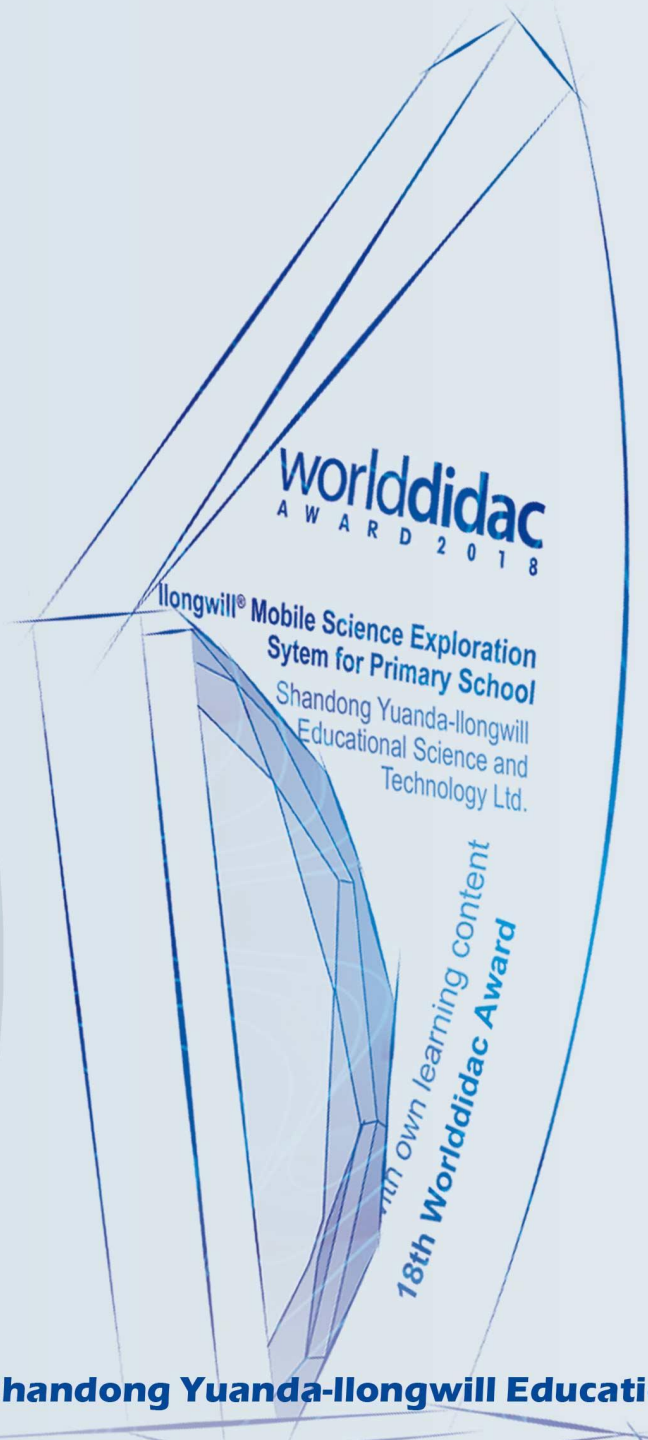
Yuanda Ilongwill

Winner of Worlddidac Award 2014 & 2018



2023 Catalogue

Shandong Yuanda-Ilongwill Educational Science and Technology Ltd.

NEW CONCEPTS, NEW PRODUCTS!

Ilongwill® SALinger Mobile Lab Investigation System

(Including Ilongwill® Mobile Science Experiment and Inquiry System

worlddidac AWARD 2018 Winner of the Worlddidac Award of 2018)

P3~P6

DDM "Sensor"+"Data Display Module"

WMT "Sensor"+"Wireless Transmitter Module"+"Mobile Terminal"

New Software

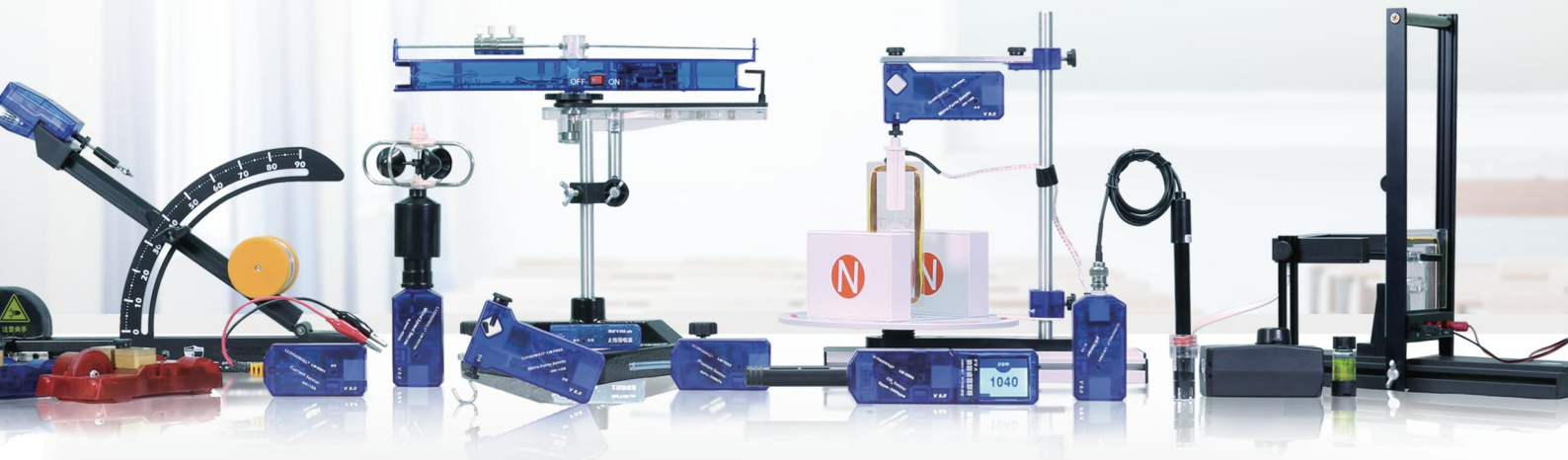
Support Windows/Mac OS/Android/iOS/Chrome OS Systems

Accessible to mobile/tablet/computer platforms

Meet the experimental teaching requirements of physics, chemistry, biology, geography and primary school science

Support the experimental teaching of all disciplines and grades.

Offline operation, online real-time results display, application of modern technology for efficient and intuitive experiment exploration



P104

Students Health Indicators Measurement System

Can measure 6 physiological indicators of human body at the same time, including body temperature, blood pressure, heart rate, respiratory rate, skin resistance and electrocardiogram.

P106

Magic Circuits

Each module can be drawn together by magnetic suction. With conductive tape, you can make circuit connections required by textbooks or create your own circuit.

P81

Ice-water Interconversion Apparatus

The physical phenomenon in the process of ice-water conversion can be observed directly, and the measured temperature data can be plotted automatically.

P86

Functional Inclined Plane Apparatus

Used with software, the measured angle and force data can be displayed in real time.

NEW Online Monitoring System for Water Quality of River and Lake

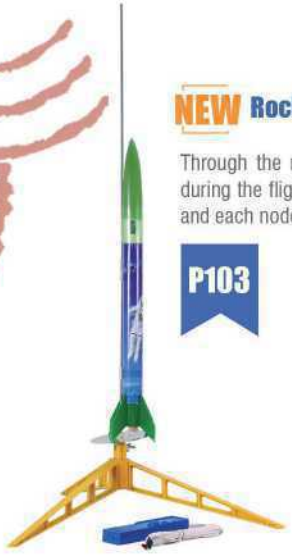
Supports mobile online monitoring of pH, dissolved oxygen, conductivity, ammonia nitrogen, turbidity, water temperature and GPS of waters.

P103

NEW Digital Weather Station

With the functions of unattended operation, real-time display, recording of meteorological and environmental information, automatic generation of meteorological database, analysis and comparison of multiple data and multiple measurement points.

P99



NEW Rocket Flight Recorder

Through the measurement system, 10 types of data during the flight can be recorded, and the flight record and each node data can be restored in a graphical form.

P103

NEW Marine Laboratory on USV

Can be used in all kinds of lakes, rivers, reservoirs, coastal areas and other field environments. It is a comprehensive system that integrates meteorological data, hydrological water quality, data monitoring and wireless transmission.

P102

NEW Sky Laboratory on UAV

Can collect meteorological data such as temperature, humidity and atmospheric pressure at different altitudes, record the location information of measuring points in real time through GPS, and complete the collection of water samples or soil samples in the designated area.

P101

NEW

P80

Block Circuit

Specially designed for the curriculum, simply using the magnetoelectric connection, the Block Circuit can be used to perform the electrical experiment of middle and high school.

NEW

P88

Sensor Automatic Control Circuit Module

Can be used to perform the experiments run by sensor control actuator

Ilongwill®Magic Board System

NEW

P96 ~97

NEW

P87

Earthquake Simulation Platform

Simulates the P-wave, S-wave and surface-wave that occur successively in earthquake.

NEW

P88

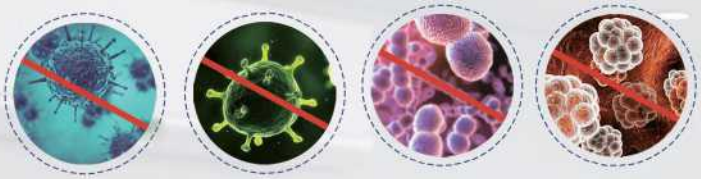
Telephone Apparatus

Can be used to perform the experiment of conversion of sound energy and electric energy.

Yuanda Ilongwill cleanbay ™

Clean our world, Change Our Life

NEW PRODUCT PREVIEW NEW



Yuanda Ilongwill cleanbay™ Campus Health Service System

Sterilization, Disinfection and Odor Control
Improve the Compus Health, Preventthe Cross Infection

P127~133

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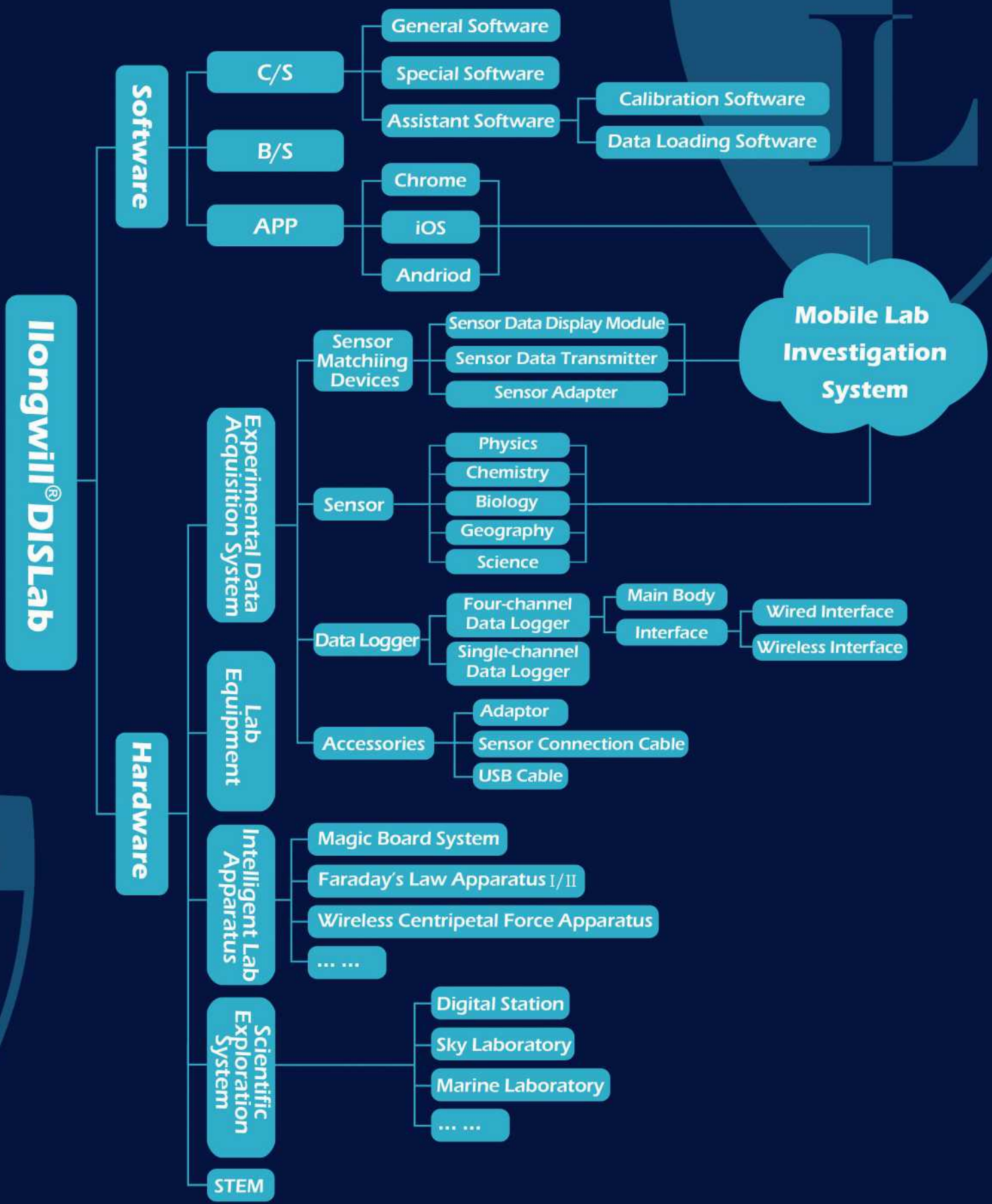
Yuanda-Ilongwill——Digital Teaching Instrument

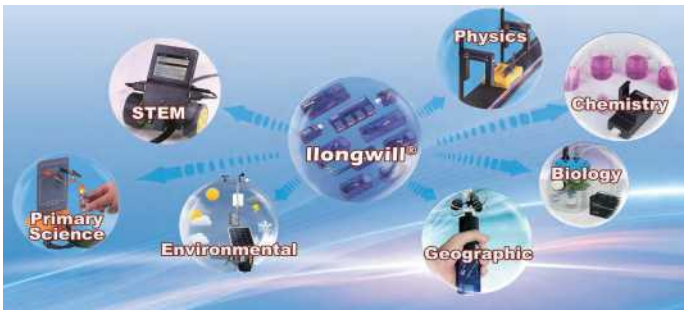
Digital Teaching International Leader



Promoting the Cognition

llongwill® Covers All Levels of Study and Supports Experiment Activities of All Subjects in School Teaching

With teaching and application practices in past over a decade, great progress in subject teaching field has been achieved by llongwill® Until now, llongwill® system consisting of software and hardware, has covered K-12 level curriculum, and supported experiment teaching in primary school science and physics, chemistry, biology, geography/earth science and STEM.



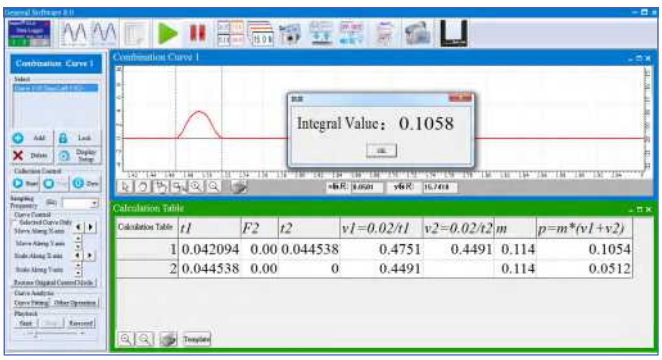
From invisible to visible, from impossible to possible

• Attentions to Micro Signals

Varieties of difficulties with micro currents measurement in experiments can be easily solved with llongwill® micro current sensor.

Examples: fruit battery, body current, conductivity in the pure water, glass items conductivity, power generated by geomagnetic etc.

