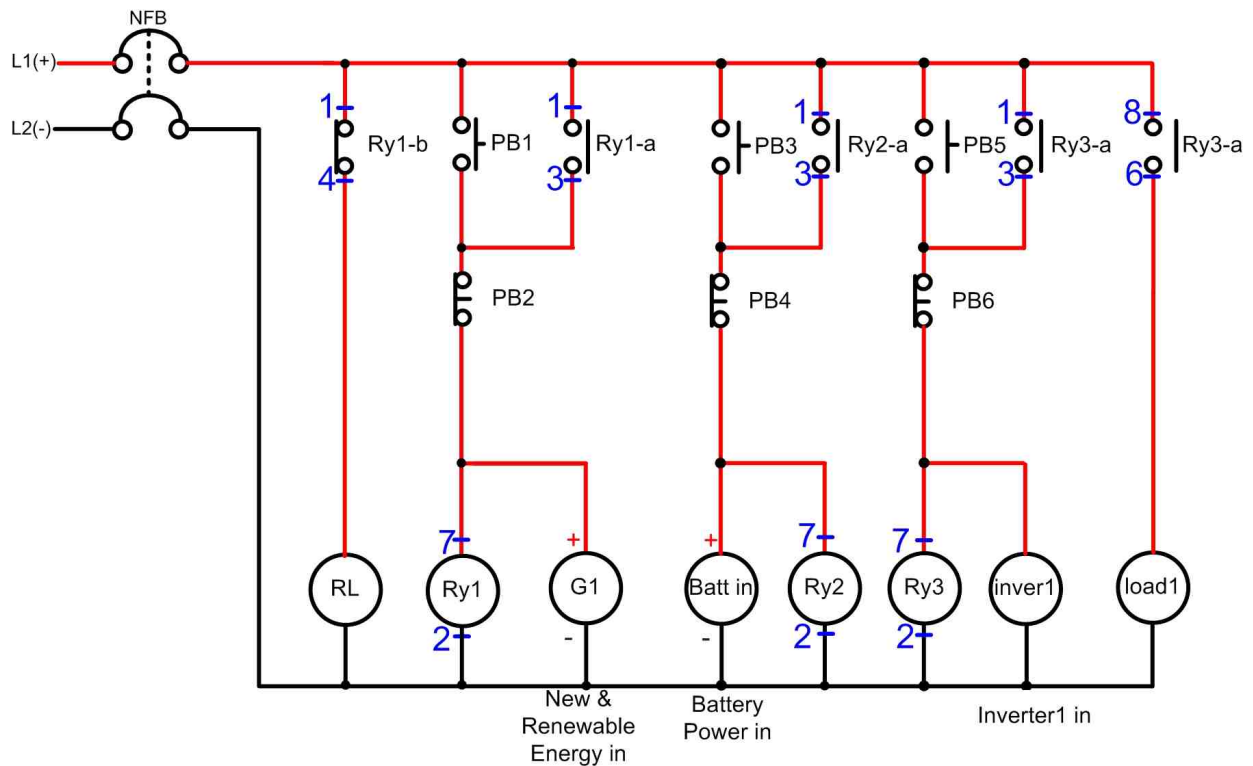
- | | |
|--|---|
| L1, L2 : Line Voltage
N.F.B : No fuse circuit breaker
inver1 : inverter
G1 : New&Renewable energy input signal
RL: DC Lamp | Ry : Relay
PB1,3,5 : A contact pushbutton switch
PB2,4,6 : B contact pushbutton switch
Bat in : Battery input signal
load1 : Load power output signal |
|--|---|

2. Stand-alone inverter systems



- (1) Independent inverter system is not connected with power system of commercial, but it is the generating system used as independent power, so it is mostly used in the undeveloped region where commercial power system cannot be supplied and when independent power is required because of certain circumstance.
- (2) Because there are time differences between generating time and time that consumes electricity, most independent systems are equipped with battery, and it saves generated power to battery, and discharge the battery if necessary to use the power.
- (3) It is varied from small size to large size, and small sizes, such as table calculator or clock using solar battery cannot called as the devices that use independent power system. Large size is used for emergency power of mountain cabin, villa, laboratory facility or emergency equipment. Because it is not related to commercial power, it can be operated independently when commercial power is blacked out due to disaster.

3. Explanation

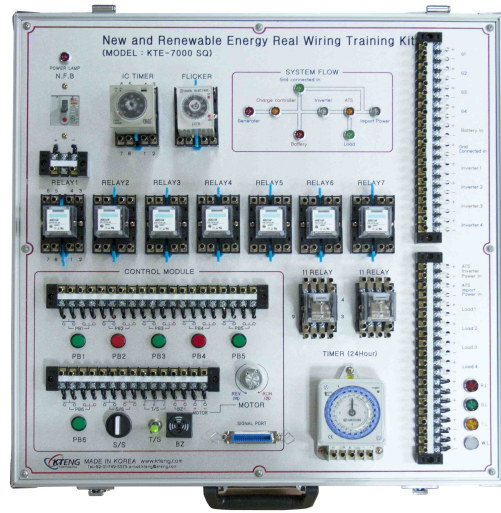


- (1) Turn on the NFB breaker, and then red lamp will be on.
- (2) Push the PB1, and then red lamp will be off. Also, relay one and G1 mc will be excited, so it will be self-maintained due to relay one a contact point, and new renewable energy will be deployed, so it will be connected to charging controller throughout connecting panel.
- (3) Push PB3, and then relay two will be excited and self-maintained, and batt in mc will also be excited, so charging controller and battery will be connected.
- (4) Push PB5, and then relay three will be excited and self-maintained, and mc of inverter one will also be excited, so charging controller and battery will be connected. Because relay three a contact point is closed in same time, mc of load one will be excited, so power is supplied to load from inverter output power..
- (5) Push PB6, and then relay three and mc of inverter one will be demagnetized, so power supply to load from inverter output will be blocked, and battery and inverter connection will be blocked.
- (6) Push PB4, and then relay two and batt in mc will be demagnetized, so connection to charging controller and battery will be blocked.
- (7) Push PB2, and then relay one and G1 mc will be demagnetized, so supply of new renewable energy will be blocked and red lamp will be on.
- (8) Turn off the NFB breaker, and then red lamp will be off.

New and Renewable Energy Real Wiring Training Kit



Hybrid Generation Experiment Equipment (KTE-CP520)



New & Renewable Energy Real Wiring Training Kit (KTE-7000SQ)

• Requirement

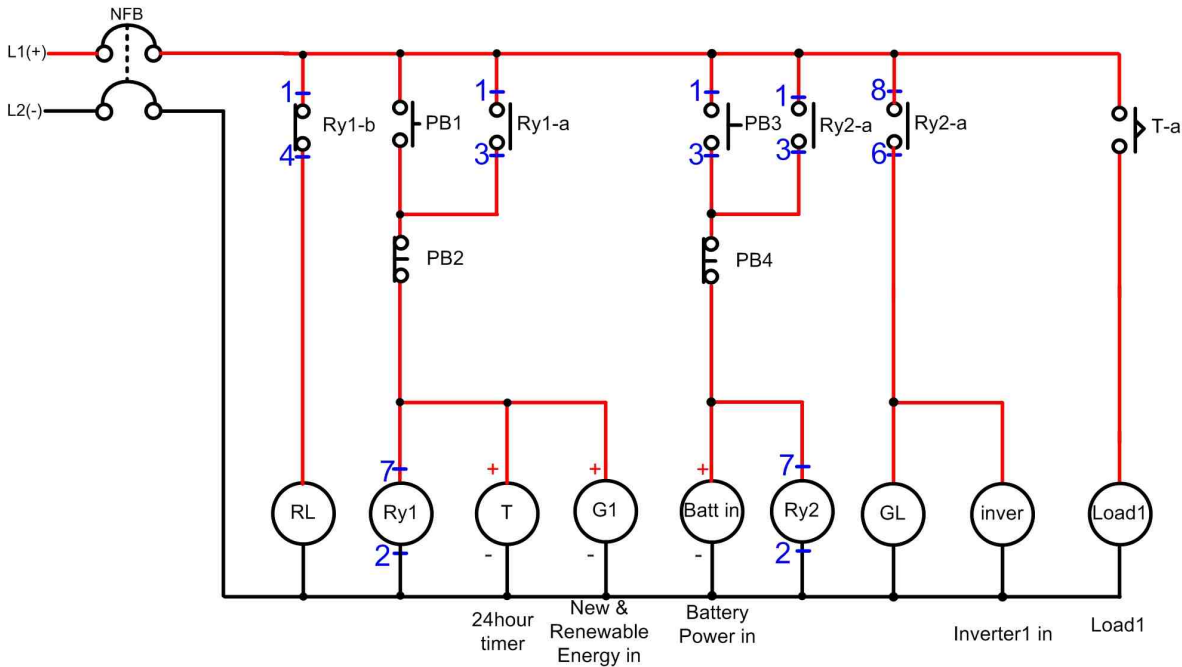
1. Prepare and check the test devices, tools and materials.
2. Independent inverter circuit can be understood and wiring can be conducted.
3. Use the test devices, tools, and materials, create the circuit with thread wiring or banana jack.
4. Operation function of circuit can be explained.
 - (1) Explain the processes operated when pb1 is pushed.
 - (2) Explain the processes operated when inverter1 operating.
5. Use the test devices, tools, and materials, conduct thread wiring and operate.