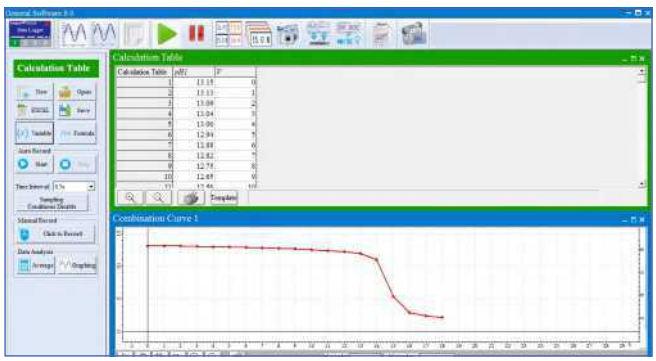
• Capturing Transient Signals



With high-speed collection capacity, llongwill® V8.0 can easily capture transient signals, firmly holding the key moment of experiment.

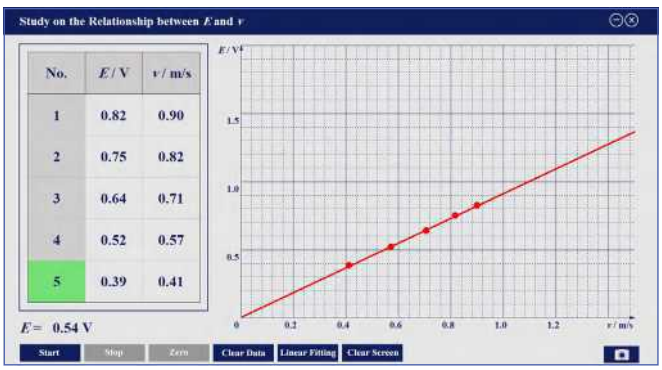
Examples: theorem of momentum, self induction phenomenon, LC vibration, Faraday's Law etc.

• Linking the Relationship between data and graph



Using llongwill® digital experiment apparatus can encourage students to link the relationship between data and graph more easily, and students can see real experiment pictures as well as hold experiment regulation, through the phenomenon.
Examples: study on centripetal force, comparison between kinetic energies, acid-base neutralization titration, photosynthesis etc.

• Fill gaps in experiment teaching

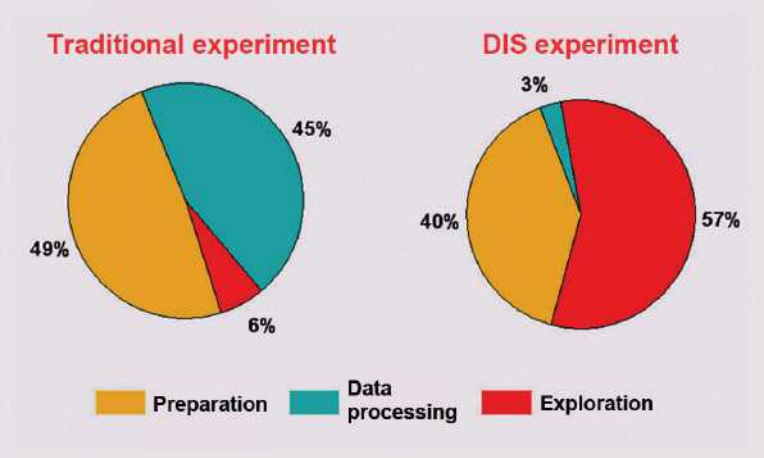


Help teachers and students overcome the difficulties in experiment operation, and help them make their dreams come true with the advantages of llongwill® products.

Examples: series experiments of Faraday's law, 2-D motion system, study on centripetal force, conduction of nervous impulse etc.

Improving Experiment Efficiency

llongwill® can effectively improve efficiency of experiment, and enhance students' abilities in analyzing and solving problems



llongwill® DISLab adopts advanced sensor and high speed digital circuit technology in the data collection, transmission and preprocessing of the measured data. Update the measured data to the computer or pad terminal.

After widely used, strictly verified, calculated and processed by optimized teaching software for many yeas, DISLab has a series of outstanding advantages, such as high speed, high data density, high accuracy, high visibility and so on, which are not available in the traditional experiments. It is significantly better than the traditional experiment on experimental efficiency improvement, experimental result optimization and teaching effect strengthen, which can training the students' ability of "independent learning and independent exploration in the information technology environment " Optimization and teaching effect are significantly better than the traditional experiment, are more conducive to the development of Students "in the information technology environment, independent learning and independent exploration ability".

Changing experiment modes by Intelligent Equipment

Constructing Standard Model, Developing Experiment Equipment, and Extending applications of Sensors

Up to now, more than 60 types of innovative new experiment apparatuses supporting to llongwill® digital laboratory

information system has been developed and another more than ten types of apparatus are going to be developed and launched soon. The application areas are mainly in physics, environmental science and primary science, also in chemistry and biology. supporting and covering all science lessons from primary school to junior & senior middle school.

Ilongwill® SALinger Mobile Lab Investigation System

MULTI-PLATFORM COMPATIBILITY

SUPPORT MULTI-SYSTEM AND CROSS-PLATFORM APPLICATION

llongwill® SALinger Mobile Lab Investigation System

NEW

worlddidac AWARD 2018

WON THE 18TH WORLDDIDAC INNOVATION AWARD FOR EQUIPMENT GROUP

llongwill® SALinger Mobile Lab Investigation System cooperates with sensors to collect and process experiment data, and upload the data to the cloud for storage

Components:

llongwill® SALinger system is composed of software, wireless transmitter B, sensor data display module with QR code and sensor adapter. With V8.0 sensors (compatible with V7.0 sensors), it can be used to perform experiments related to primary school science, middle school physics, chemistry and biology.

llongwill® SALinger mobile lab investigation system software includes two versions: primary school version and general version. The primary school version is suitable for primary school teaching scenes, while the general software is suitable for scientific activities and experimental inquiry in middle and high school.

General wireless transmitter and sensor code scanning identification

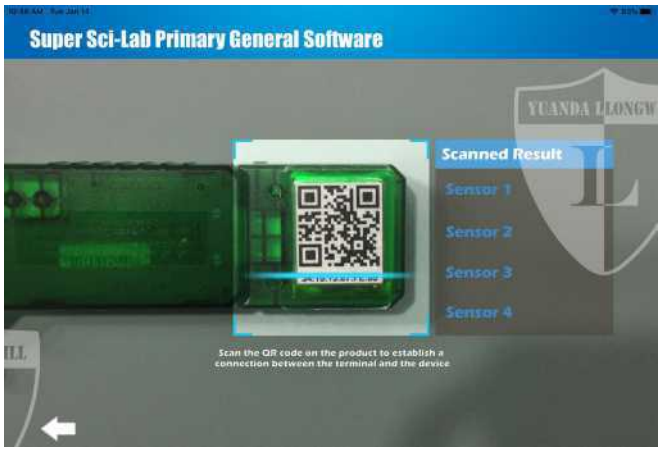
Hardware Applications:

•Wireless Transmitter B

Wireless transmitter B can be connected to a variety of V8.0 sensors, and connected to tablets and mobile phones through QR code scanning to realize wireless data transmission.

•Data display module

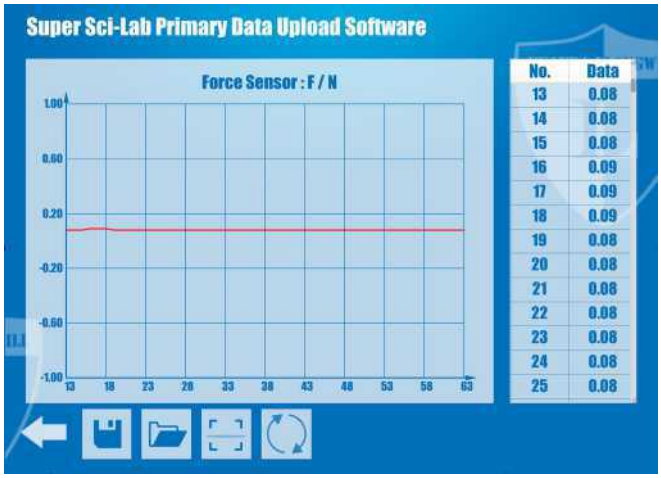
Through scanning the QR code on the back of the data display, it can be connected with the tablet and mobile phone, and can display the experimental data in real time.



Primary school wireless transmitter and sensor code scanning identification

Primary data display module and data upload by sensor code scanning

The data display module, cooperating with the sensor, can display the experimental data at the same time with the software by scanning the QR code, and cooperating with the primary software, it also can upload the data by scanning the code.

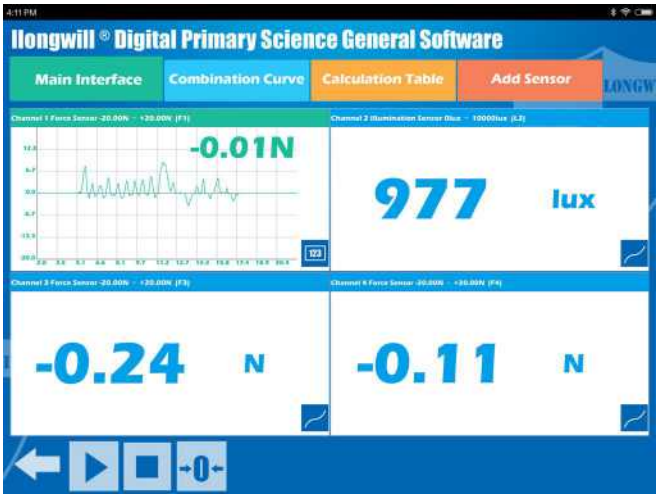


Interface of curve after data uploading for primary school version

Software -Primary School Edition:

●General module

The general software has a "one-to-many" function, which supports up to four sensors(same kind or different), and supports parallel data logging(figure below) to carry out data recording, calculating and graph analysis.

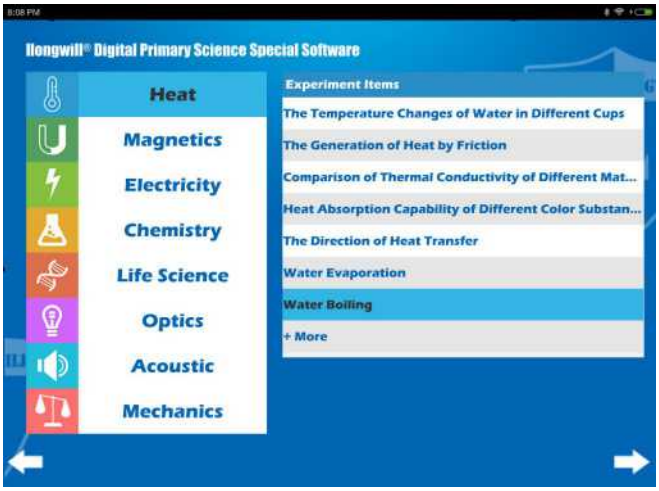


Four-channel simultaneous display interface of primary school general module

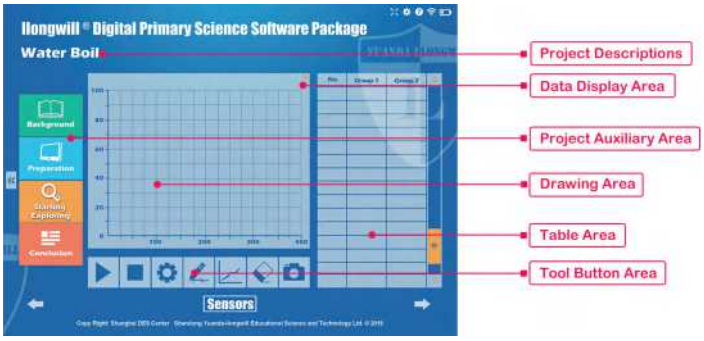
●Special module

The special module is a software package composed of multiple independent software interfaces. Each independent software interface corresponds to a scientific experiment or inquiry project. According to the experiment or inquiry requirements, the independent software presents the corresponding operation steps and sequence.

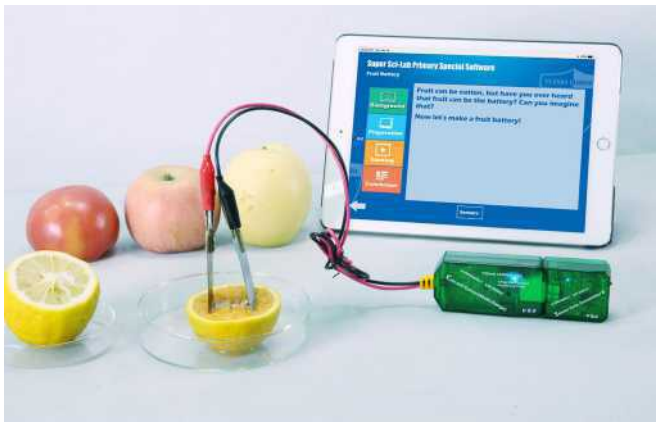
The main interface of special software consists of the project description area, data display area, project auxiliary area, drawing area, table area, and tool button area.



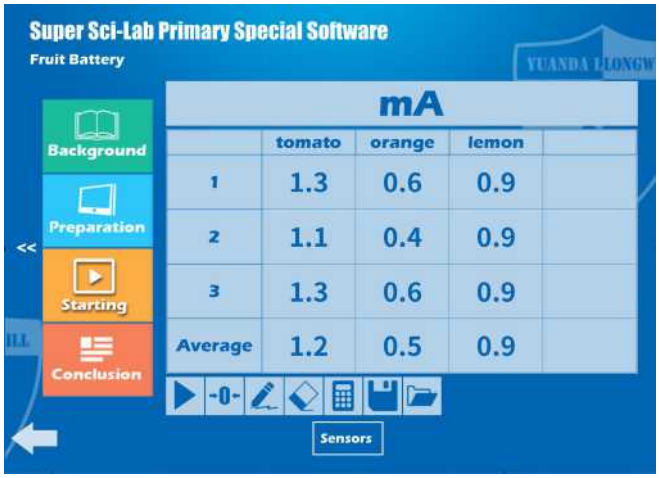
Main interface(above) and sub-interface(below) of Primary school special module



Typical Applications-primary school:



Fruit battery experiment(above) and experiment results(below)



Software -General Edition:

Compared with the primary version, the general version has no special software and data upload function; the general version is mainly composed of main interface, combination curve, calculation table and sensor addition, which can display, plot, record and process the data collected in the experiment in real time. Both the general version and the primary school version can support four different or the same kind sensors at the same time.

Typical Applications-general version:

Overweight and weightlessness experiment(above) and experiment results(below)

Gravity-mass relationship experiment (above) and experiment results(below)

Ilongwill®DISLab Experimental Data Acquisition System

OPEN A NEW ERA OF DIGITAL EXPERIMENTAL TEACHING!

Ilongwill®DISLab Experimental Data Acquisition System consists of data logger(P8), sensors(P11-P47), Sensor auxiliary equipment and accessories(P9), primary school science inquiry kit(P49-P52).

Data Logger

llongwill® Data Logger adopts modular design with a diamond appearance, which makes it easy to be compatible with multiple platforms. Besides connection to the computer, the data logger can also be connected to a Pad and other independent unit.

The Data Logger supports both wired and wireless communications .

Based on specific teaching request, the communication mode can be selected by changing the plugged interface (wired interface and wireless interface).

Data Logger

Design Patent Application No.:ZL201430174802.5

LW-D801

· Modular structure
· USB communication
· Hot-plug with interface
· 2 models for option, wired and wireless

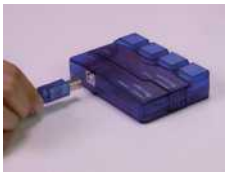
Wired Interface

LW-A801

· Modular structure
· Hot-plug with Data Logger
· 4 sensor ports
· Wired connection with sensors by cables

Wired communication

► Plug the Wired Interface into the Data Logger
► Connect the data logger to the computer by USB cable
► Open the software and connect the sensor to data logger by sensor cable



Data Logger + Wired Interface+ USB cable + Sensor cables

Wireless Interface

LW-A802

· Modular structure
· Hot-plug with Data Logger
· 4 sensor ports
· Wireless connection with sensors by Sensor Data Transmitter

Wireless communication

► Plug the Wireless interface into the Data Logger
► Connect the data logger to the computer by USB cable
► Plug it into the sensor and turn on the wireless transmitter

Single-channel Wired Data Logger

LW-D805

It can be connected to any kind of sensor, connected to the computer through MicroUSB cable, and compatible with computer software.

Single-channel Wireless Data Logger

LW-D806

Wirelessly connect a wireless transmitter module with sensors or intelligent equipment with wireless function.

Sensor Data Display Module

Utility Model Patent No.: ZL201420583663.6
Design Patent Application No.:ZL201430380651.9

LW-A804

· Independent unit for sensor data display Module
· Highlighted display screen
· Auto-identify the sensor
· Real-time data display
· Rechargeable Lithium battery
· Support data input into computer

Relative humidity sensor is connected to Sensor Data Display Module

Wireless Transmitter

LW-A803

· Used with wireless interface
· Hot-plug with sensor
· With built-in lithium battery

Wireless Transmitter B

LW-A816

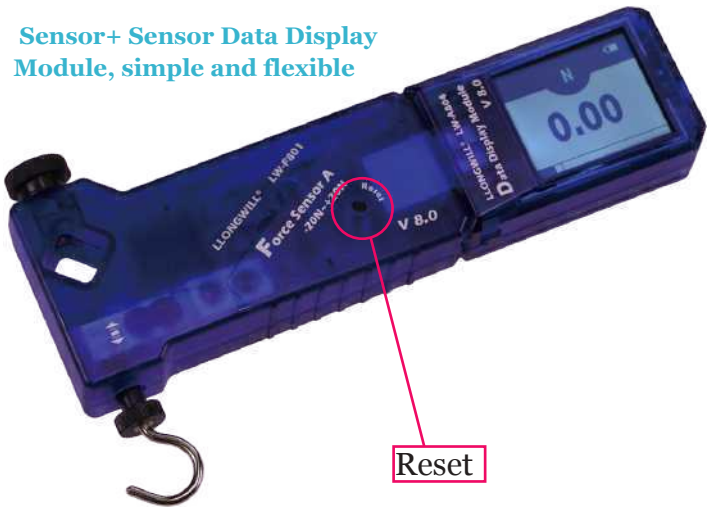
NEW

· Hot-plug with sensor
· With built-in lithium battery
· Establish the communication between the sensor and the mobile terminal by Bluetooth
·Through scanning the QR code, the wireless communication with Android/iOS platform software(P114-P128) can be built.

Data Storage

Sensor Data Display Module has data storage function with storage frequency of 4Hz, and the data inputting function that importing software can automatically recognize data recorded in the last sensor. All data displayed on this module can be stored in it and exported into computer by cable. By starting the Data Import software, and clicking “Download” and “Export”, the data stored in the Module can be exported into the computer.

Sensor+ Sensor Data Display Module, simple and flexible



Reset, Sensor Zero Setting

In order to eliminate drifting and guarantee measurement precision, most of llongwill® V8.0 sensors provide Zero Setting function. Operation method of zero setting: Long-press reset button for 3~5 seconds before use.

Sensor Adapter

LW-A810

· Used for some special kinds of V8.0 sensors which can be connected to sensor data display module/wireless transmitter module

Accessories

The accessories of llongwill® DISLab experimental data acquisition system include adaptor (A), sensor connection cable (B) and USB cable (C).

llongwill®DISLab Experimental Data Acquisition System

PHYSICS SENSORS

Force

LW-F801/LW-F802
Range: -20N~+20N/-50N~+50N
Resolution: 0.01N

· Hand shank design, easy grip
· Pull or press the sensor hook for force measurement
· Pull force shows positive reading
· Press force shows negative reading
Be careful to avoid over range
Be sure to relieve the stress after use

Force C

LW-F804
Range: -50N~+50N
Resolution: 0.01N

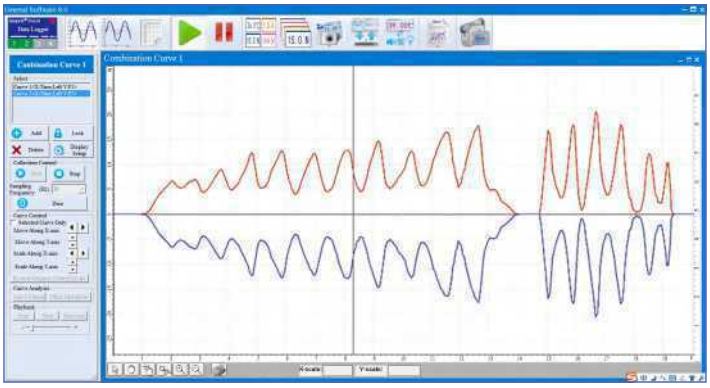
· Straight handle structure
· Pull force shows positive reading
· Press force shows negative reading
Be careful to avoid over range
Be sure to relieve the stress after use

Overweight and weightlessness experiment

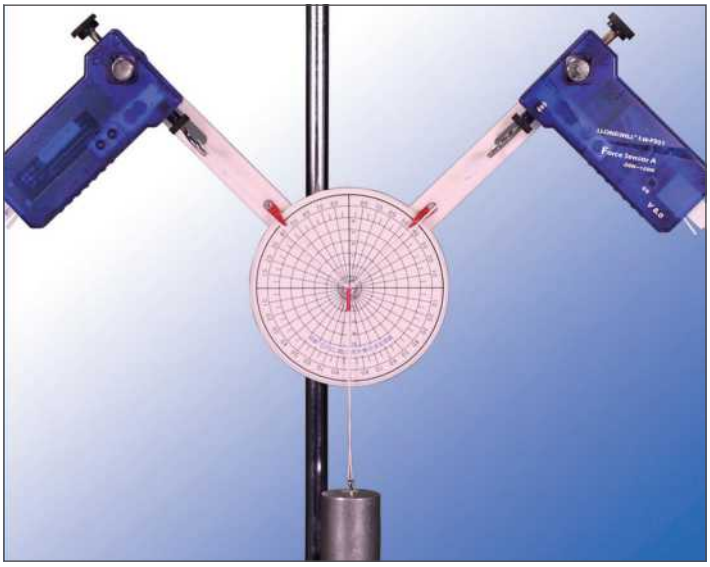
Typical Applications:

Study on friction (study of static friction and dynamic friction); equilibrium of two forces; Hooke's law; relationship between gravity and mass; resolution and composition of force; interaction of force; Newton's third law; overweight and Weightlessness; momentum theorem (variable force); Archimedes' Law, law of buoyancy, electric scales, study on centripetal force, measurement of Ampere force, study on fixed pulley and movable pulley, study on relation between oscillator displacement and spring stress during simple harmonic oscillation, and thermal expansion and contraction.

Newton's Third Law experiment



Experiment results of Newton's Third Law



Force composition experiment

Micro Force

LW-F803
Range: -2N~+2N
Resolution: 0.01N

· Unique micro range design
· Measure the pull and press force

Be careful to avoid over range
Be sure to relieve the stress after use

Typical Applications:

Electrical scales; Ampere force; compare of different airfoils.

Experimental Case of llongwill® Micro Force Sensor—Study on Ampere Force:

With micro force sensor and current sensor, Ampere Force Apparatus V2.0 can be used in the experiment of Ampere force measurement. During the experiment, one multi-turn coil is connected with micro force sensor, the other end of the coil is put into the magnetic field, and the current intensity will be tested with the current sensor. Such apparatus can change the current intensity, the length of wire in magnetic field and the angle between current and direction of magnetic field to measure Ampere force under different conditions respectively.

Ampere Force Apparatus V2.0 uses two common magnets instead of Nd magnets of V1.0, instead of one common force sensor.

Force & Angle

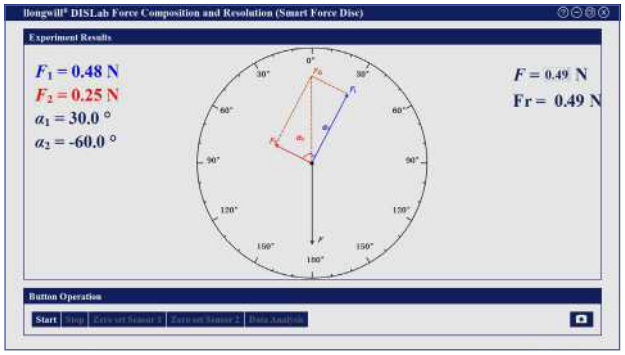
LW-F808
Range: -20N~+20N -180°~+180°
Resolution: 0.01N/0.1°

· Unique Design
· Built-in high-sensitivity angle sensor
· Convenient for the Smart Force Disc

Be careful to avoid over range
Be sure to relieve the stress after use

Typical Application:

Verify the Parallelogram Law of forces



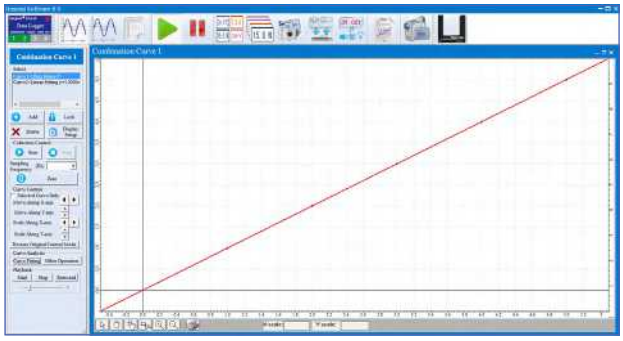
Experiment interface of force resolution using Smart Force Disc

Smart Force Disc with Force & Angle Sensors

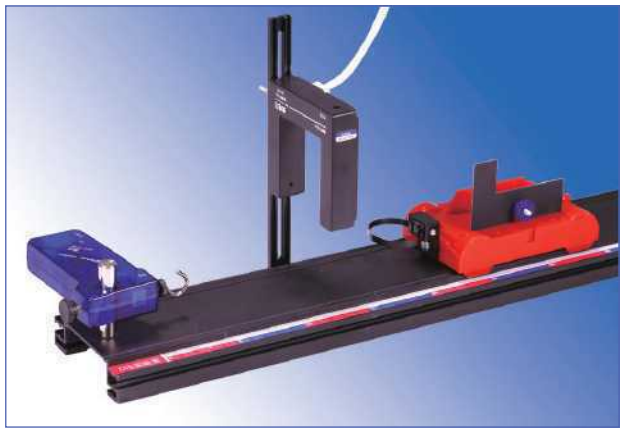
Photo Gate

LW-F851
Microsecond Precision

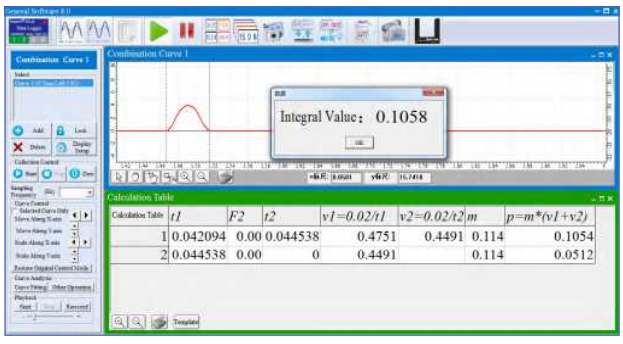
·The object's running time between any two photo gates can be measured.
· Support 4 types of time recording modes: I-type light blocking, U-type light blocking, Count, Pendulum.



Experiment results of the relation between acceleration and force by using two photo gates



Experiment of Momentum Theorem under variable force

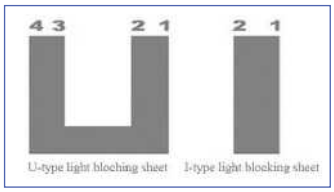


	t1	F2	t2	v1=0.02/t1	v2=0.02/t2	m	p=m*(v1+v2)
1	0.042094	0.00	0.044538	0.4751	0.4491	0.114	0.1054
2	0.044538	0.00	0	0.4491		0.114	0.0512

Experiment results of Momentum Theorem under variable force

Typical Applications:

Measurement of instantaneous velocity; equilibrium of two forces; kinetic energy of objects; study on Conservation Law of Mechanical Energy; Centripetal Force Study; Theorem of Momentum (variable force); Theorem of Momentum (constant force); relationship between induced electromotive force and magnetic flux change; measurement of average velocity; relationship between average velocity and instantaneous velocity; measurement of accelerated velocity; relationship between acceleration and tension; relationship between acceleration and mass; using Photo Gate Sensor to measure the acceleration of free falling body; work and energy; Law of Conservation of Momentum; observation of kinetic energy during collision; Law of Conservation of Mechanical Energy verification with inclined track method; measurement of simple pendulum's period; relationship between simple pendulum's period and length; measurement of gravity acceleration using simple pendulum, etc.



Software interface of Photo Gate setting

Setting of llongwill® Photo Gate:

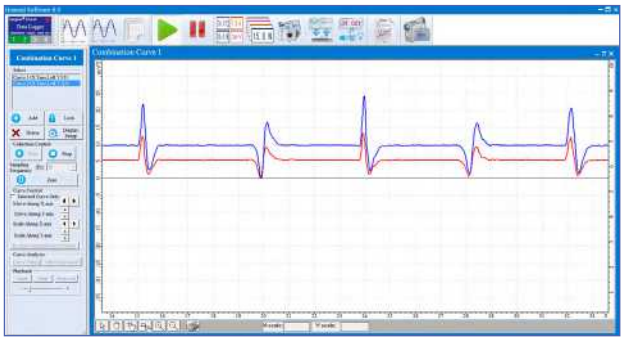
By virtue of simple optical circuits switching, photo gate can be used to measure light blocking time of moving objects and other fundamental quantities. It has been widely used in the experiment teaching in primary schools, junior and senior middle schools. Four usage modes have been developed, and it is necessary choose before the experiment, the key points in use of the sensor are as the following:

- Click "Photo gate setting" icon in the status bar; and photo gate setting window is open.
- Select the light blocking mode of the photo gate, 4 modes totally for option: "I" type, "U" type, "simple pendulum" and "timing":
- "I " type light blocking sheet is indicated with 1 and 2 from the right edge to the left; "U" type light blocking sheet is indicated with 1, 2, 3 and 4 from the right edge to the left edge. Assumed that the light blocking sheet is moving from left to right, start timing when edge 1 light blocking and stop timing until edge 2 light blocking. For "U" type light blocking sheet, start timing when edge 1 light blocking and stop timing until edge 3 light blocking.
- For "Simple pendulum" type, each period of simple pendulum movement will be recorded continuously.
- For "Counting" type, the accumulated light blocking times will be recorded during the whole experiment process.
- By using two photo gate sensors, the running time of light blocking sheet passing through them can be measured.

Acceleration

LW-F871
Range: -50m/s^2~+50m/s^2
Resolution: 0.01m/s^2

· The acceleration sensor measures three components of acceleration in 3 orthogonal axis
· The sensor can be used separately or fixed to a moving object.



The graph represents the forces exerted on the mass when it's weightless or overweight

Study over gravity and zero gravity

Zero Setting Function:

· In the software, the data in 3-axis displayed in the sensor window simultaneously.
· Click the button to select the data in X-axis direction, and make the sensor placed horizontally in X-axis direction, then click the zero button. Repeat the steps in Y-axis and Z-axis directions accordingly.