		Evaluation Item	Allot	Obtain	Remarks			
Valuation Basis	Item point (70)	Configuration Circuit and operation	20					
		Real wiring circuit configuration	20					
		Configuration state	10					
		Understanding and description for circuit	20					
	Work point (10)	Work attitude and safe	5					
		Usage and arrangement of tool	5					
Time point (20)	Subtract () point in every () minute excess				Item	Work	Time	Total

Experiment name	13. Stand-alone inverter circuit configuration training for Solar street light	Required time
		8
The Object of Experiment	① Wiring can be conducted based on designed circuit diagram. ② Stand-alone inverter circuli can be understood and wiring can be conducted. ③ Solar street light equipment can be.	
Experiment Equipment	Tool and Material	Spec of Tools
• Hybrid Generation Experiment Equipment (KTE-CP520) • New & Renewable Energy Real Wiring Training Kit (KTE-7000SQ) • New & Renewable Energy PLC Training Kit (KTE-7000PL)	• Screw driver set • Nipper • Wire Stripper • Hook Meter	• #2× 6× 175mm • 150mm • 0.5~6mm ² • 300A 600V
		Q`nty
		1 1 1 group1

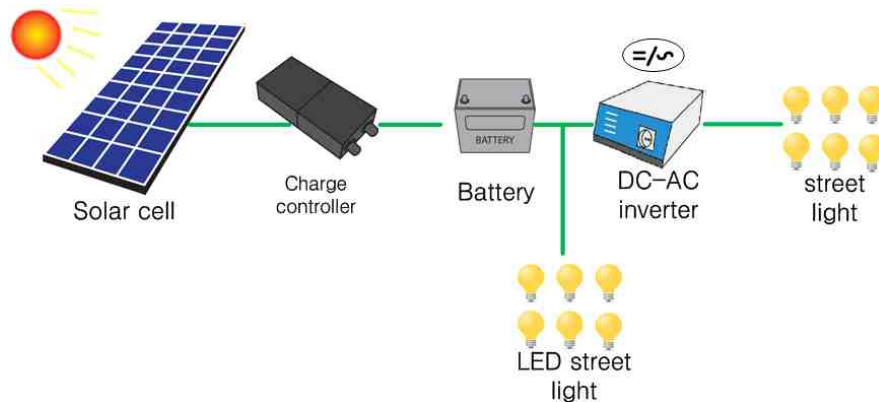
Control Circuit

1. Control Circuit



- | | |
|--------------------------------------|------------------------------------|
| L1, L2 : Line Voltage | Ry : 8pin, 11pin Relay |
| N.F.B : No fuse circuit breaker | PB1,3: A contact pushbutton switch |
| inver1 : Stand-alone inverters | PB2,4: B contact pushbutton switch |
| RL, GL : DC Lamp | Bat in : Battery input signal |
| G1 : New&Renewable energy input line | load1 : Load power output signal |
| S/S : Selector switch | |

2. Stand-alone inverter system solar street light



(1) Calculation of solar generating material capacity

1) Understand of electronic device that will be used.

- The most important thing when designing solar generating system is what electronic device will be used for how many hours in a day.
- Power consumption (w) of electronic device
- Understanding of voltage (v)- dc and ac of electronic device
- Daily average usage (Hr)

2) Calculation of system power consumption

(2) Method for selecting solar cell module.

1) Calculate the daily power consumption

Daily power consumption (whr) = power consumption (w) x daily using time

2) Calculate the average value of generating capacity needed for one day.

Daily generating capacity (w) = daily power consumption (whr) ÷ 3.5hr (average duration of sunshine in korea)

3) Decide the necessity solar battery module capacity considering generating efficiency (coefficient of output loss preservation)

Necessity solar battery module (w) = daily necessity generating capacity x 1.2 (coefficient of output loss preservation)

-If ac product is applied, multiply inverter loss preservation coefficient (1.2~1.25) depending on dc-ac inverter efficiency. Efficiency of inverter varies with inverter.

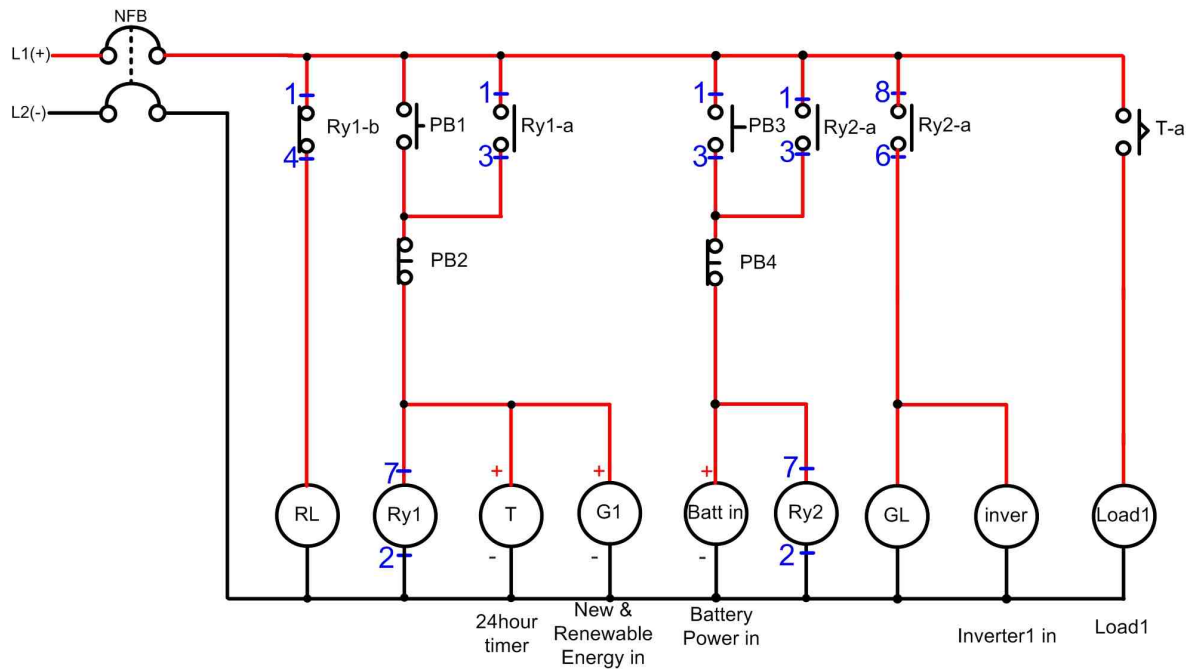
(3) Selecting method of battery

Necessity battery capacity (ah) = daily power consumption (whr) ÷ battery voltage (normally 12v) x number of sunless days x 1.25 (coefficient of battery discharging loss preservation)

- What is number of sunless days?

“It means "number of days that sun does not shine during all day", and for solar ray generation, electricity is not generated when cloudy day with less sunshine or raining day from solar battery module. These days called as number of sunless days, and this should be considered when selecting a battery. Normally calculated from 3 to 7.

3. Explanation

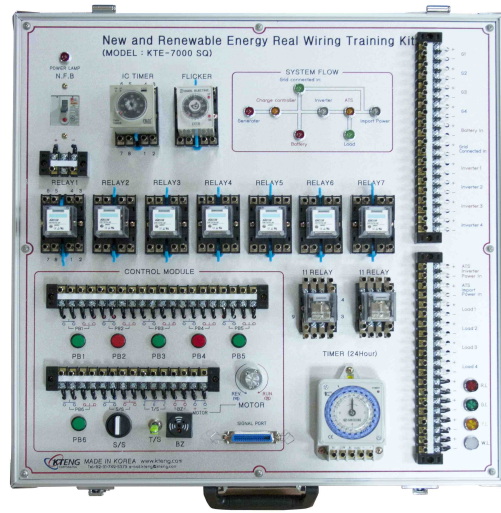


- (1) Turn on the NFB breaker, and then red lamp will be on.
- (2) Push the PB1, and then red lamp will be off. Also, relay one, green lamp and timer will be excited, so it will be self-maintained due to relay one a contact point, and new renewable energy will be deployed, so it will be connected to charging controller throughout connecting panel.
- (3) Push PB3, and then relay two will be excited and self-maintained, and battery in mc will also be excited, so charging controller and battery will be connected. Because green lamp will be on in same times and inverter mc will be excited, battery and inverter will apply an electric current.
- (4) If a contact point is closed depending on timer setup, load one mc will be demagnetized, so power is supplied from inverter output to load, and if a contact point is opened, power supply to load will be blocked.
- (5) Push PB4, and then relay two and batt in mc will be demagnetized, so source controller and battery connection will be blocked. Green lamp will be off in same time, and because inverter mc will be demagnetized, battery and inverter connection will be blocked.
- (6) Push PB2, and then relay one, timer and green lamp mc will be demagnetized, so supply of new renewable energy will be blocked, and red lamp will be on.
- (7) Turn off NFB, and then red lamp will be off.

New and Renewable Energy Real Wiring Training Kit



Hybrid Generation Experiment Equipment (KTE-CP520)



New & Renewable Energy Real Wiring Training Kit (KTE-7000SQ)

• Requirement

1. Prepare and check the test devices, tools and materials.
2. The use of stand-alone inverters can explain the purpose and effect.
3. Use the test devices, tools, and materials, create the circuit with thread wiring or banana jack.
4. Operation function of circuit can be explained.
 - (1) Explain the processes operated when pb1 is pushed.
 - (2) Timers can be used to describe the process behavior.
 - (3) Explain the processes operated when pb2 is pushed.
5. Use the test devices, tools, and materials, conduct thread wiring and operate.