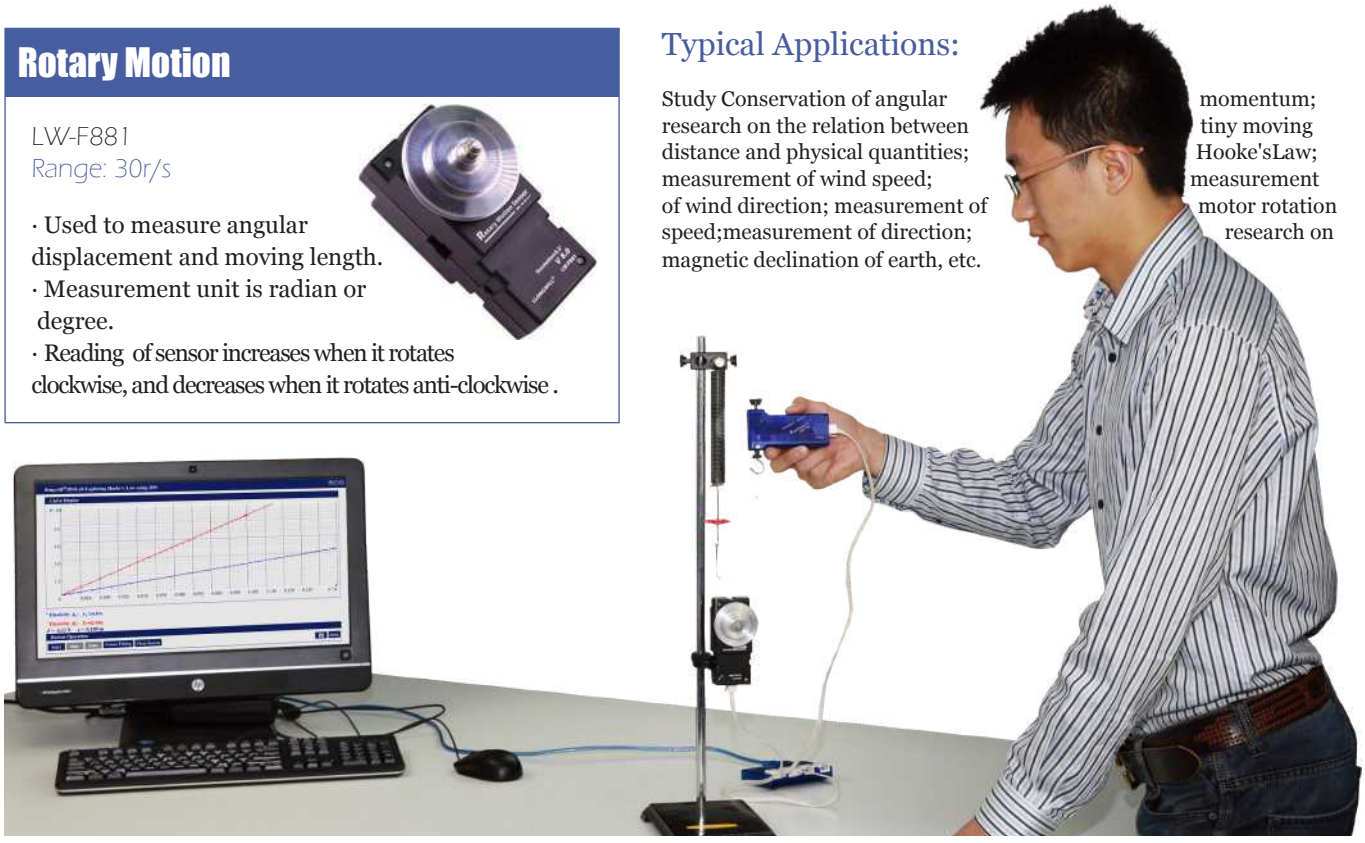
Rotary Motion

LW-F881
Range: 30r/s

· Used to measure angular displacement and moving length.
· Measurement unit is radian or degree.
· Reading of sensor increases when it rotates clockwise, and decreases when it rotates anti-clockwise .

Typical Applications:

Study Conservation of angular momentum; research on the relation between tiny moving distance and physical quantities; Hooke'sLaw; measurement of wind speed; measurement of wind direction; measurement of motor rotation speed;measurement of direction; research on magnetic declination of earth, etc.

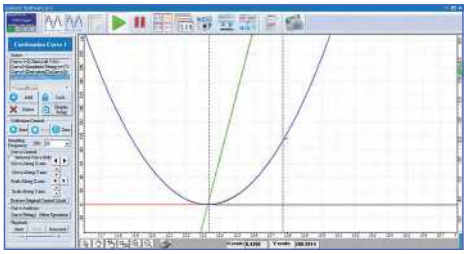


Displacement Sensor (Separated)

LW-F831
Range: 0cm~200cm
Resolution: 1mm

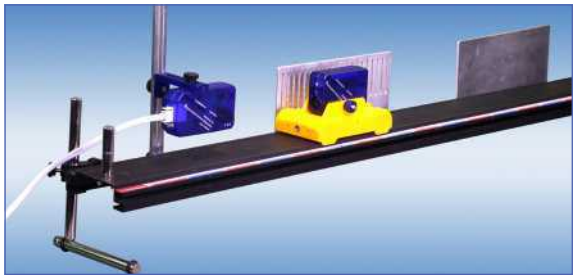
· Unique separated design
· No measuring blind zone
· Emitter + Receiver
· Emitter: powered by lithium battery
· Receiver: connected with data logger

Study on free fall motion



Experiment results of the study on free-fall motion

Typical Applications:



Electromagnetic damping experiment

Newton's second law (graph as below); study on the uniform linear motion; study on forced vibration; calculate acceleration from *v-t* figure; vibration image of spring oscillator; free Fall motion; oscillator displacement in simple harmonic vibration; study on the electromagnetic damping experiment, etc.

Displacement Sensor (Integrated)

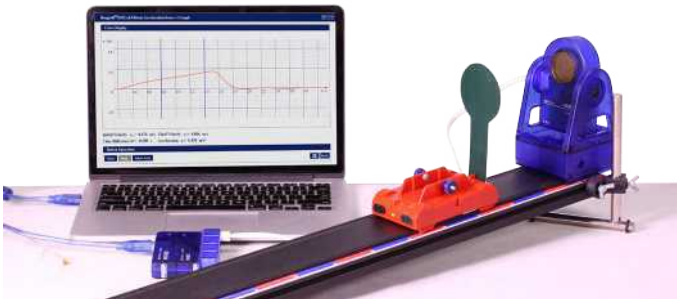
LW-F832
Range: 0.15m~6m
Resolution: 1mm

· Ultrasonic transceiver
· The reflecting area of the measured object should be no less than 4cm²

Be sure to turn it off after use!

Typical Applications:

· Vibration image and measurement of period of simple pendulum (Image A)
· Image of spring oscillator vibration and force exerted on spring (Image B)
· Damped vibration
· Measurement of acceleration



Measure the velocity of moving object by using Displacement Sensor (Integrated)

Typical Applications:

· Study on the relative illumination distribution
· Boyle's Law
· The Law of buoyancy
· Hooke's Law (Image C)
· The study on the relationship between illumination and distance (Image D)

Displacement Sensor (Small-range)

LW-F833
Range: 0 mm ~50mm
Resolution: 0.1mm

· Measure the micro displacement with adjustable potentiometer
· Support automatic data reading instead of manual reading

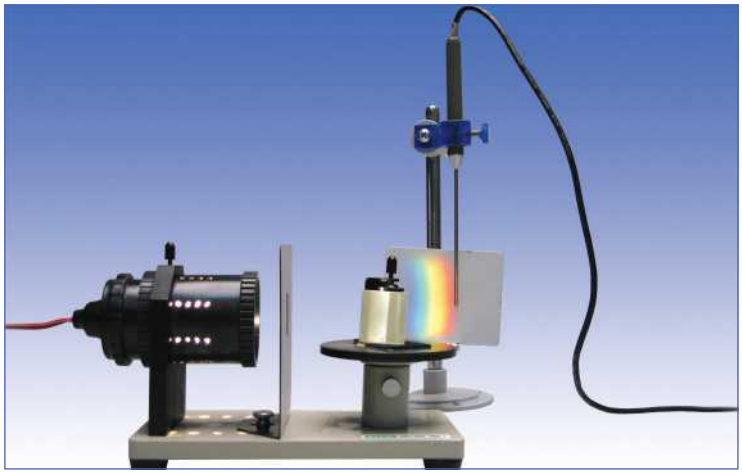
Be careful to avoid over range!

Temperature

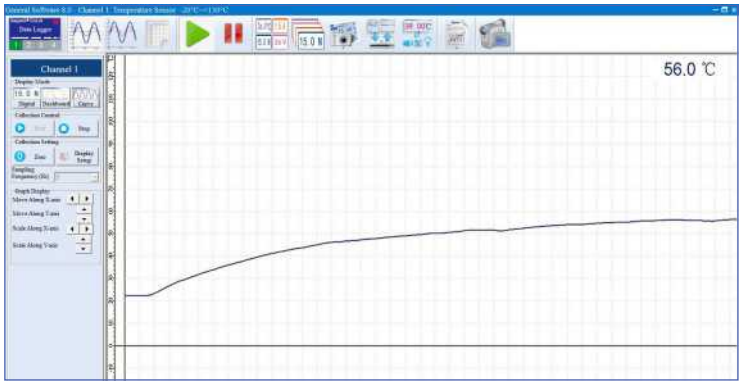
LW-T803
Range: -50℃~+200℃
Resolution: 0.1℃

· Separated design: sensor circuit + probe
· Easy to renew the temperature probe

Be careful to avoid heating the probe with the flame directly !



Infrared thermal effect experiment and the results: temperature increases obviously (see below)



Typical Applications:

· Temperature increase caused by friction working
· Relationship between boiling point and air pressure
· Temperature curve of water during heating process
· Temperature decrease caused by liquid evaporation
· Application of solar energy
· Relationship between air pressure and temperature
· Specific heat capacity
· Study on the characteristics of semi-conductor thermoelectric power generation chip
· Infrared thermal effect
· Study on the efficiency of heat radiation absorption of objects in different colors · Heat conducting · Cooling Law of water · Temperature variation regularity when solid melting · The relationship between current thermal effect of current and resistance etc.

Fast Response Temperature

LW-T804
Range: -20℃~+130℃
Resolution: 0.1℃

· Semi-closed design for sensor probe
· Faster response than common temperature sensor

Be careful to protect the probe!

Typical Applications:

· Charles' Law
· Temperature increase caused by friction work

IRT

LW-T805
Range: -20℃~+200℃
Resolution: 0.1℃

· Built-in Infrared thermosensitive component
· Non-contact temperature measurement

Typical Applications:

Measure the temperature of bulbs with infrared temperature (IRT) sensor.

Pressure

LW-T822
Range: 0kPa ~700kPa
Resolution: 0.1kPa

· Used to measure the Absolute Pressure
· Be sure to keep air tight

Be sure to avoid using it directly in water
Be sure to avoid over range

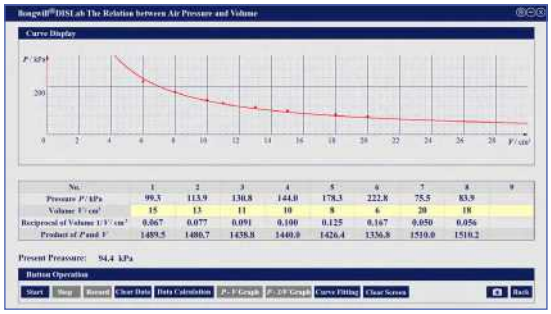
Typical Applications:

· Boyle's Law
Charle's Law
· The internal liquid pressure
· The relationship between pressure and altitude

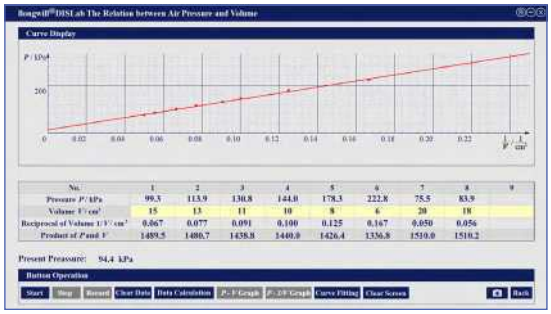
The Special Software of Boyle's Law:

· Principle: the volume of a given mass of ideal gas is inversely proportional to its absolute pressure under the condition of a constant temperature.
· Apparatus: llongwill® data logger, pressure sensor and syringe.
· Operation: Click "Start", and input the volume into the table.
· Results: "*P-V*" curve and "*P-1/V*" curve could be obtained based on the experiment data. Draw the corresponding curves of "*P-V*" and "*P-1/V*" (graph on the right).

The experiment of Boyle's Law



"*P-V*" curve



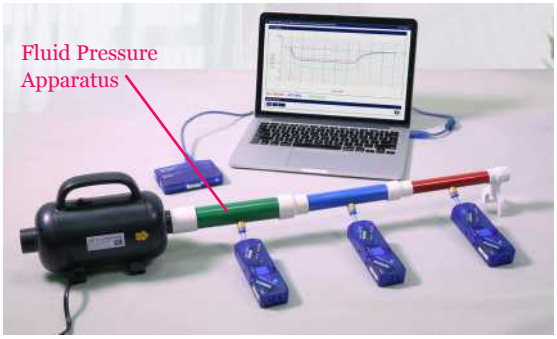
"*P-1/V*" curve

Relative Pressure

LW-T823
Range: -20kPa~+20kPa
Resolution: 0.01kPa

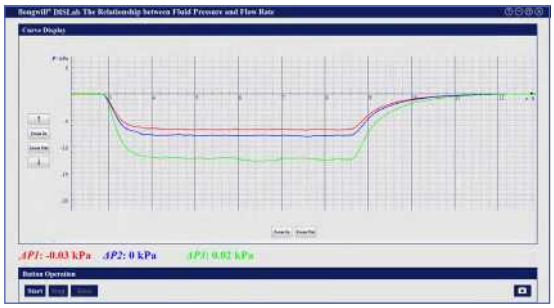
· Measure the micro change of the relative gas pressure
· The reading is the pressure difference based on initial pressure value.

Be sure to keep air tight
Be sure to avoid using it directly in water
Be sure to avoid over range



Typical Applications:

Verifying the relationship between pressure and flow rate (image on the right). In the image, red curve, blue curve and green curve show the pressure measured by three individual sensors which are connected with different parts of this apparatus. The faster the flow rate is, the lower the pressure is.

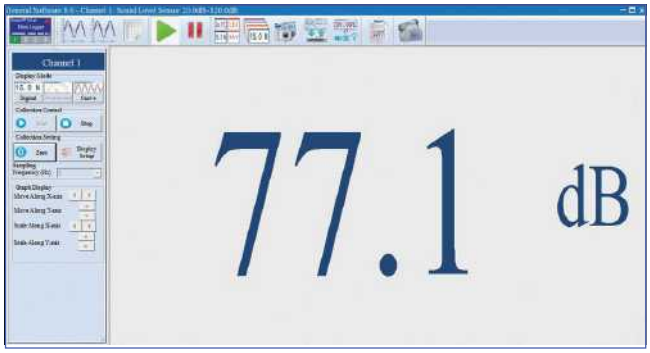


Sound/Sound Level Sensor

LW-Y806
Sound frequency measurement range:
20Hz~20kHz
Sound level measurement range:
20dB ~120dB

· By pressing the button, switch the waveform and intensity of the measured sound to study the frequency, period and amplitude of the sound.

Who has the loudest voice? (sound level measurement)——Interesting investigation in Primary School Science (image above). Software interface for the sound level measurement (graph as below).



Typical Applications and advantages:

Supports experimental research on the frequency, period, and amplitude of sound, and can be expanded to research projects such as voiceprint recognition, the relationship between amplitude and loudness, and environmental monitoring.

llongwill® DISLab V8.0 data logger can connect four sound/sound level sensors at the same time, and observe four sound signals in parallel! At this time, the computer performance has an impact on the restoration and reproduction of the sound waveform. Please choose a high-configuration computer for experiments.

Dual-range Illumination

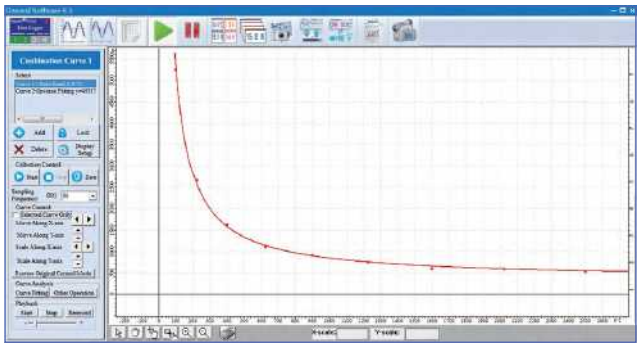
LW-L802
Range: 0 lx~5000 lx~50000 lx
Resolution: 2 lx

· Measure the illuminance per unit area
· Sensor range can be adjusted according to the light condition

Typical Applications:

· Measurement of illuminance
· Compare the illuminance between different light source
· Study on the relationship between illumination and distance
· Study on the relationship between illumination and photosynthetic efficiency
· Study the illuminance and photosynthetic efficiency
· The relationship between illuminance and distance

The relationship between illumination and distance



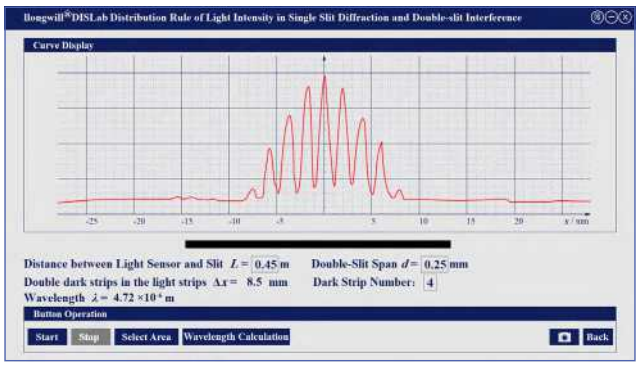
Curve of I-D (Illumination and Distance)

Relative Illumination Distribution

LW-L803
Range: 60mm
Resolution: 12dot/mm

Typical Applications:

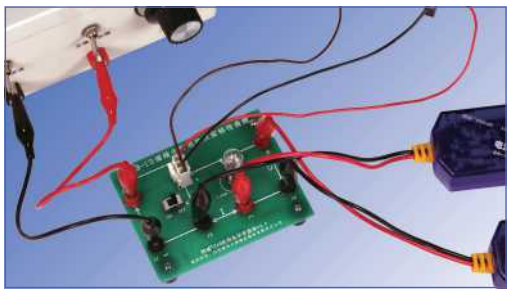
· Double-slit interference
· Diffraction of light
· Polarization of light



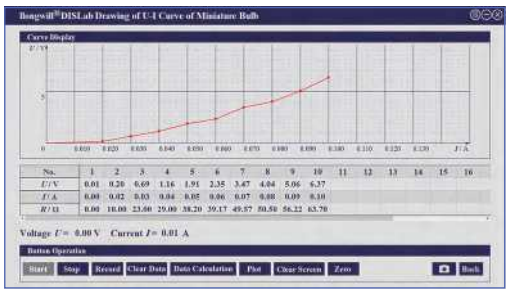
Double-slit experiment results by using Relative Illumination Distribution Sensor

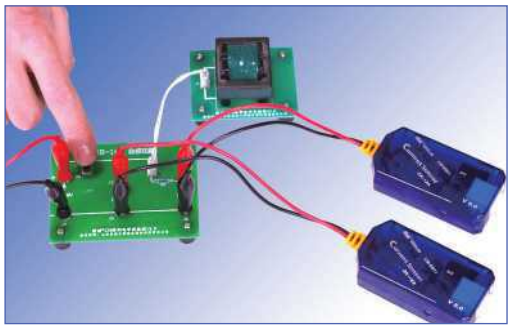
The Extensive Applications of Current and Multi-range Current Sensor working with Voltage Sensor and llongwill® EXB Series Circuit Board

Current regularity in series circuits; current regularity in parallel circuits; Ohm's Law in closed circuits; volt-ampere characteristic curve of conductors.

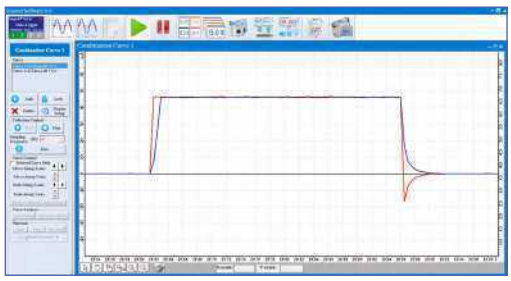


Describe *U-I* curve of a small bulb, the experiment curve as below





Self inductance, the experiment curve as below



Fruit Battery-experiment by using micro current sensor

Current

LW-E801
Range: -2A~+2A
Resolution: 0.01A

· Measure the magnitude and direction of the current
· The usage is similar to ammeter

Typical Applications:

The small bulb's U-I characteristic curves; small motor's U-I characteristic curve; self induction; the principle of generator; rectification and wave filtering; measure the resistance with the method of Volt-Ampere, etc.

Current (Multi-range)

LW-E803
Range: -2A~+2A
-200mA~+200mA
-20mA ~+20mA
Resolution: 0.01A/1mA/0.1mA

· Click the button on the sensor for range adjustment
· Long-press the button for sensor zero
· The usage is similar to ammeter

Typical Applications:

Self induction； constant voltage source; constant flow source, primary cell, etc.

Micro Current

LW-E821
Range: -1μA~+1μA
Resolution: 0.01μA

· The usage is similar to ammeter
· Connected in series
· Show the current direction with positive or negative value

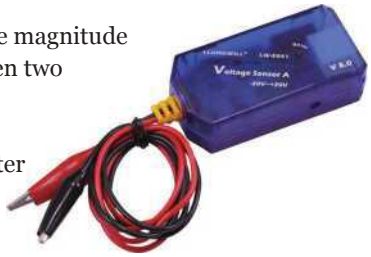
Typical Applications:

Induced current at the change of weak magnetic flux; Lenz's Law; study on the geomagnetic field; fruit battery; human body current; conduction of nerve impulse; thermoelectric effect, etc.

Voltage

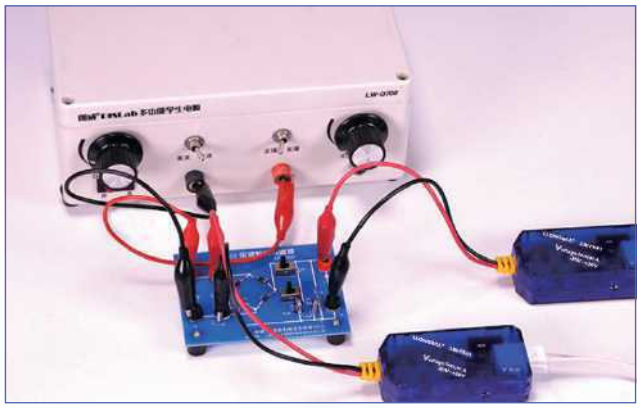
LW-E841
Range: -20V~+20V
Resolution: 0.01V

· Measure the voltage magnitude and direction between two points of the circuit
· The usage is similar to voltammeter

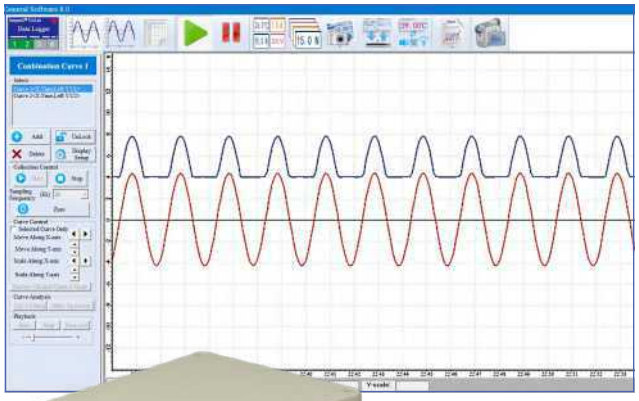


Typical Applications:

Charge-discharge and series-parallel connection of the capacitors; analysis of complicated circuit; principle of generator; voltage dividing circuit and current limiting circuit; study on electromagnetic damping; characteristic curve of transistor amplifier circuit.



Rectifier and filter, the experiment curve as below



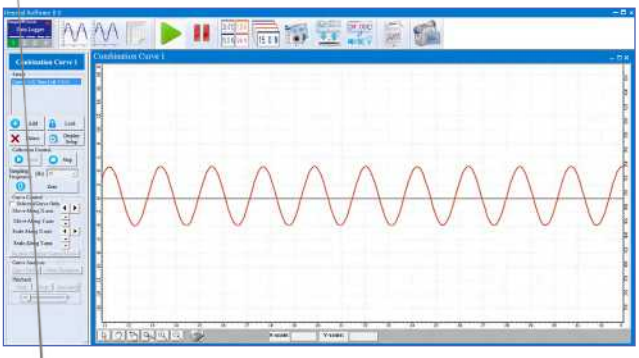
The Extensive Applications of Voltage and Multi-range Voltage Sensor working with Current Sensor and Ilongwill® EXB Series Circuit Board

Describe volt-ampere characteristic curve of a miniature bulb; Resistance Law, relationship between EMF and internal voltage and external voltage of power supply; characteristic research on semi-conductor with thermoelectric power generation chips; vibration image of simple pendulum; phase of simple harmonic vibration; superposition of simple harmonic waves; voltage relationship in series circuits; volt-ampere characteristics of conductors, measurement of resistivity of metal wire using voltammetry; measurement of EMS and internal resistance of battery using voltammetry; measurement of EMS of battery using compensation method; study research on the output power of power supply and power-supply efficiency; volt-ampere characteristic curve of small motors; measurement of resistance through partial voltage and current-limited circuits using voltammetry; AC waveform; rectification and wave filtering; LC oscillation; Faraday's Law of Electromagnetic Induction; RC phase shift; RL phase shift; characteristic curve of diode; characteristic curve of triode; Lissajous figures; simple gate circuits; bistable circuits and multi-harmonic oscillation etc.

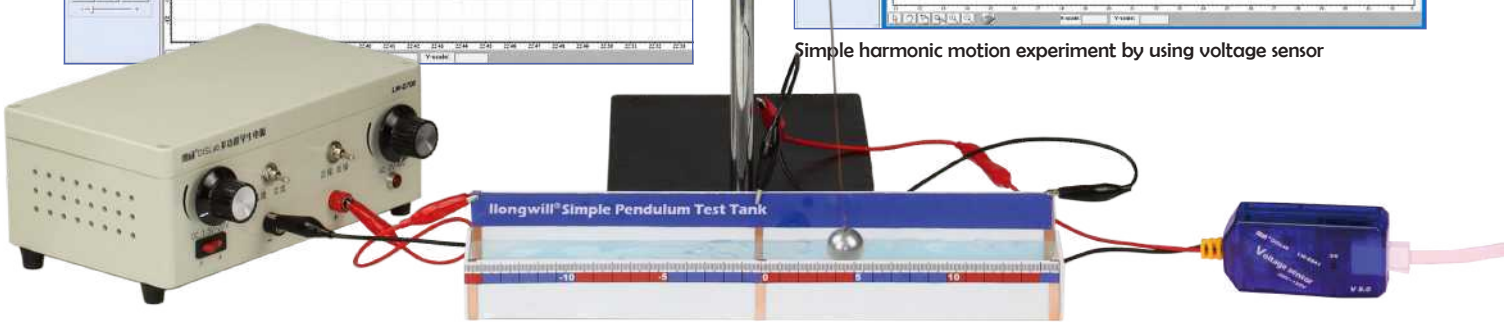
Voltage (Multi-range)

LW-E844
Range: -20V~+20V
-2V~+2V
-0.2V~+0.2V
Resolution:
0.01V / 0.001V/ 0.1mV

· Click the button for range adjustment
· Long-press the button to zero the sensor
· The usage is similar to voltammeter



Simple harmonic motion experiment by using voltage sensor



AC Current Sensor

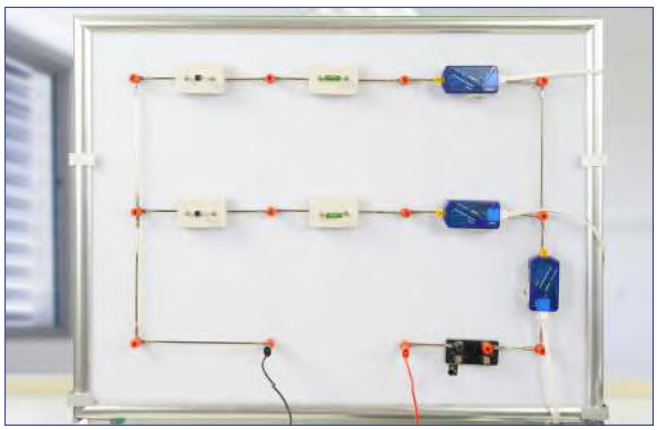
LW-E811
Range: 0~2A
Resolution: 0.01A

· The AC current sensor is used to measure the effective value(i.e. root mean square, RMS) of AC current, and supports three working modes: wired communication with data logger, wireless communication and independent data display.

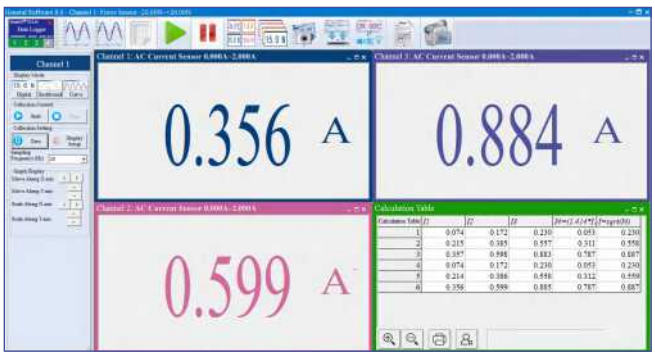
The voltage of the circuit connected to this sensor must be within the safe range(36V). It is strictly forbidden to use it for the current measurement of 220V voltage circuit.

Typical Applications:

The relationship between AC RMS and peak value, the relationship between the RMS value and the peak value of half-wave rectified square wave(fixed duty cycle), and the calculation of the RMS value of current in circuit with diode.



The relationship between AC RMS and peak value(above) and experiment results(below)



AC Voltage Sensor

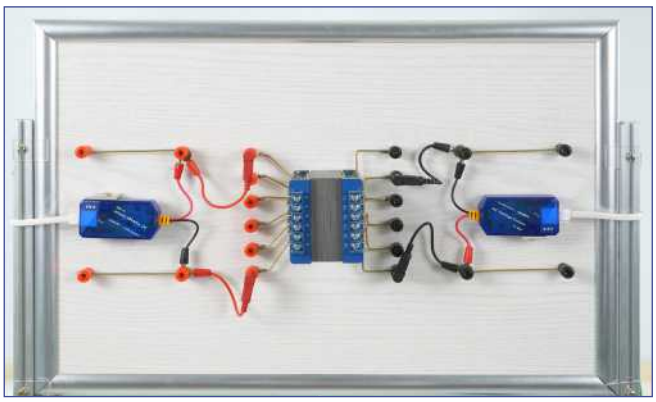
LW-E812
Range: 0~36V
Resolution: 0.1v

· The AC voltage sensor is used to measure the effective value of AC voltage, and supports three working modes: wired communication with data logger, wireless communication and independent data display.