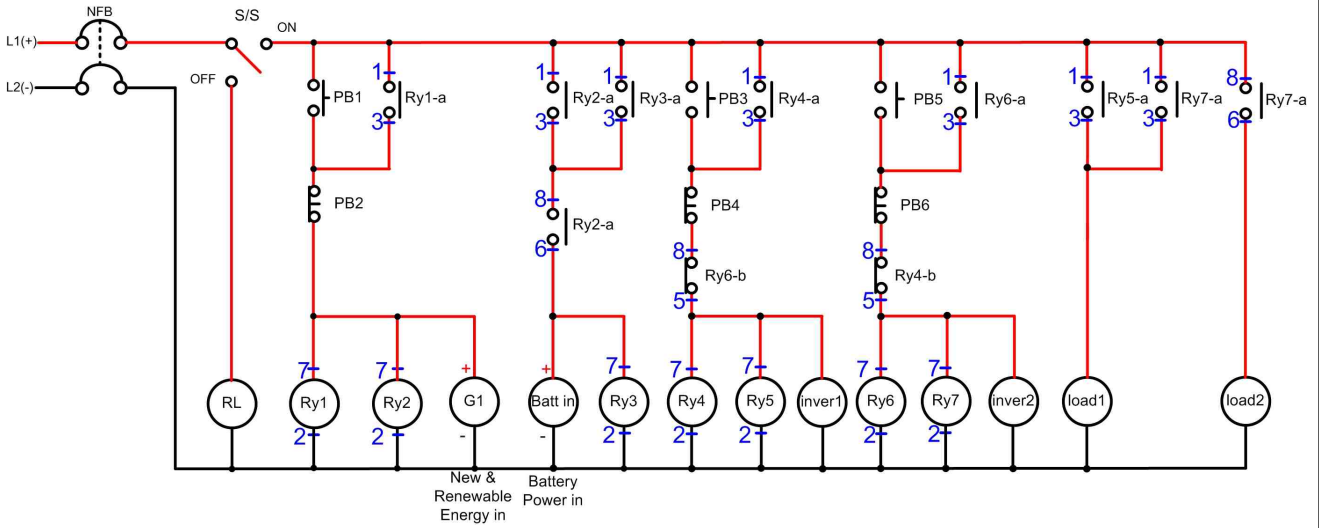
		Evaluation Item	Allot	Obtain	Remarks			
Valuation Basis	Item point (70)	Configuration Circuit and operation	20					
		Real wiring circuit configuration	20					
		Configuration state	10					
		Understanding and description for circuit	20					
	Work point (10)	Work attitude and safe	5					
		Usage and arrangement of tool	5					
Time point (20)	Subtract () point in every () minute excess				Item	Work	Time	Total

Experiment name	14. Stand-alone inverter circuit configuration training 2	Required time
		8
The Object of Experiment	① Wiring can be conducted based on designed circuit diagram. ② Stand-alone inverter circuit can be understood and wiring can be conducted. ③ Selecting method and efficiency relationship of inverter depending on load power usage capacity can be understood and explained.	

Experiment Equipment	Tool and Material	Spec of Tools	Q`nty
• Hybrid Generation Experiment Equipment (KTE-CP520) • New & Renewable Energy Real Wiring Training Kit (KTE-7000SQ) • New & Renewable Energy PLC Training Kit (KTE-7000PL)	• Screw driver set • Nipper • Wire Stripper • Hook Meter	• #2× 6× 175mm • 150mm • 0.5~6mm ² • 300A 600V	1 1 1 group1

Control Circuit

1. Control Circuit



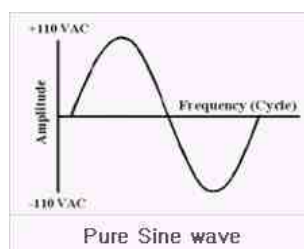
- | | |
|--------------------------------------|---------------------------------------|
| L1, L2 : Line Voltage | Ry : 8Pin Relay |
| N.F.B : No fuse circuit breaker | PB1,3,5 : A contact pushbutton switch |
| inver1 : Stand-alone inverters | PB2,4,6 : B contact pushbutton switch |
| inver2 : Stand-alone inverters | Bat in : Battery input signal |
| RL : DC Lamp | load1,2 : Load power output signal |
| G1 : New&Renewable energy input line | S/S : Selector switch |

2. Selection of a stand-alone inverters



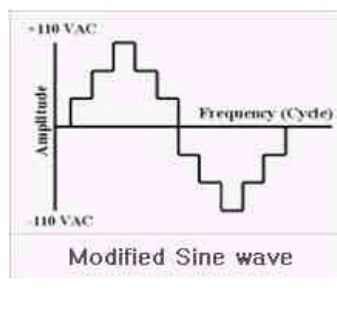
1) Selecting method and efficiency relationship of inverter depending on load power usage capacity can be understood and explained. Because electricity generated from solar generating system is dc, it should be converted to ac voltage if it is intended to use in house or sell to grid. This can be divided into independent inverter and grid-connected inverter. Independent inverter is used regardless of grid, and inverter that sells the electricity to grid (power company) is called as grid-connected inverter. Independent inverter is divided into sine wavelength inverter and pure sine wavelength.

a. Pure Sine Wave Inverter



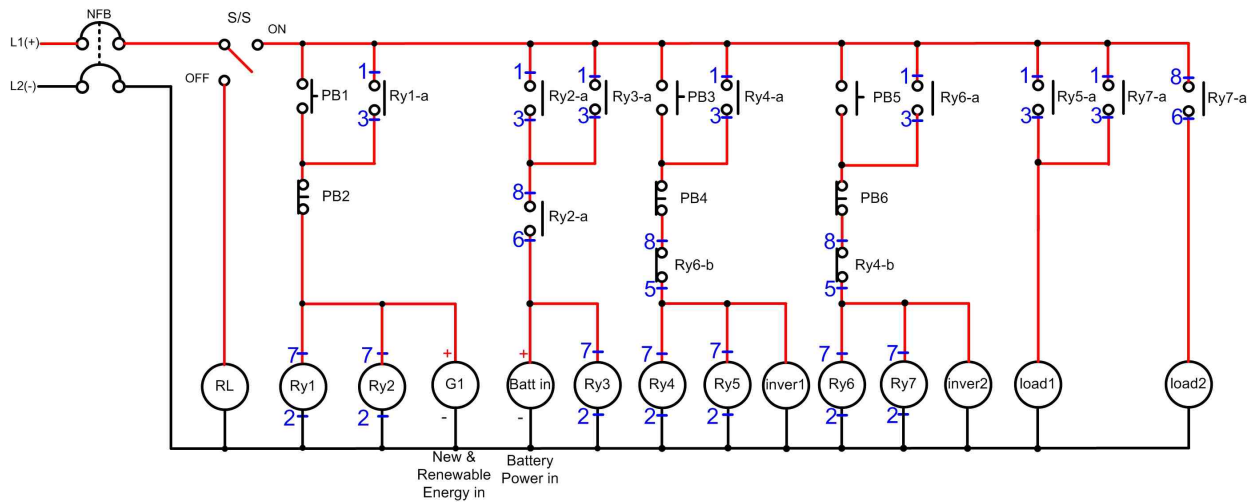
-It is the inverter that makes the sine wavelength and sends clean sine wavelength for wavelength of electricity supplied to house from grid (KOPEC).Electricity of this wavelength can be used in all ac electronic devices used in house, and independent solar generating system, measuring device, medical device, communication device, fluorescent light and computer should choose the sine wavelength inverter.

b. Modified Sine Wave Inverter



- It is similar to sine wavelength, but distortion fo wavelength, if it reaches to rated power, phenomenon that wavelength is distorted occur, so surge is caused, and noise and image noise will occur. Because it is modified wavelength, it may not be used in sensitive electronic devices, and products that this wavelength can be used are non-sensitive motor, light and electric heater.

2. Explanation

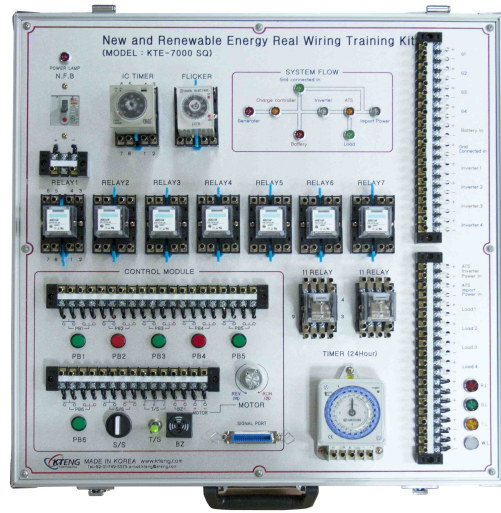


- (1) Turn on NFB breaker.
- (2) Turn off selector switch, and then red lamp will be on.
- (3) Turn on selector switch, and then red lamp will be off.
- (4) Push the pb1, and then relay one, relay two and g one mc will be excited, so it will be self-maintained due to relay one a contact point, and new renewable energy will be deployed, so it will be connected to charging controller throughout connecting panel. Relay three will be excited in same times, and it will be self-maintained, and batti in mc will be excited, so charging controller and battery will be connected.
- (5) Push PB3, and then relay four, relay five and inverter one mc will be excited, so battery and inverter one will apply an electric current, and in same times, because a contact point of relay 5 will be closed, load one also will be excited, so power is supplied from inverter one output to load one. At this time, even if pb5 is pushed, relay 6, relay 7, and inverter two mc will not be operated because b contact point of relay four is opened by creating interlock circuit.
- (6) Push PB4, and then relay four, relay 5 and inverter one mc will be demagnetized, so battery and inverter connection will be blocked, and because load one mc will be excited, power supply from inverter one output to load will be blocked.
- (7) Push PB5, and battery and inverter will apply an electric current for each other because relay six, relay seven and inverter two mc will be excited, and in same times, because a contact point of relay seven will be closed, load one and load two will be excited too, so power is supplied from inverter two output to load. At this time, even pb3 is pushed, interlock circuit is created, so because b contact point of relay six is opened, relay four and inverter one mc will not be operated.
- (8) Push PB6, and then relay six, relay seven and inverter two mc will be demagnetized, so battery and inverter connection will be blocked, and because load one and load two mc will be excited, power supply from inverter two output to load will be blocked.
- (9) Push PB2, and then relay one, relay two and g one mc will be demagnetized, so supply of new renewable energy will be blocked. Because a contact point of relay three is closed, batt in mc and relay three is in self-maintained state, and connections of charging controller and battery will be maintained. At this time, if push pb3 or pb5, power is supplied to load.
- (10) Turn off NFB breaker, and then batt in mc and relay three will be demagnetized, so connections of charging controller and battery will be also blocked.