The voltage of the circuit connected to this sensor must be within the safe range(36V). It is strictly forbidden to use it for the current measurement of 220V voltage circuit.

Typical Applications:

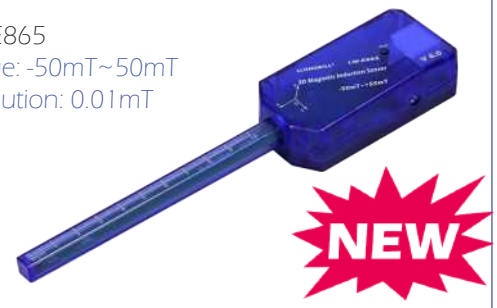
Explore the relationship between voltage and the number of turns of the primary and secondary coils of the transformer, the relationship between the AC RMS and peak value, and the relationship between the RMS value and the peak value of half-wave rectified square wave(fixed duty cycle).



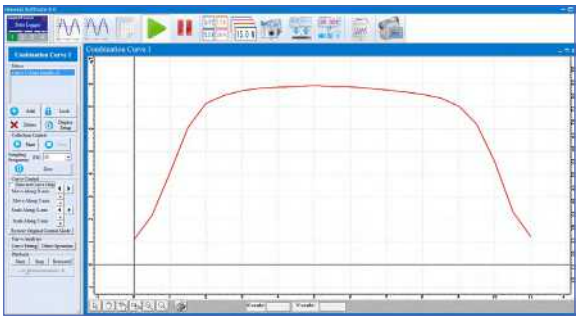
Explore the relationship between voltage and the number of turns of the primary and secondary coils of the transformer(above) and experiment results(below)

3D Magnetic Induction Sensor

LW-E865
Range: -50mT~50mT
Resolution: 0.01mT



· The 3D magnetic induction sensor is used to measure the magnetic induction intensity in a certain place, and it needs to be measured after the reading is stable.
· The vector sum of the three-dimensional components is the absolute value of the magnetic induction intensity of the measurement point.



Study on the magnetic field distribution in the electrified solenoid, results as above

Typical Applications:

Measurement of the magnetic induction intensity of electric solenoid; Faraday's Law; study on the geomagnetic field by using magnetic induction sensor; measure the rotational speed; study on the magnetic induction intensity of magnetic; study on uniform magnetic field; study on the relationship between magnetic induction intensity of electrified solenoid and current.

Study on the Internal Magnetic Field of the Electrified Solenoid:

The Electrified solenoid is a common-used experiment apparatus in electromagnetism, whose internal magnetic field distribution has specific teaching significances. Students would have a better understanding of generation conditions of “uniform magnetic field” and the knowledge of Electromagnetic Induction Law through the comparison of internal magnetic field distribution between general solenoid and special solenoid with a certain number of coil turns as well as solenoid with certain length-to-diameter ratio.

E-compass

LW-E864
Range: 0~359°
Resolution: 1°

Typical Applications:

· Geomagnetic orientation
· Study on geomagnetic declination

G-M

LW-R801
Range: 0~40000 pulse/minute
Measure the pulse number caused by β,γ radiation

Typical Applications:

Measurement of background counting rate; radiation shielding; measurement of radioactivity of building materials

AC Frequency

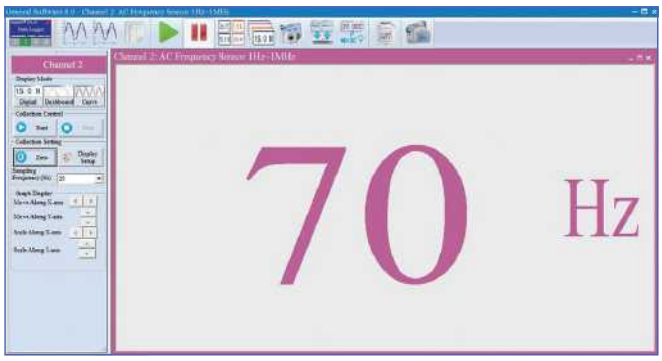
LW-E883
Range: 1Hz~1MHz

· Measure the AC voltage signals

Typical Applications:

· AC frequency measurement
· The relationship between AC frequency and rotation velocity of hand generator

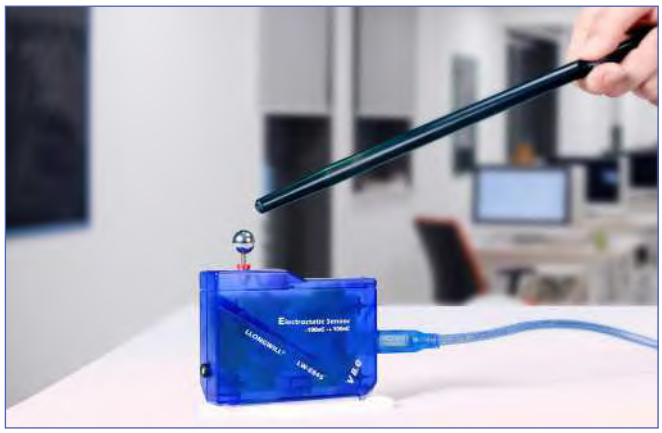
Measure the output frequency of Low Frequency Signal Generator by using AC Frequency Sensor (results as below)



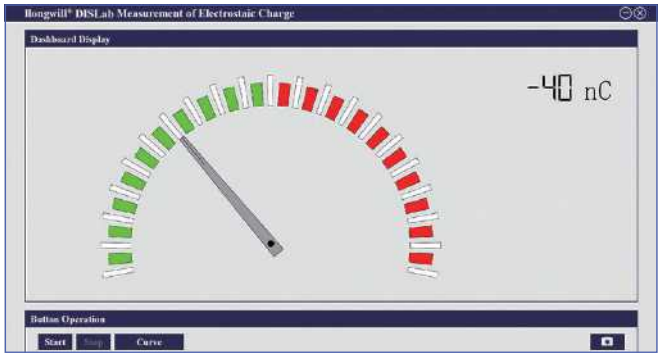
Electrostatic

LW-E845
Range: -100nC~+100nC

· Used to measure the electrostatic charge
· Connect with the computer directly
· No need of Data Logger



Measure the charge quantity on the rubber rod after rubbing with fur



Electrometer

Invention Patent No.: 201210521414.X

LW-E846
Range:-100nC~+100nC
·Measure the electrostatic charge.
·Display the data directly by LCD.

Usage of llongwill® Electrostatic Sensor and Electrometer:

Both llongwill®Electrostatic Sensor and llongwill® Electrometer can be connected with computers directly (electrostatic sensor adopts wired manner while electrometer adopts wireless manner).
Please make the measured electrified object approach to the metallic ball during experiments.

Ilongwill®DISLab Experimental Data Acquisition System

CHEMISTRY SENSORS

pH

LW-C807
Range: 0~14
Resolution: 0.01

· Measure the pH value of solution
· Characteristic of quick response

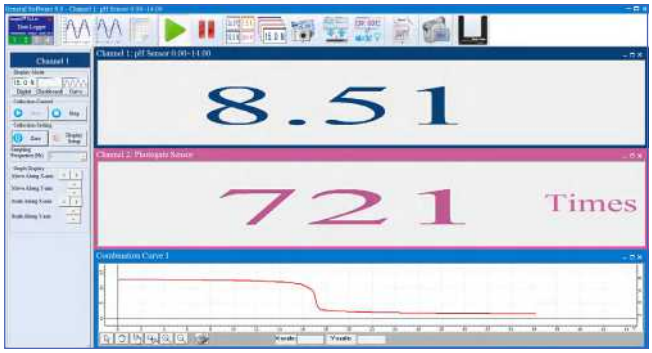
NEW

Notes in Using llongwill® pH Sensor:

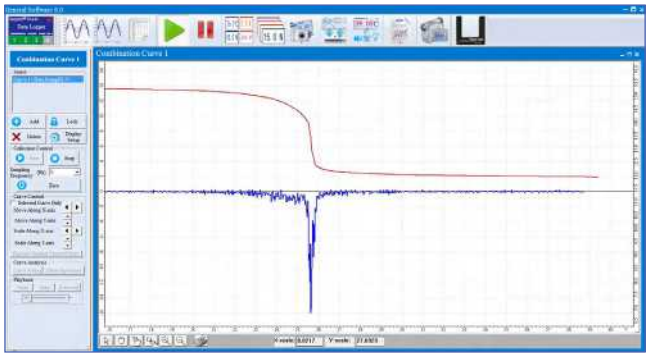
● The glass bulb of front end of electrode shall be immersed in the solution completely;
● Sensor electrode shall be rinsed before and after usage and before measuring different liquids. Cleaning method: wash electrodes with distilled water then gently dry the electrodes with absorbent tissues; No rubbing the electrode to avoid damaging;
● Ensure that there is sufficient activated fluid with ingredient of activated fluid is 3.3mol/L KCl solution, in the sealing cap. Users should fill regularly with self-prepared electrode activated fluid by themselves according to the ingredient.

Typical Applications:

Acid-base neutralization titration (as below); determination of acetic acid ionization equilibrium constant; simulation of acid rain formation; pH measurement of different drinking water; effect of temperature on the ionization equilibrium of acetic acid; acid rain monitoring.



The results of Acid-base Neutralization Titration by using pH sensor



The "*pH-V*" curve of Acid-base Neutralization Titration by using pH sensor

Measure the pH value of fruit juice by using pH sensor

Conductivity

LW-C802
Range: 0ms/cm~20ms/cm
Resolution: 0.001ms/cm

· Measure the conductivity of solution

Typical Applications:

· Solution conductivity measurement
· Conductivity titration
· Concentration determination of strong electrolytes
· Effect of temperature on the acetic acid ionization equilibrium
· Effect of concentration on the ionization of electrolytes
· Study on the substance of ionic reaction
· Change of ion concentration during the dilution of glacial acetic acid

Glacial acetic acid dilution experiment (results as below)

Conductivity titration experiment

Chroma

LW-C803
Range: 0~100%
Resolution: 0.1%

· With build-in luminous tube and receiver
· can distinguish the light transmittance of 3 kinds of colors.
· light transmittance can be converted absorbency.
· Assorted with a cuvette

Turbidity

LW-C804
Range: 0NTU ~ 400NTU
Resolution: 0.1NTU

· NTU means the nephelometric turbidity unit
· 1NTU means the cloudiness or haziness caused by 1mg SiO_2 in 1L of water

Typical Applications:

· Determination concentration of a colored solution
· Determination content of the protein
· Water quality monitoring

Typical Applications:

· Effect of concentration on chemical reaction rate
· Water quality monitoring

Principle of llongwill® Chroma Sensor:

Pure water is colorless and transparent. However, water would appear a certain color with dissolution of various substances. Chroma of water is the indicator used for color quantitative determination of water or various aqueous solutions. There are two methods in determining solution chroma: The colorimetric method and the dilution method. The unit of both methods is percentage. The transmittance of light penetrating through solutions is determined with the chroma sensor. There are luminescent tube and receiving tube built in the sensor. Between them, there is a cuvette filled with solution samples. The receiving tube receives the transmission light after penetrating the cuvette and convert it to the transmittance of solution.

Principle of llongwill® Turbidity Sensor:

Turbidity is the impeding degree of suspended solids in the water to the light penetration. A beam of parallel light is spreading in the transparent liquid. If there are not suspended particles in the liquid, the light beam would spread in the form of straight line and would not change its direction; if there are suspended particles, the light beam would form scattered light (that is the measured value at the 90 degree direction of incident light) when meeting the particles. The more the suspended particles in the solution (the more turbidity), the more fierce the scattering phenomenon is, and the larger the turbidity is. Turbidity unit is inNTU. Scattered light intensity is in direct proportion to the solution turbidity within a certain turbidity range under the condition that incident light is constant. Solution turbidity could be measured following this law.

High-temperature

LW-T802
Range: 0℃~1200℃
Resolution: 1℃

Be careful to protect the probe!

Typical Applications:

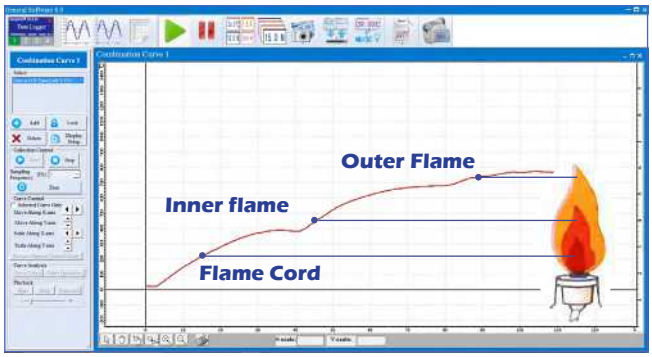
· Compare the temperature of different parts of alcohol lamp flame
· Compare the melting temperature of different metals
· Study on the conductivity of melted KNO_3

Experiment examples:

► Measure and compare melting temperatures of soldering tin, tin and lead etc.
► Principle: Melting point of soldering tin is different from that of fine metal (tin and lead) which constitutes alloy.
► Apparatus: llongwill® Data logger; high temperature sensor; copper sheet; soldering tin; tin; lead; alcohol lamp and iron stand .
► Operation: Put soldering tin, tin and lead on the copper sheet. Then light the alcohol lamp. When soldering tin, tin and lead starting to melt, record the temperatures individually.
► Notes: Three high temperature sensors could be parallel used to measure the temperatures of three metals individually in order to improve experimental efficiency and reduce operation processes. The experiment shall be carried out in the fuming cupboard since harmful gas will be distributed in melting of tin.

Melting point of soldering tin

Measure the temperature of different parts of alcohol lamp flame, results as below



Measure and compare melting temperatures of soldering tin, tin and lead

SO_2

LW-C841
Range: 0ppm~20ppm
Resolution: 0.01ppm

· Measure the SO_2 content in the air

Results of measuring content of SO_2 in cigarette smoke

Experiment Example:

► Principle: Rainfall with pH less than 5.65 is called acid rain. Acid rain is mainly caused by a large number of acidic materials, mainly SO_2 and tail pipe exhaust that come out of vehicles.

► Apparatus: Data Logger, SO_2 sensor, pH sensor, 250mL gas bottles, rubber stoppers, 5mL syringes.

► Operation:

① Inject prepared SO_2 into the 250 mL gas bottle with a 5mL syringe. It can be observed that readings of SO_2 increases obviously (graph A on the left);

② Inject distilled water into the same 250 mL gas bottle with the 5 mLsyringe and shake the gas bottle properly. As SO_2 is water-soluble, it can be observed that readings of SO_2 decreases obviously (graph B on the left);

③ Pour the solution in the gas bottle into a beaker. Test the pH and you will find that the solution is acidity (graph C on the left).

Measurement of SO_2 contents in cigarette smoke

Measurement of SO_2 contents in the air around power plant

NH_4^+

LW-C834
Range: 0~1mol/L
· Used to measure the NH_4^+ concentration in solution

Experiment results of measuring the content of NH_4^+ in chemical fertilizer

Typical Applications:

Concentration testing of NH_4^+ in the chemical fertilizer; determining of ammonium hydroxide ionization constant; influence of temperature to ammonium hydroxide ionization; determining of ammonium salt solution concentration, etc.

Concentration determination of NH_4^+ in chemical fertilizer

K^+

LW-C832
Range: 0~1mol/L

· Used to measure the K^+ concentration in the solution

Typical Applications:

· Measure the K^+ content in vegetable and fruit
· Measure the K^+ content in the solution
· Measure the K^+ content in the cell sap
· Measure the K^+ content in the chemical fertilizer etc.