New and Renewable Energy Real Wiring Training Kit



Hybrid Generation Experiment Equipment (KTE-CP520)



New & Renewable Energy Real Wiring Training Kit (KTE-7000SQ)

• Requirement

1. Prepare and check the test devices, tools and materials.
2. The use of stand-alone inverters can explain the purpose and effect.
3. Use the test devices, tools, and materials, create the circuit with thread wiring or banana jack.
4. Operation function of circuit can be explained.
 - (1) Explain the processes operated when pb1 is pushed.
 - (2) Explain the processes of inverter1.
 - (3) Explain the processes of inverter2.
5. Use the test devices, tools, and materials, conduct thread wiring and operate.

		Evaluation Item	Allot	Obtain	Remarks			
Valuation Basis	Item point (70)	Configuration Circuit and operation	20					
		Real wiring circuit configuration	20					
		Configuration state	10					
		Understanding and description for circuit	20					
	Work point (10)	Work attitude and safe	5					
		Usage and arrangement of tool	5					
Time point (20)	Subtract () point in every () minute excess				Item	Work	Time	Total

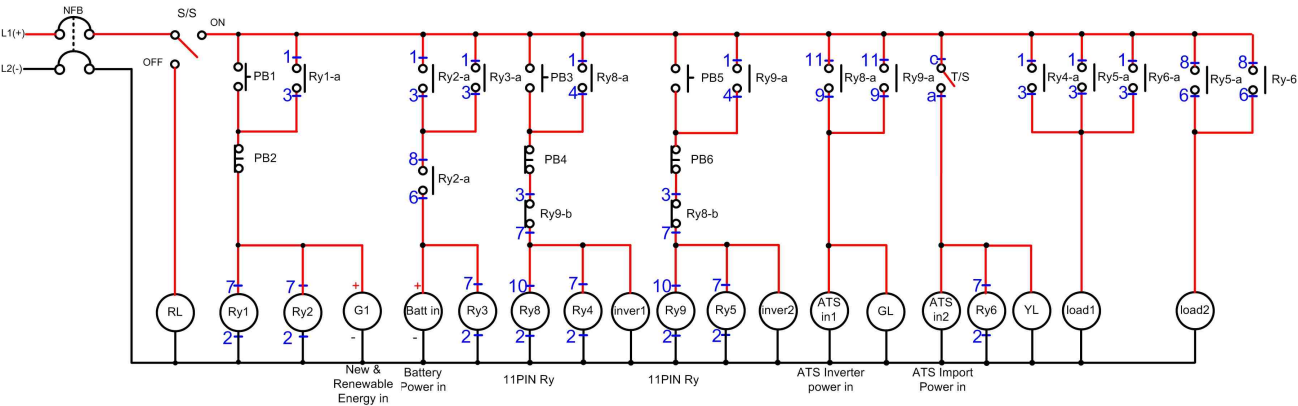
New and Renewable Energy Real Wiring Training Kit

Experiment name	15. Stand-alone inverter circuit configuration training 3	Required time
		8
The Object of Experiment	① Wiring can be conducted based on designed circuit diagram. ② Stand-alone inverter circuli can be understood and wiring can be conducted. ③ Selecting method and efficiency relationship of inverter depending on load power usage capacity can be understood and explained.	

Experiment Equipment	Tool and Material	Spec of Tools	Q`nty
• Hybrid Generation Experiment Equipment (KTE-CP520) • New & Renewable Energy Real Wiring Training Kit (KTE-7000SQ) • New & Renewable Energy PLC Training Kit (KTE-7000PL)	• Screw driver set • Nipper • Wire Stripper • Hook Meter	• #2× 6× 175mm • 150mm • 0.5~6mm ² • 300A 600V	1 1 1 group1

Control Circuit

1. Control Circuit



- | | |
|---|---|
| L1, L2 : Line Voltage
N.F.B : No fuse circuit breaker
inver1 : inverter1
inver2 : inverter2
RL, GL, YL : DC Lamp
ATS in1 : ATS inverter power in
ATS in2 : ATS import power in
T/S : Toggle Switch | Ry : 8pin, 11pin Relay
PB1,3,5 : A contact pushbutton switch
PB2,4,6 : B contact pushbutton switch
Bat in : Battery input signal
load1,2 : Load power output signal
S/S :Selector switch
G1 : New&Renewable energy input line |
|---|---|

2. Charging controller



Main function of charging controller is to use maximum capacity of battery through normal charging of battery and extent the battery life, so it is applied to both solar and wind power generator. Function of charging controller is to prevent the reverse direction flow of current and overcharge. Some of them have functions that block the overload and over-discharge or display function that shows charging status and flow of power.

(1) Reverse direction flow prevention function

- If day becomes sunshine less, current may flow reverse from battery to solar panel. At this time, by using blocking diode that connects bipolar elements in series or using mosfet element that has less power loss, it can make that current flows only from solar panel to battery.

(2) Overcharge prevention function:

- What will happen if voltage is supplied from solar panel continuously when battery is charged completely? At this time, as battery voltage will be increased excessively, water will be dissolved to oxygen and hydrogen, and gas will occur. From this process, loss of distillate water will be caused while gas is ignited, so it may cause explosive. As a result, battery will be deteriorated and life cycle will be shorten. To prevent overcharge, block the current if battery voltage reaches to certain level.

(3) Over-discharge prevention function.

- Connect the current again if voltage of battery drops to less than certain voltage. This is called as voltage regulating, and it is the basic function of all charging controller.

A. On.off method

- Some controllers repeat the block or connect current flows to battery completely to control the current flow. This is called as on/off control method.

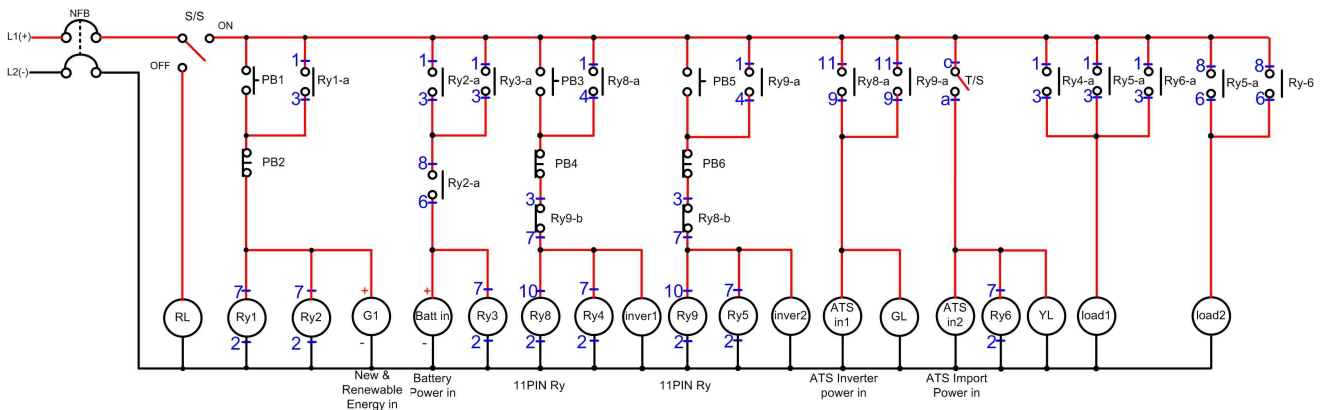
B. Pwn method

- If battery is charged completely, it will go to second step, in second step, voltage that is about to maintain the battery will be dropped. This is called as trickle charge. It only charges with amounts that water drop falls. Two steps charging control is meaningful in the environment that power usage is too much or too less, that is, charging/discharging is not stable.

C. Maximum power point tracking (MPPT) method

- It is also known as, maximum power point tracking. The most biggest difference with above method is that it matches the voltage of battery with voltage generated in panel to obtain maximum charging efficiency. This is similar principle that matches optimum ratio of engine rotating and wheel rotating numbers using gear transmission. Specially, it can obtain the maximum 30% of charging efficiency increasing effect in winter season than normal pwm method.

2. Explanation



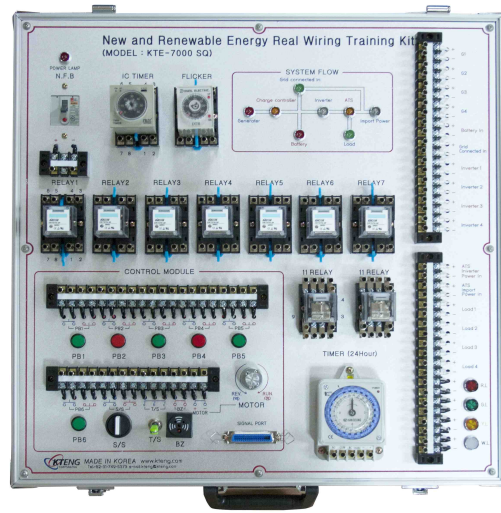
- (1) Turn on NFB breaker.
- (2) Turn off the selector switch, and then red lamp will be on.
- (3) Turn on selector switch, and then red lamp will be off.
- (4) Push the pb1, and then relay one, relay two and g one mc will be excited, so it will be self-maintained due to relay one a contact point, and new renewable energy will be deployed, so it will be connected to charging controller throughout connecting panel. Relay three will be excited in same times, and it will be self-maintained, and batti in mc will be excited, so charging controller and battery will be connected.
- (5) Push pb3, and then relay four, relay eight and inverter one mc will be excited, so battery and inverter one will apply an electric current, and in same times, because a contact point of relay four will be closed, load one also will be excited, so power is supplied from inverter one output to load one. At this time, even if pb5 is pushed, relay 5, relay 9, and inverter two mc will not be operated because b contact point of relay 8 is opened by creating interlock circuit.
- (6) Push pb4, and then relay four, relay 8 and inverter one mc will be demagnetized, so battery and inverter connection will be blocked, and because load one mc will be excited, power supply from inverter one output to load will be blocked.
- (7) Push pb5, and battery and inverter will apply an electric current for each other because relay nine, relay 5 and inverter two mc will be excited, and in same times, because a contact point of relay 5 will be closed, load one and load two will be excited too, so power is supplied from inverter two output to load. At this time, even pb3 is pushed, interlock circuit is created, so because b contact point of relay nine is opened, relay four and inverter one mc will not operated.
- (8) If turn on the toggle switch, and then ats in two mc and relay six will be excited, and then yellow lamp will be on. At this time, commercial power is transmitted to ats master section.
- (9) If commercial power is transmitted to ats master section, power supply of load and load two will be changed from inverter output power to commercial power after 30 seconds. This process is automatic.