Experimental device for measuring potassium ion content in milk (See the right picture)

NO_3^-

LW-C836
Range: 0~1mol/L
· Used to measure the NO_3^- concentration in solution

Experiment results of determination of NO_3^- concentration in the fruit juice

Typical Applications:

Determination of NO_3^- concentration in drinking water; food and waste water; changes of NO_3^- concentration in the oxidation-reduction reaction.

Determination of NO_3^- concentration in the fruit juice

Cl^-

LW-C835
Range: 0~1mol/L
· Used to measure Cl^- concentration in solution

Experiment results of Cl^- content in table salt.

Typical Applications:

Residual Cl^- in tap water; testing of AgCl ion product constant; testing of Cl^- content in blood; testing of Cl^- content in disinfectant.

Experiment of Cl^- content in table salt by using chloride ion sensor

NO_2

LW-C822
Range: 0~200ppm
· Used to measure NO_2 content in gas

Typical Applications:

Testing of NO_2 content in vehicle exhaust and waste gas from power plant; study of acid rain formation by NO_2; measurement of N_2O_4 equilibrium constant generated by NO_2

Experiment of testing of NO_2 content in vehicle exhaust with llongwill® NO_2 sensor and llongwill® digital display module

Experiment results of testing of NO_2 in vehicle exhaust

CO

LW-C826
Range: 0~1000ppm
· Used to measure CO content in gas

Typical Applications:

Testing of CO content in cigarette; CO content in air; CO content during candle combustion; study on water solubility of CO.

Experiment of CO content generated during cigarette combustion measured by using llongwill® CO sensor

Experiment of CO content generated during cigarette combustion

CH_4

LW-C824
Range: 0~5%
· Used to measure CH_4 content in gas

Typical Applications:

Testing of CH_4 content in air; inquiry of reaction condition of CH_4 and Cl_2; inquiry of CH_4 generation regular in our surroundings; detection of leakage.

Detection of gas composition by using CH_4 sensor

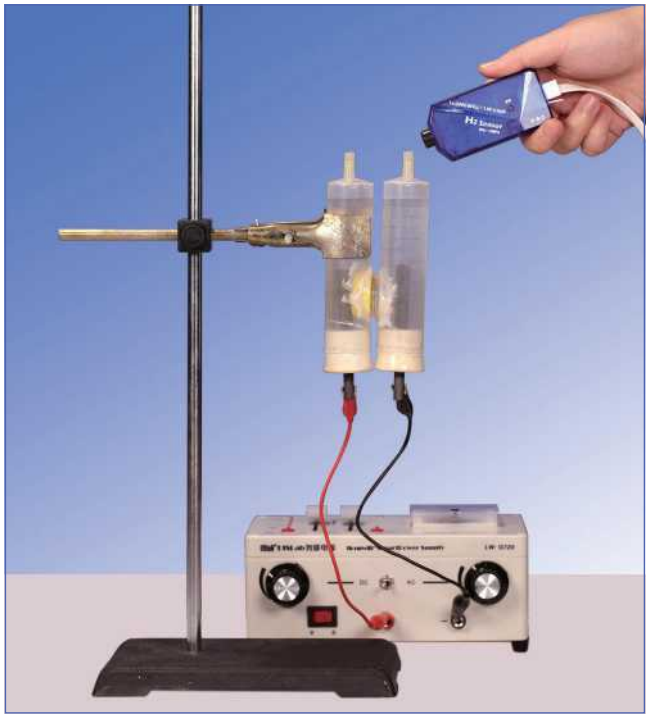
Experiment results of detection of gas composition

H_2

LW-C806
Range: 0~100% LEL
· Measure H_2 content in air

Typical Applications:

Study on products from the electrolysed water; testing of H_2 content in air; inquiry of gas component in balloon; inquiry of products from metal and hydrochloric acid reaction.



Inquiry experiment of products from electrolysed water by using H_2 sensor

NH_3

LW-C823
Range: 0ppm~100ppm
·Measure NH_3 content in gas

Typical Applications:

Testing of NH_3 content in public toilet; verification of existence of NH_4^+ in solution by heating it.

Detection of NH_4^+ with NH_3 sensor

Experiment Example:

Inquiry of mixed product of 84 disinfectant and toilet cleaner

► Principles: Main component of 84 disinfectant is NaClO, while main component of toilet cleaner is HCl. Oxidation-reduction reaction may occur in the mixture of 84 disinfectant and toilet cleaner and Cl_2 may be produced. Cl_2 is a poisonous, yellow green gas with strong and pungent smell. It may stimulate eyes and respiratory tract, making people have uncomfortable feelings such as shedding tears and cough.
► Apparatus: Cl_2 Sensor, stand support, baker.
► Conclusion: 84 disinfectant cannot be used together with toilet cleaner. If mixed unintentionally, open windows immediately for ventilation and move to a place with fresh air quickly.

Cl_2

LW-C821
Range: 0ppm~20ppm
· Used to test Cl_2 content in gas

Ilongwill®DISLab Experimental Data Acquisition System

BIOLOGY SENSORS

Study on photosynthesis of terrestrial plants and the experiment result of increasing oxygen content

O_2

LW-B801
Range: 0~100%
· Measure O_2 content in air

O_2 B

LW-B805
Range: 0~25%
· It is suitable for measuring content of oxygen with low concentration

Typical Applications:

The relationship between breath holding time and oxygen content in exhaled air; testing of exhaled air component and comparison with outside air; seed germination; photosynthesis of terrestrial plant; respiration of terrestrial plant; respiration of animal; respiration of saccharomycete; influence of different plants to surrounding environment.

Measuring O_2 content in forest with O_2 sensor

Study on the relationship between the duration of holding breath and the oxygen content in exhaled gas

CO_2

LW-B804
Range: 0ppm~50000ppm
Resolution: 1ppm

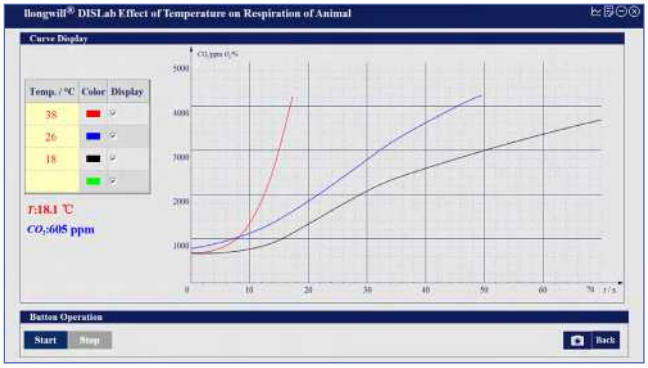
· Air circulation by pump driving
· Measure the change of CO_2 content in the air

CO_2 C

LW-B806
Range: 0ppm~5000ppm
Resolution: 1ppm

Adopts diffusive design and can measure the dynamic change of carbon dioxide content in the air.

Effects of temperature on animal respiration (figure above) and results (figure below)



Typical Applications:

Photosynthesis of terrestrial plant; respiration of terrestrial plant; respiration of animal; influence of temperature to photosynthesis; influence of temperature to respiration; difference between exhaled air and outside air; comparison between exhaled air and combustion gas; study on seed germination process; study on the respiration of saccharomycete and two respiratory modes; study on the reaction between baking soda and vinegar; study on the reaction between sodium carbonate and hydrochloric acid, etc.

Relative Humidity

LW-B807
Range: 0~100%
Resolution: 0.1%
· Measure water vapour content in air

Measuring the ambient relative humidity using relative humidity sensor and sensor data display module

The optimum humidity environment for people's daily activities as below:

Housing environment: 40%～70%RH
The optimum environment for disease prevention and cure:40%～55%RH
Storage environment of books and cultural relics:40%～60%RH
Storage of cotton and wooltextiles: 40%～60%RH
Storage of confectionery: 50%～60%RH
Storage of fruits and vegetables: 50%～70%RH

Experiment Example-Transpiration:

► Principle: Transpiration is the process that moisture being scattered into atmosphere in state of vapor from live plant surface (mainly leaf). Plant transpiration can be verified with change of relative humidity in sealed container tested by a relative humidity sensor.
► Apparatus: llongwill® data logger, relative humidity sensor, green plant, sealing apparatus etc.
► Results: See graphs on the right.

Transpiration experiment of plants (figure above) and results (figure below)

Typical Applications:

Plant transpiration; difference between exhaled air and outside air; influence of different plants to surrounding environment; regulation of body perspiration to body temperature; influence of AC dehumidification to indoor humidity etc. The sensor probe can be easily put into the sealing apparatus to obatian experiment data precisely.

O_2 Sensor (Dissolved)

LW-B831
Range: 0mg/L~20mg/L
Resolution: 0.01mg/L
· Measure oxygen dissovled in liquid
· With the temperature compensation function

Working Principle of llongwill® O_2 Sensor (Dissolved):

Molecular oxygen in the air, which can be dissolved in water, is also called dissolved oxygen, usually recorded as DO and denoted by milligram of oxygen in every liter of water. Amount of dissolved oxygen in water is an important index of self-purification capability of water. Water temperature and air pressure are main factors influencing oxygen's dissolve in water. The higher the air pressure and the lower the water temperature, the more oxygen dissolved in water.

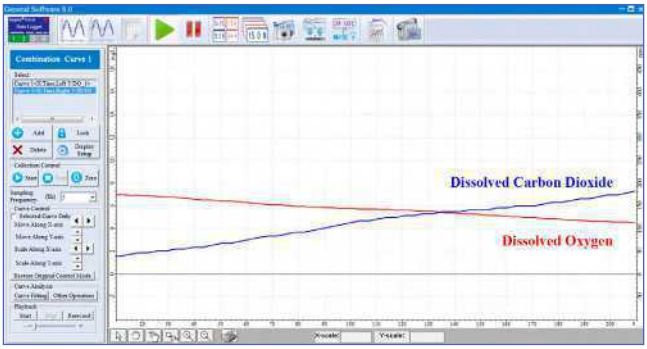
CO_2 Sensor (Dissolved)

LW-B832
Range: 4.4ppm~1800ppm
Resolution: 0.1ppm
· Measure CO_2 dissolved in liquid

Typical Applications:

Respiration of fish; photosynthesis of aquatic plants; photosynthesis of aquatic animals; respiration of saccharomycetes.

Respiration experiment of fish (figure above) and results (figure below)



The experiment of study on the respiration of saccharomycetes by using CO_2 Sensor (Dissolved)

ORP

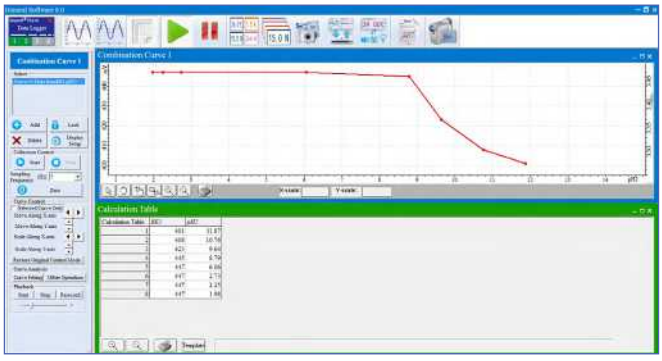
LW-C805
Range: -500mV~+1200mV
Resolution: 1mV
· Measure Oxidation-reduction Potential of solution

Working Principle of llongwill® ORP Sensor:

Oxidation-reduction potential of solution—ORP value is the key index of reduction or oxidation of solution. ORP measurement is widely used for water quality analysis. If ORP value of water sample is less than 650mv, it means the water measured has been disinfected well.

Typical Applications:

Study on the change of oxidation-reduction potential during the growth of saccharomycete; study on the influence of ORP change in micro ecological system to the growth of aquatic plant; comparison of the effects of different disinfectants; water Quality Detection, etc.



Experiment result of study on the influence of pH value to the oxidation-reduction potential of $KMnO_4$

Gaseous Alcohol Sensor

LW-C842
Range: 0mg/L~2mg/L
· Measure alcohol content in air

Typical Applications:

· Compare the volatile gas from different alcohol; Measure the alcohol content in exhaled gas; Study of fermentation.

The volatile alcohol gas from dry red wine is lower obviously than that from Chinese liquor.

The reading of alcohol gas sensor surges, because there is much more alchol in Chinese Liquor than red wine

Examine the exhaled air of drivers warn drunk driving

EKG

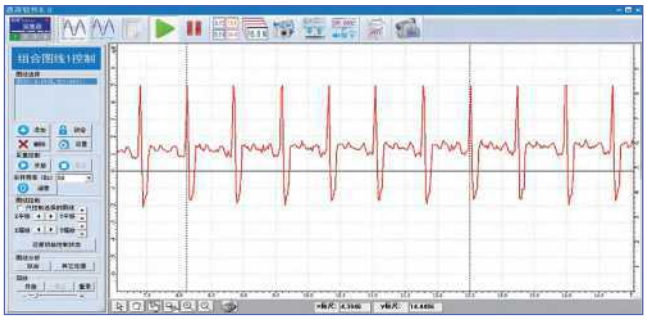
LW-B851
Range: -5mV~+5mV
· Describe EKG curves

Typical Applications:

Display P wave, QRS wave; T wave and U wave in EKG and calculate the heart rate; study on EKG of human body under different conditions; compare the EKG of different animals.

Application Guide:

The connection principle is to make sure the holder's cable and the electrode holder in the same color. After connecting, clip the electrode holders in black and yellow on the left wrist, and then clip the electrode holder in red on the inside of the right wrist.



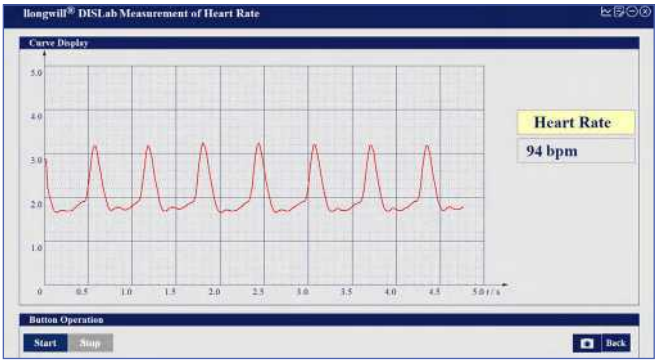
Heart Rate

LW-C853
Range: 0~200bpm
· Measure heart rate

Typical Application:

Heart rate measurement; comparison of heart rate between pre-exercise and post-exercise; the factors related to heart rate; the animals' heart rate.

Heart Rate measurement, results as below



Measuring results of heart rate

Respiration Sensor

LW-B852
Range: 0~200bpm

· Record the breathe time per minute
· Measure the respiration rate under different conditions

Typical Applications:

· Compare the respiration rate of different people with different sexes and ages
· Comparison of respiration rate between pre-exercise and after-exercise
· Study on the relationship between heart rate and respiration rate

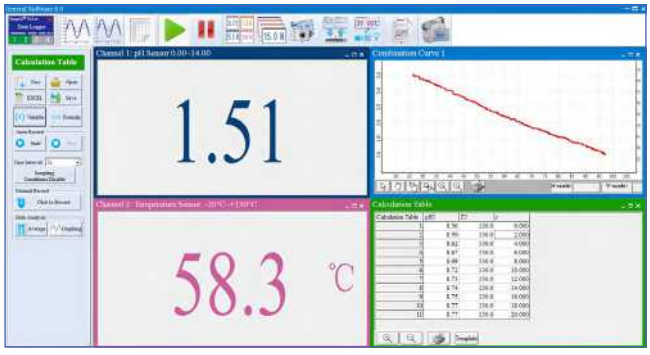
General Sensors

General science sensors can be used either for Physics experiments, or Chemistry experiments, and also can be used for Biology experiments, including temperature, pressure, current, voltage, micro-current, multi-range current sensor, etc. The above Physics sensors provide new experiment methods for Biology and Chemistry experiments, having significant role in enhancing experiment quantification and efficiency.