- (10) If turn off the toggle switch, and then ats in two mc and relay six will be excited, and then yellow lamp will be off. At this time, connections between commercial power and ats will be blocked, and power supply of load one and load two will be changed to inverter output power. This process is automatic.
- (11) Push pb6, and then relay six, relay nine, relay f and inverter two mc will be demagnetized, so battery and inverter connection will be blocked, and because load one and load two mc will be excited, power supply from inverter two output to load will be blocked.
- (12) Push pb2, and then relay one, relay two and g one mc will be demagnetized, so supply of new renewable energy will be blocked. Because a contact point of relay three is closed, batt in mc and relay three is in self-maintained state, and connections of charging controller and battery will be maintained. At this time, if push pb3 or pb5, power is supplied to load.
- (13) Turn off NFB breaker, and then batt in mc and relay three will be demagnetized, so connections of charging controller and battery will be also blocked.

New and Renewable Energy Real Wiring Training Kit



Hybrid Generation Experiment Equipment (KTE-CP520)



New & Renewable Energy Real Wiring Training Kit (KTE-7000SQ)

• Requirement

1. Prepare and check the test devices, tools and materials.
2. The use of stand-alone inverters can explain the purpose and effect.
3. Use the test devices, tools, and materials, create the circuit with thread wiring or banana jack.
4. Operation function of circuit can be explained.
 - (1) Explain the processes operated when pb1 is pushed.
 - (2) Explain the processes of inverter1.
 - (3) Explain the processes of inverter2.
 - (4) It explains the processes of operation when turn on t/s tp supply the commercial power.
5. Use the test devices, tools, and materials, conduct thread wiring and operate.

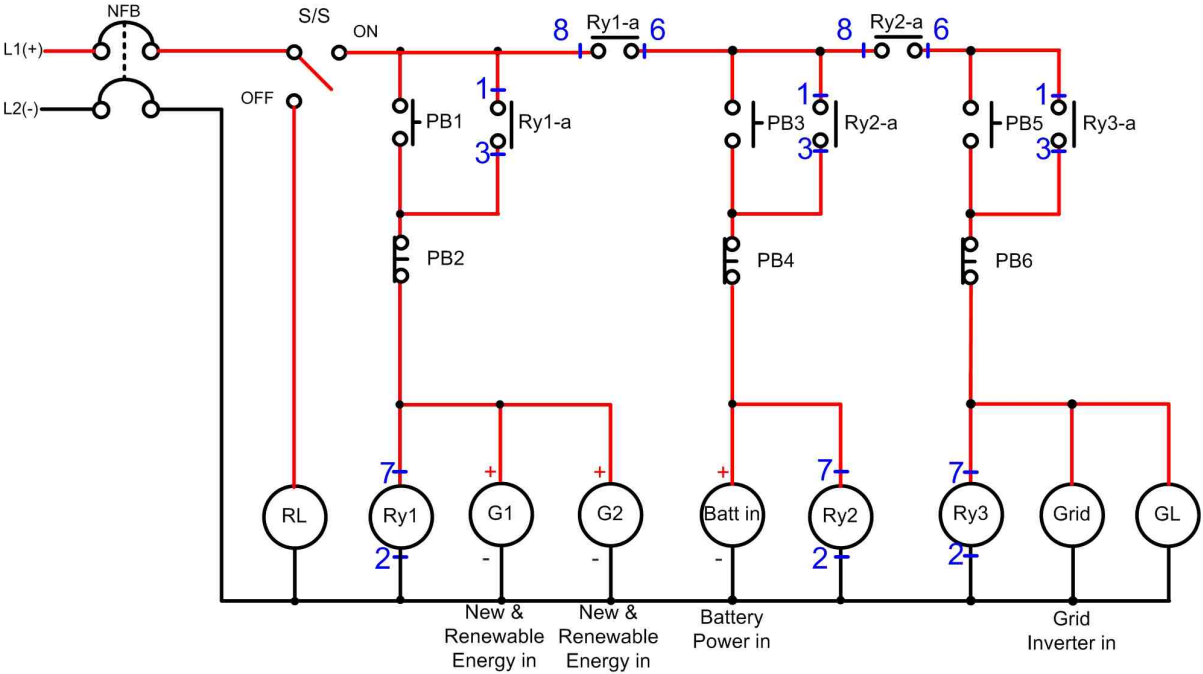
		Evaluation Item	Allot	Obtain	Remarks			
Valuation Basis	Item point (70)	Configuration Circuit and operation	20					
		Real wiring circuit configuration	20					
		Configuration state	10					
		Understanding and description for circuit	20					
	Work point (10)	Work attitude and safe	5					
		Usage and arrangement of tool	5					
Time point (20)	Subtract () point in every () minute excess				Item	Work	Time	Total

New and Renewable Energy Real Wiring Training Kit

Experiment name	16. Hybrid systems and Grid connected inverter circuit configuration 1	Required time	
		8	
The Object of Experiment	① Wiring can be conducted based on designed circuit diagram. ② Hybrid system can be understood and wiring can be conducted. ③ Grid-connected inverter system can be understood, and wiring can be conducted.		
Experiment Equipment	Tool and Material	Spec of Tools	Q`nty
• Hybrid Generation Experiment Equipment (KTE-CP520) • New & Renewable Energy Real Wiring Training Kit (KTE-7000SQ) • New & Renewable Energy PLC Training Kit (KTE-7000PL)	• Screw driver set • Nipper • Wire Stripper • Hook Meter	• #2× 6× 175mm • 150mm • 0.5~6mm ² • 300A 600V	1 1 1 group1

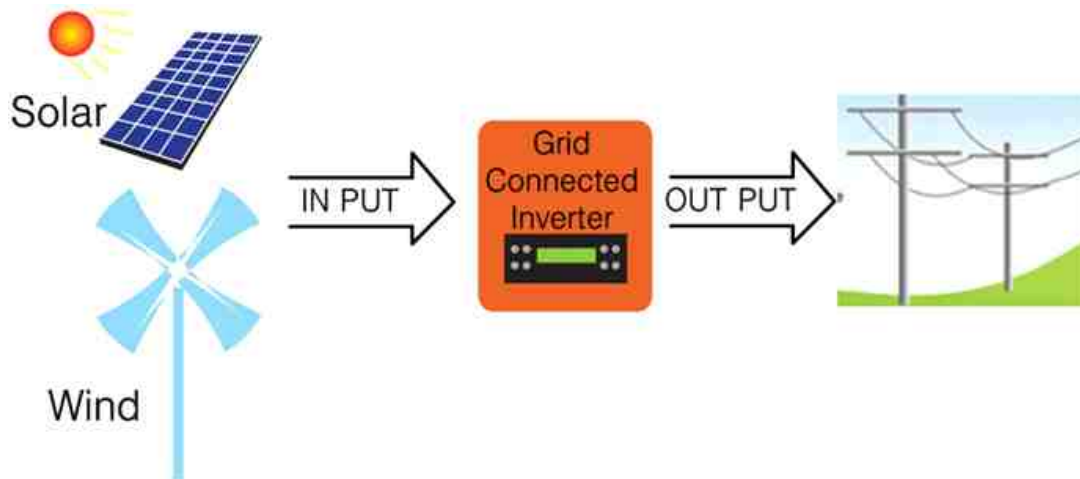
Control Circuit

1. Control Circuit



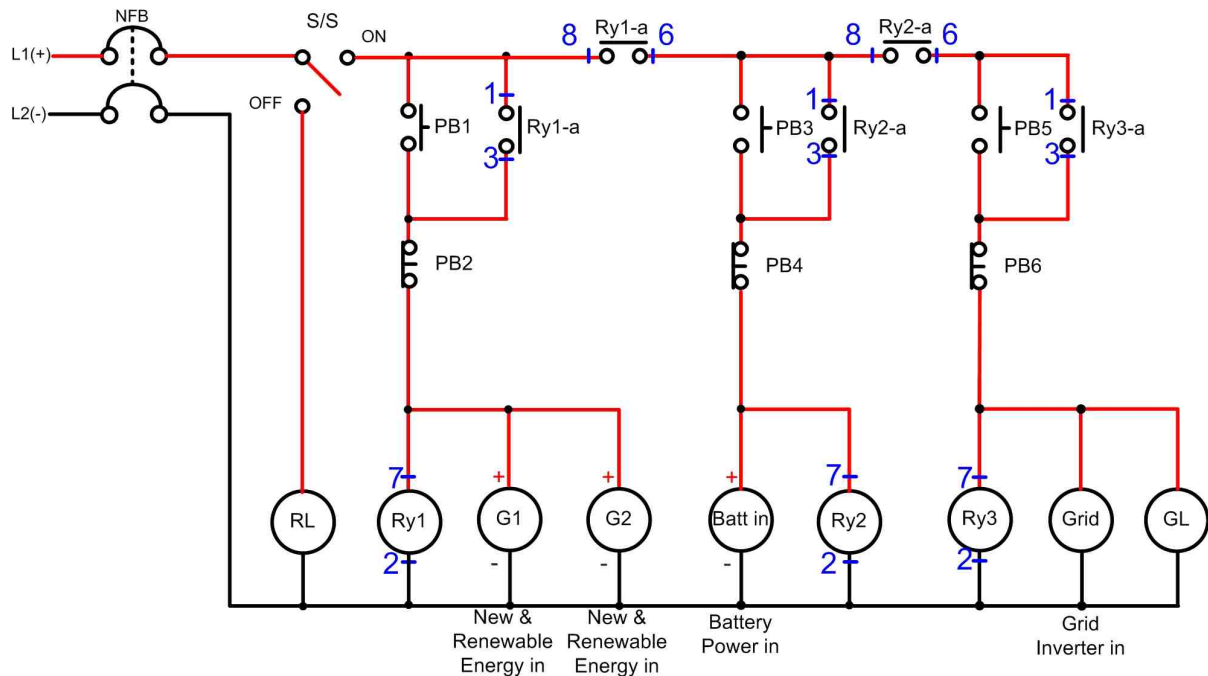
- | | |
|--|-------------------------------------|
| L1, L2 : Line Voltage | Ry : 8pin Relay |
| N.F.B : No fuse circuit breaker | PB1,3 : A contact pushbutton switch |
| G1, G2 : New&Renewable energy input line | PB2,4 : B contact pushbutton switch |
| Grid : Grid connected inverter | Bat in : Battery input signal |
| RL, GL : DC Lamp | S/S : Selector switch |

2. Grid connected inverter system



- (1) What is grid-connected inverter system? Grid-connected inverter system supplies the remaining power from power supply of load, by connecting with commercial power system.
- (2) Hardware configuration of grid-connected inverter consists of input section made to be supplied the dc safely from solar battery, power convert section that converts dc to ac, transformer that transforms the sizes of electric heating and voltage, main control panel to control each part, sensor and relay board that detects various signals and generates the contact point output for protection motion, auxiliary power to supply the dc power needed for system and display and keypad that displays various indicators and is for setup/control.
- (3) Unlike independent, grid-connected inverter system does not use the battery, and because it is the system that supplies the power remained from load directly to grid and equipped with grid-connected inverter, it can save the battery cost, so maintenance cost will be cheaper.

3. Explanation

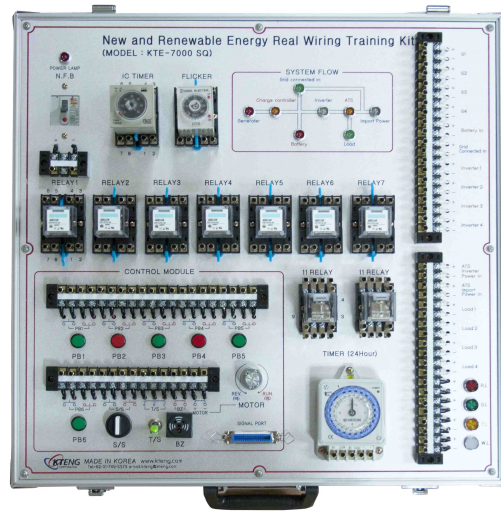


- (1) Turn on NFB breaker
- (2) Turn off selector switch, and then red lamp will be on.
- (3) Turn on selector switch, and then red lamp will be off.
- (4) Push the pb1, and then relay one, g one mc and g two mc will be excited, so it will be self-maintained due to relay one a contact point, and new renewable energy will be deployed, so it will be connected to charging controller throughout connecting panel.
- (5) Push the pb3, and then relay two will be excited, so it will be self-maintained, and charging controller and battery will be connected.
- (6) Push the pb5, and then relay three will be excited, so it will be self-maintained, and green lamp will be on, so grid mc will be excited, and battery and grid-connected inverter will be connected, so power generated to commercial power is reverse supplied.
- (7) Push pb4, and then relay two and batt in mc will be demagnetized, so source controller and battery connections will be blocked.
- (8) Push pb2, and then relay one, g one mc, and g two mc will be demagnetized, so supply of new&renewable energy will be blocked.
- (9) Trun off the NFB breaker.

New and Renewable Energy Real Wiring Training Kit



Hybrid Generation Experiment Equipment (KTE-CP520)



New & Renewable Energy Real Wiring Training Kit (KTE-7000SQ)

• Requirement

1. Prepare and check the test devices, tools and materials.
2. Using purpose and effects of grid-connected inverter can be explained.
3. Use the test devices, tools, and materials, create the circuit with thread wiring or banana jack.
4. Operation function of circuit can be explained.
 - (1) Explain the processes operated when pb1 is pushed.
 - (2) Explain the processes operated when pb3 is pushed.
5. Understand and can explain the hybrid system.
6. Use the test devices, tools, and materials, conduct thread wiring and operate.

		Evaluation Item	Allot	Obtain	Remarks			
		Valuation Basis	Item point (70)	Configuration Circuit and operation	20			
Real wiring circuit configuration	20							
Configuration state	10							
Understanding and description for circuit	20							
Work point (10)	Work attitude and safe		5					
	Usage and arrangement of tool		5					
Time point (20)	Subtract () point in every () minute excess				Item	Work	Time	Total

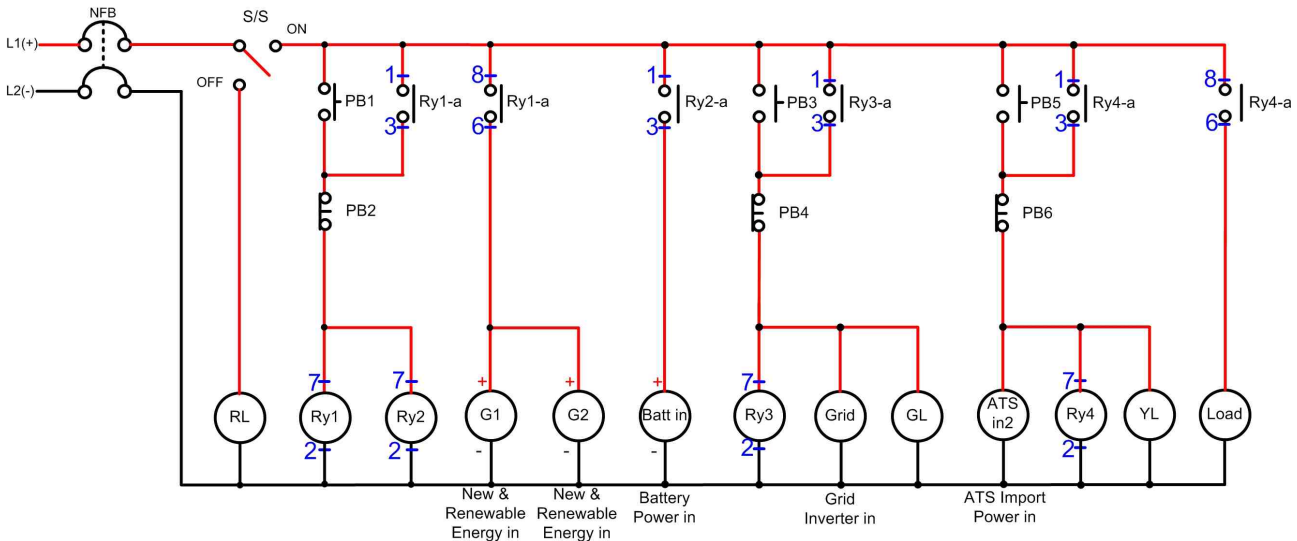
New and Renewable Energy Real Wiring Training Kit

Experiment name	17. Hybrid systems and Grid connected inverter circuit configuration 2	Required time
		8
The Object of Experiment	① Wiring can be conducted based on designed circuit diagram. ② Hybrid system can be understood and wiring can be conducted. ③ Grid-connected inverter system can be understood, and wiring can be conducted.	

Experiment Equipment	Tool and Material	Spec of Tools	Q`nty
• Hybrid Generation Experiment Equipment (KTE-CP520) • New & Renewable Energy Real Wiring Training Kit (KTE-7000SQ) • New & Renewable Energy PLC Training Kit (KTE-7000PL)	• Screw driver set • Nipper • Wire Stripper • Hook Meter	• #2× 6× 175mm • 150mm • 0.5~6mm ² • 300A 600V	1 1 1 group1

Control Circuit

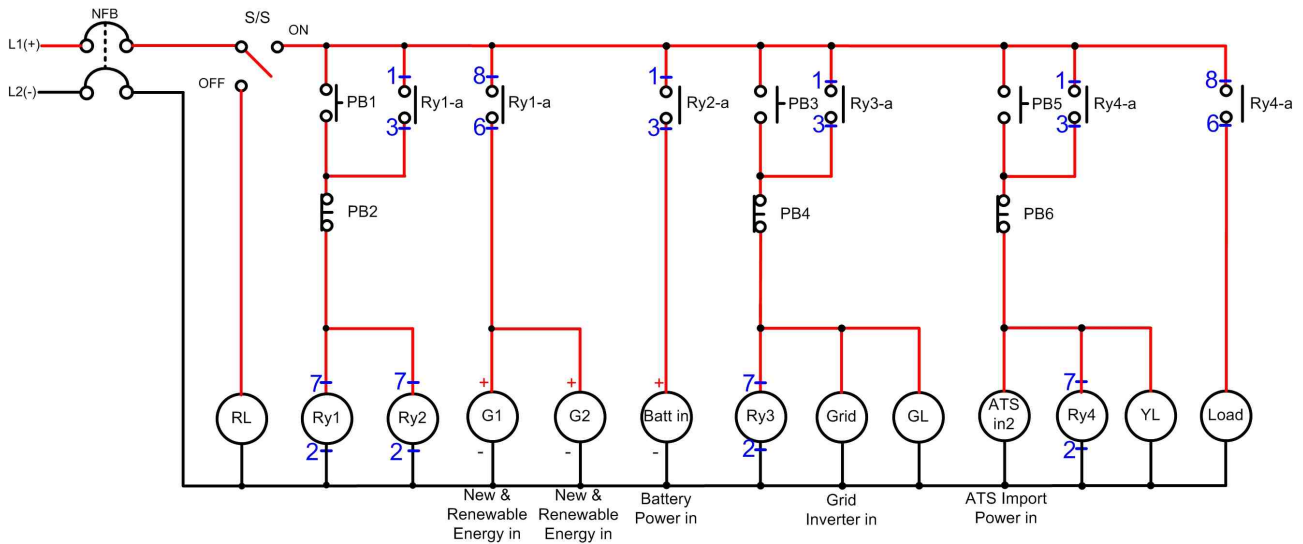
1. Control Circuit



L1, L2 : Line Voltage
 N.F.B : No fuse circuit breaker
 G1, G2 : New&Renewable energy input line
 Grid : Grid connected inverter
 RL, GL, YL : DC Lamp
 ATS in2 : ATS import power in

Ry : 8pin Relay
 PB1,3,5 : A contact pushbutton switch
 PB2,4,6 : B contact pushbutton switch
 Bat in : Battery input signal
 load : Load power output signal
 S/S : Selector switch

2. Explanation

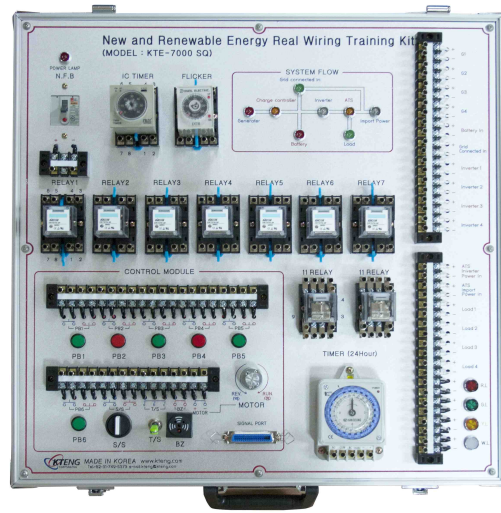


- (1) Turn on NFB breaker
- (2) Turn off selector switch, and then red lamp will be on.
- (3) Turn on selector switch, and then red lamp will be off.
- (4) Push the pb1, and then relay one, relay two and g one mc will be excited, and G1 and G2 mc will be excited. So, new renewable energy is supplied, so it will be connected to charging controller throughout connecting panel.
- (5) Push pb3, and then because relay 3 and grid mc is excited, battery and grid-connected inverter is connected, so power generated to commercial power is reverse supplied. In same time, green lamp will be on.
- (6) Push the pb5, ats in two mc and relay four will be excited, and yellow lamp will be on, and at this time, commercial power is supplied to ats master section. Because a contact point of relay 4 is closed in same time, load mc will be also excited, so ats commercial power output is connected to load.
- (7) Push the pb6, and then ats in two mc and relay 4 will be demagnetized, so power supply to load will be blocked, and yellow lamp will be also off.
- (8) Push pb4, and then relay three and grid mc will be demagnetized, so connections of battery and grid-connected inverter will be blocked, and green lamp will be also off.
- (9) Push the pb2, and then relay one, relay two, g1 mc, g2 mc and batt in mc will be demagnetized, so connections of battery and grid-connected inverter will be blocked, and also supply of new renewable energy will be blocked.
- (10) Turn off the NFB breaker.

New and Renewable Energy Real Wiring Training Kit



Hybrid Generation Experiment Equipment (KTE-CP520)



New & Renewable Energy Real Wiring Training Kit (KTE-7000SQ)

• Requirement

1. Prepare and check the test devices, tools and materials.
2. Grid-connected inverter system can be understood.
3. Use the test devices, tools, and materials, create the circuit with thread wiring or banana jack.
4. Operation function of circuit can be explained.
 - (1) Explain the processes operated when pb1 is pushed.
 - (2) Explain the processes operated when pb3 is pushed.
 - (3) Explain the processes operated when pb5 is pushed.
5. Hybrid system can be understood.
6. Use the test devices, tools, and materials, conduct thread wiring and operate.

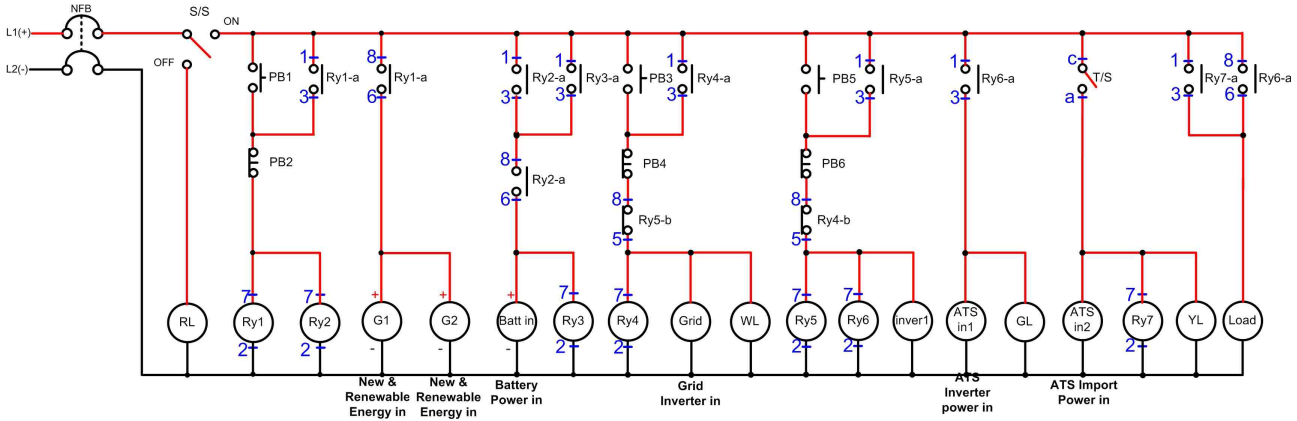
		Evaluation Item	Allot	Obtain	Remarks			
Valuation Basis	Item point (70)	Configuration Circuit and operation	20					
		Real wiring circuit configuration	20					
		Configuration state	10					
		Understanding and description for circuit	20					
	Work point (10)	Work attitude and safe	5					
		Usage and arrangement of tool	5					
Time point (20)	Subtract () point in every () minute excess				Item	Work	Time	Total

New and Renewable Energy Real Wiring Training Kit

Experiment name	18. Stand-alone inverter & Grid connected inverter complex using the system configuration training	Required time
		8
The Object of Experiment	① Wiring can be conducted based on designed circuit diagram. ② Circuit of multi-use system and wiring can be conducted. ③ Reason of multi-use system configuration can be understood, and wiring can be conducted.	
Experiment Equipment	Tool and Material	Spec of Tools
• Hybrid Generation Experiment Equipment (KTE-CP520) • New & Renewable Energy Real Wiring Training Kit (KTE-7000SQ) • New & Renewable Energy PLC Training Kit (KTE-7000PL)	• Screw driver set • Nipper • Wire Stripper • Hook Meter	• #2× 6× 175mm • 150mm • 0.5~6mm ² • 300A 600V
		Q`nty 1 1 1 group1

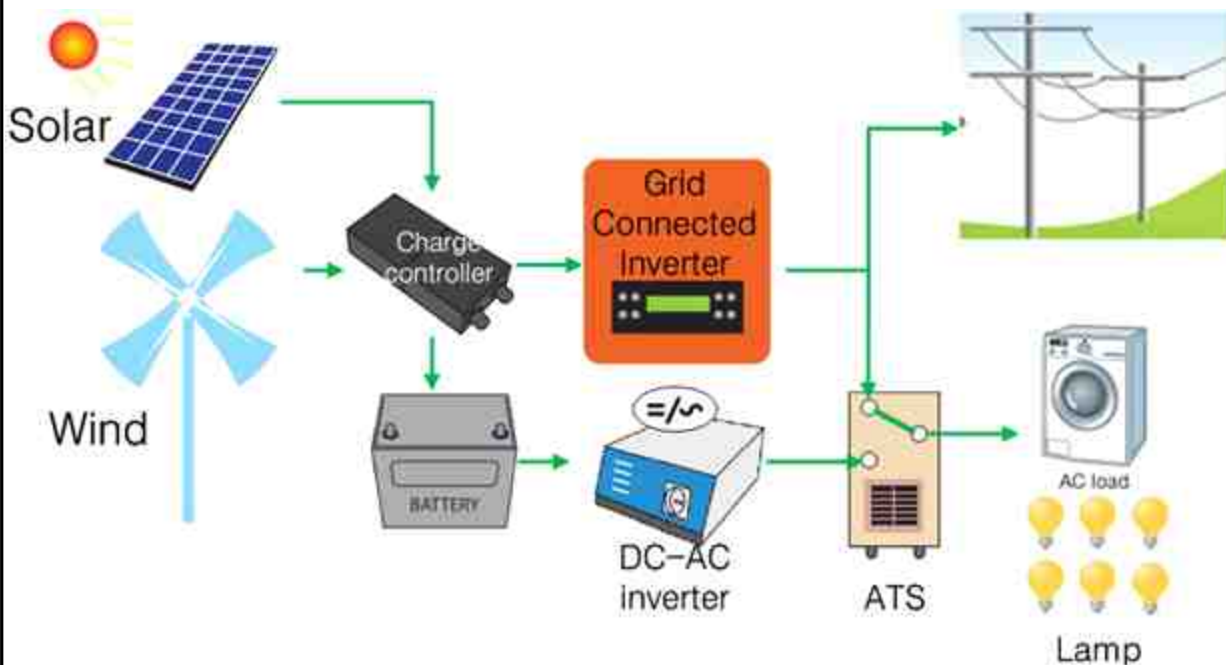
Control Circuit

1. Control Circuit



- | | |
|---|---|
| L1, L2 : Line Voltage
N.F.B : No fuse circuit breaker
G1, G2 : New&Renewable energy input line
Grid : Grid connected inverter
RL, GL, YL : DC Lamp
ATS in1 : ATS inverter power input
ATS in2 : ATS import power input
T/S : Toggle Switch | Ry : 8pin Relay
PB1,3,5 : A contact pushbutton switch
PB2,4,6 : B contact pushbutton switch
Bat in : Battery input signal
load : Load power output signal
S/S : Selector switch
inver1 :Stand-alone inverters |
|---|---|

2. Stand-alone inverter and grid-connected inverter multi-use system

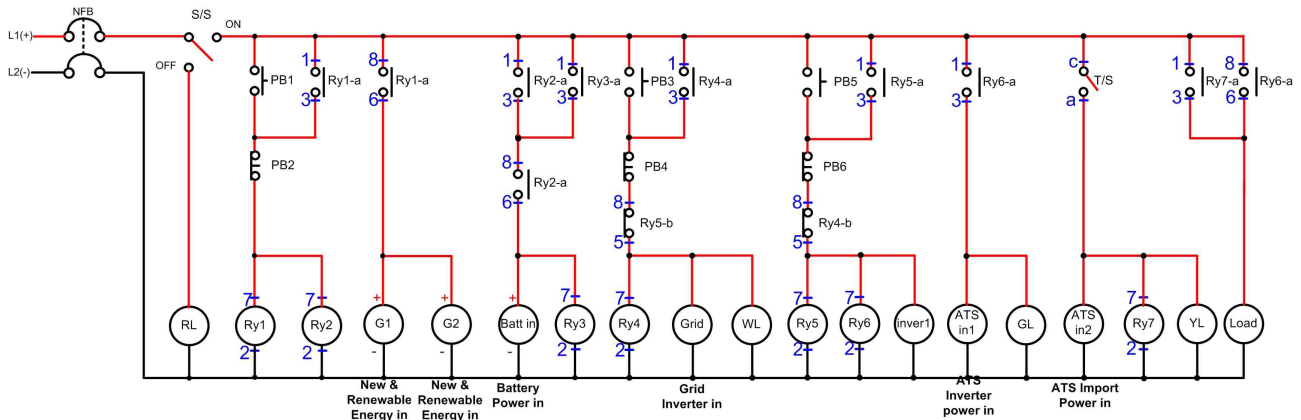


- (1) The system consists that create the Stand-alone inverter and grid-connected inverter multi-use system to charge using battery, and it is the system that supplies the power with uninterruptible state with automatic power switch by using independent inverter, power remained from load supply to grid using grid-connected inverter, and to protect important facilities, such as computer data or devices from unexpected blackout of commercial power.

3. Solar and wind power hybrid systems

- (1) It is the method that produces the power complementary; solar generating in shiny and no wind day, and wind power generating in cloudy and windy day, so it is most suitable generating system for Korea. Because of high device price, it is not widely distributed to normal houses. However, hybrid system that combination new renewable energy, such as solar, wind power, water power, hydrogen, solar heat and ground heat, can reduce the carbon dioxide emission that is major factor of earth abnormal temperatures due to limited resources; fuel or coal, etc, and as future substitute energy, a lot of researches are required.

4. Explanation



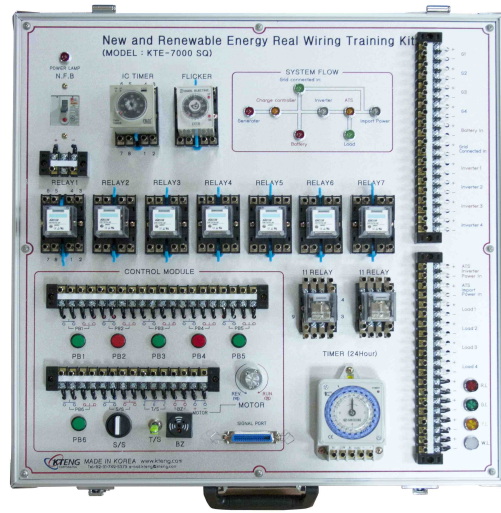
- (1) Turn on the NFB breaker.
- (2) Turn off the selector switch, and then red lamp will be on.
- (3) Turn on selector switch, and then red lamp will be off.
- (4) Push the pb1, and then relay one and relay two will be excited, so it will be self-maintained by relay one a contact point, and g1 and g2 mc will be excited. Thus, new renewable energy will be supplied, and it will be connected to charging controller throughout connecting panel. Also, because relay two a contact point is closed, batt in mc will be excited, so charging controller and battery will be connected.
- (5) Push pb3, and then because relay 4 and grid mc is excited, battery and grid-connected inverter is connected, so power generated to commercial power is reverse supplied. In same time, green lamp will be on.
- (6) At this time, even if push the pb5, it will not operate because b contact point of relay 4 is opened and interlock is acted.
- (7) Push the pb4, and then relay four and grid mc will be demagnetized, and white lamp will be off.
- (8) Push the pb5, and because relay 5, relay 6 and inverter one mc will be excited, battery and inverter one will apply the electric current for each other, and in same times, because relay 6 a contact point is closed, ats in one mc will be excited, so output voltage will be connected to ats slave terminal, and green lamp will be on. In same times, load mc will be also excited, so ac voltage generated from inverter is supplied to load throughout ATS.
- (9) At this time, even put the pb3, because b contact point of relay 5 is opened because of created interlock circuit, relay four and grid mc will not operate and white lamp will not be on.
- (10) Turn on the toggle switch, and then ats in two mc and relay seven will be excited, and yellow lamp will be on. At this time, commercial power is supplied to ats master section.

- (11) If commercial power is transmitted to its master section, power supply of load and load two will be changed from inverter output power to commercial power after 30 seconds. This process is automatic.
- (12) If turn off the toggle switch, and then its in two mc and relay six will be excited, and then yellow lamp will be off. At this time, connections between commercial power and its will be blocked, and power supply of load will be changed to inverter output power. This process is automatic.
- (13) Push pb6, and then relay 5, relay six, inverter one mc and its in one mc will be demagnetized, so battery and inverter connection will be blocked, and because load mc will be excited, power supply from inverter two output to load will be blocked.
- (14) Push pb2, and then relay one, relay two and g one mc will be demagnetized, so supply of new renewable energy will be blocked. Because a contact point of relay three is closed, batt in mc and relay three is in self-maintained state, and connections of charging controller and battery will be maintained. At this time, push either pb3 or pb5, grid-connected can be delayed or power can be supplied to load.
- (15) Turn off nfb breaker, and then batt in mc and relay three will be demagnetized, so connections of charging controller and battery will be also blocked.

New and Renewable Energy Real Wiring Training Kit



Hybrid Generation Experiment Equipment (KTE-CP520)



New & Renewable Energy Real Wiring Training Kit (KTE-7000SQ)

• Requirement

1. Prepare and check the test devices, tools and materials.
2. Multi-use system can be understood and explain.
3. Use the test devices, tools, and materials, create the circuit with thread wiring or banana jack.
4. Operation function of circuit can be explained.
 - (1) Explain the processes operated when pb1 is pushed.
 - (2) Explain the processes of grid connected inverter.
 - (3) Explain the processes of inverter2.
 - (4) It explains the processes of operation when turn on t/s tp supply the commercial power.
5. Use the test devices, tools, and materials, conduct thread wiring and operate.

		Evaluation Item	Allot	Obtain	Remarks			
Valuation Basis	Item point (70)	Configuration Circuit and operation	20					
		Real wiring circuit configuration	20					
		Configuration state	10					
		Understanding and description for circuit	20					
	Work point (10)	Work attitude and safe	5					
		Usage and arrangement of tool	5					
Time point (20)	Subtract () point in every () minute excess				Item	Work	Time	Total

New and Renewable Energy Real Wiring Training Kit

© Certificate of Patent



CERTIFICATE OF PATENT

PATENT NUMBER	10-0802437	APPLICATION NUMBER	2006-0131562
		FILING DATE	Dec. 21. 2006
		REGISTRATION DATE	Feb. 01. 2008

TITLE OF THE INVENTION Refrigeration Electronic Training Kit Using Programmable Logic Controller

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THIS IS TO CERTIFY THAT THE PATENT IS REGISTERED ON THE REGISTER OF THE KOREAN INTELLECTUAL PROPERTY OFFICE

Nov. 03. 2009

COMMISSIONER,
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CERTIFICATE OF DESIGN REGISTRATION

REGISTRATION NUMBER	30-04524765	APPLICATION NUMBER	2005-0037567
		FILING DATE	Nov. 08. 2005
		REGISTRATION DATE	Sept. 05. 2006
		TYPE OF REGISTRATION	EXAMINED REGISTRATION

ARTICLE THAT IS THE OBJECT OF THE DESIGN
Educational Air-conditioning/Refrigeration Schematic

OWNER OF THE DESIGN RIGHT
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CREATOR
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Sept. 05. 2006

COMMISSIONER,
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CERTIFICATE OF UTILITY MODEL REGISTRATION

REGISTRATION NUMBER	20-0447670	APPLICATION NUMBER	2009-0008945
		FILING DATE	Jul. 10. 2009
		REGISTRATION DATE	Feb. 03. 2010

TITLE OF THE DEVICE Educational Energy Collection Equipment

OWNER OF THE UTILITY MODEL RIGHT
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Feb. 03. 2010

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NO. C-2009-000406

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1. Work Title	Renewable Energy Automatic Control Work
2. Work Type	Literature
3. Register name	KTENG Co.,Ltd.
4. Corporate company registration No.	141111-0019270
5. Copyright owner	
6. Corporate company No.	
7. Creative date	Dec. 30. 2009
8. Announce date	
9. Reference	Owner : KTENG Co.,Ltd. Creative July. 14. 2008
10. Registration date	Dec. 30. 2009

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