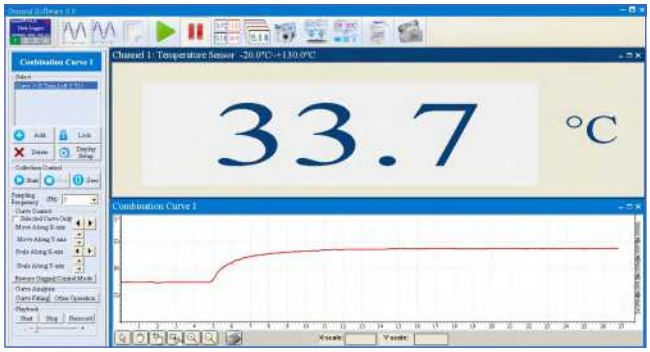
Temperature Sensor in Chemistry Experiment:

The temperature sensor can be used in experiments of Neutralization heat, heat of solution from acetic acid ionization equilibrium constant measurement, etc.

Study on the affect of temperature on of acetic acid ionization equilibrium constant, (results as below)



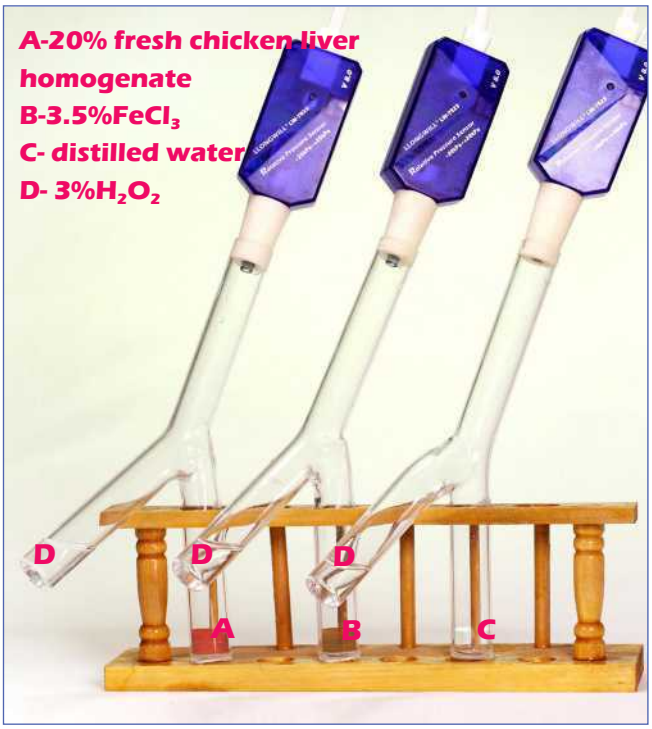
Neutralization heat experiment (NaOH + HCl) (above) and experiment results (below)



Heat of solution experiment (NaOH)

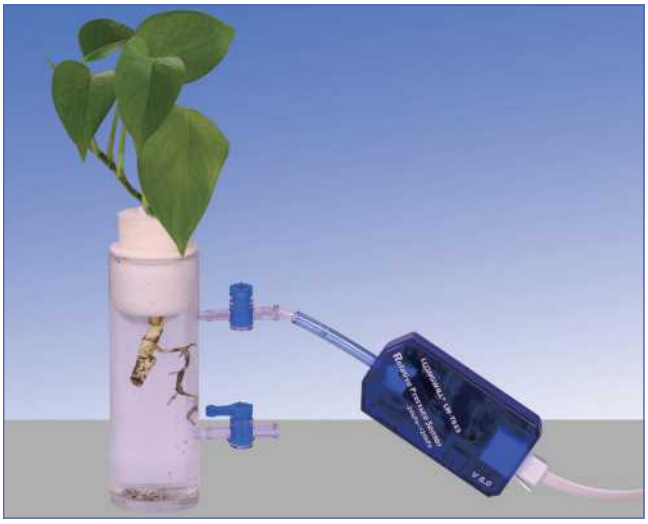
Relative Pressure Sensor in Biology and Chemistry Experiments:

· The comparison of the chemical reaction rate
· Characteristics of the enzyme
· Verification of the permeation
· Study on the water absorption and transportation in transpiration



Experiment of characteristics of the enzyme (above) and the results (below)

Experiment of chemical reaction rate comparison (above) and the results (below)



Experiment of water absorption and transportation in transpiration (right) and the results (above)

llongwill® Electricity Sensors in the Application of Chemistry Experiments:

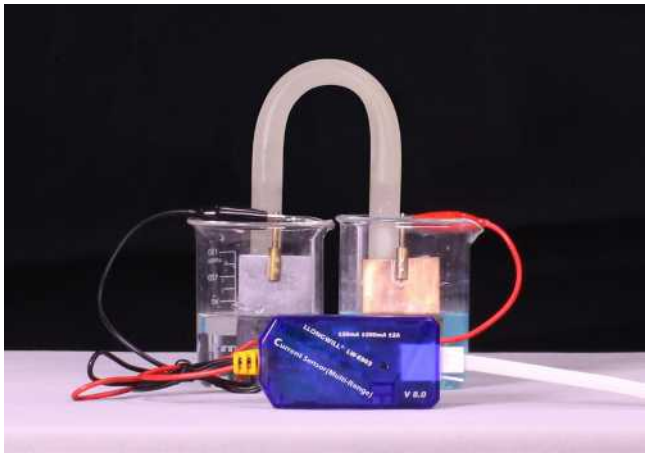
Many chemical reactions can be described as ion activities. Therefore, the electrical measurements are required to support chemical research, and thus produce an important branch of chemistry - electrochemistry. High school chemistry experiment, in part, is related to the content of electrochemistry, which contains the primary cell, electrolytic cell and molten potassium nitrate conducting and other experiments. Electricity sensors can give effective support to the above experiments.

Experiment Example I- *Study on Primary Cell:*

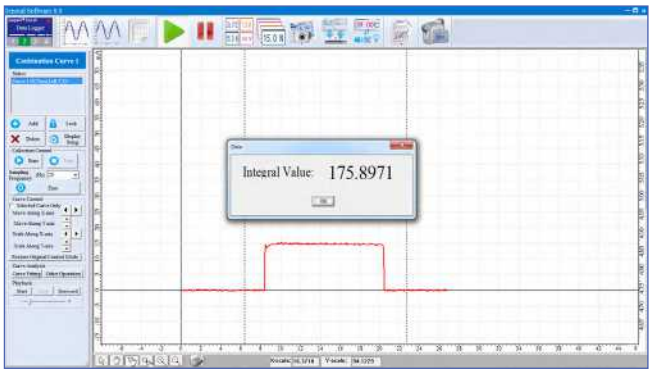
► Principles: The primary cell is a device which converts chemical energy into electric energy. In the copper-zinc primary cell, zinc atom loses two electrons, and the electrons flow from the negative electrode (zinc) to the positive electrode (copper), forming current.

► Apparatus and Reagents:

llongwill® data logger, multi-range current sensor, distilled water, copper-zinc primary cell, filter paper, 0.1mol / L HCl.



The effect of the distance between two electrodes to the primary cell, the results as below



Experiment Example II - *Study on Molten Potassium Nitrate:*

► Principles: Normal state of potassium nitrate has no electrical conductivity. But after being heated to a molten state, its chemical bonds will be broken and free particles with conductivity (K^+ and NO_3^-) will be produced. Potassium nitrate melting point is 334 ℃, and it will be decomposed meanwhile oxygen will be released if above 400 ℃ .

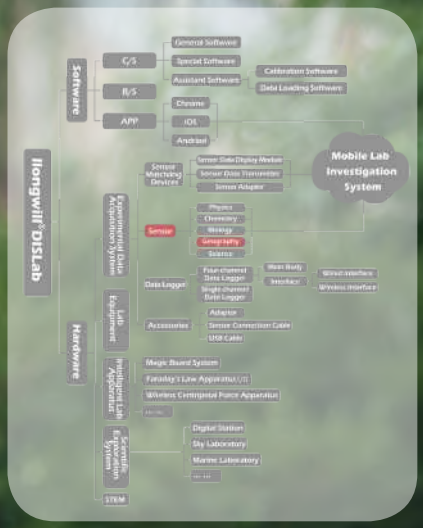
► Apparatus and Reagents:

llongwill® data logger, current sensor, high-temperature sensor, crucible, alcohol lamp, graphite electrode, potassium nitrate (solid), wire, general supply etc. (see image right).

Experiment reuslts of Study on the conductivity of molten potassium nitrate (below)

Ilongwill®DISLab Experimental Data Acquisition System

GEOGRAPHY SENSORS



The Composition of llongwill® Geography Sensors:

O_2 sensor (details on P37), pH sensor (details on P27), relative humidity sensor (details on P39), sound level sensor, CO_2 sensor, air pressure sensor, flow rate sensor, wind speed sensor, salinity sensor, soil temperature sensor, soil humidity sensor, surface temperature sensor, GPS sensor, and E-compass sensor (details on P24).

Air Pressure

LW-W3103
Range:550~1060hPa
Resolution: 0.1ppm

Sound Level

LW-Y805
Range:20dB~120dB
Resolution: 0.1dB

GPS

LW-W3115
Range:
E 0~180° W 0~180°
S 0~90° N 0~90°
Resolution: 0.00001°

CO_2

LW-B806
Range:0ppm~5000ppm
Resolution: 1ppm

Surface Temperature

LW-W3112
Range: -50℃~+130℃
Resolution: 0.1℃

Flow Rate

LW-W3116
Range: 0m/s~4m/s
Resolution: 0.01m/s

Soil Temperature

LW-W3113
Range: -40℃~+60℃
Resolution: 0.1℃

Wind Speed

LW-W3106

Range:
0.3m/s~45m/s
Resolution: 0.1m/s

Soil Moisture

LW-W3111
Range: 0~100%
Resolution:
0.1%

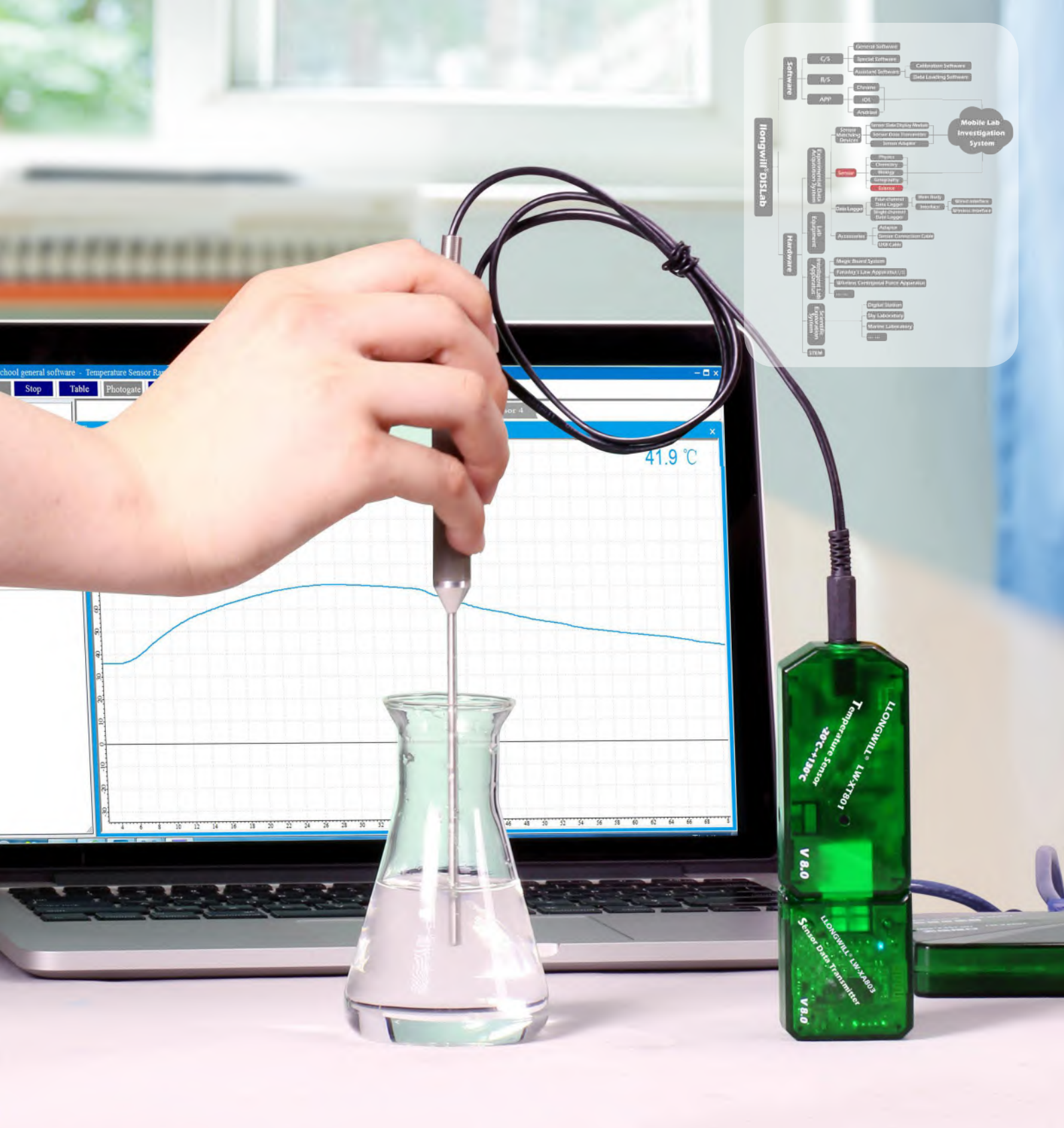
Salinity

LW-C815
Range: 0~10ppt
Resolution:
0.001ppt

Building Digital Geographic Measuring Tool Kits

With the llongwill® geographic sensors, you can build digital geographic measuring tool kit. It combines certain geographical data collection, transfer, storage and statistical analysis together, and it mainly consists of following five parts:

► Sensors——see the introduction on the left.
► Data logger——data logger equips the wired interface and wireless interface .
► Computer and data display module (more details on P9).
► Digital Geographic Field Kit software.
► Accessories ——a charger, connecting wires, a portable power supply, data cables, and sensor cables.



Ilongwill®DISLab Experimental Data Acquisition System

PRIMARY SCHOOL SCIENCE INQUIRY KIT

llongwill® Inquiry Tools Package for Primary School

llongwill® DISLab is specially designed based on the science curriculum of primary school, including Mechanics, Heat, Sound, Optics, Electricity, Magnetic, Chemistry and Life Science I,II.

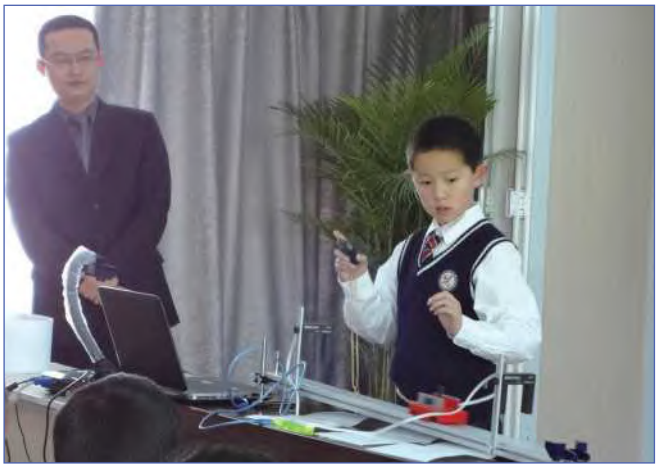
Mechanics

Including force, photogate, displacement sensors, etc.

Typical Applications:

· Whether the buoyance exerts on a sinking object
· Frictional force
· Inclined planes will reduce the force used
· Study on leverage and pulley
· Comparison of the velocity of small carts
· The secret of Simple pendulum

Experiment of simple pendulum using photogate sensor



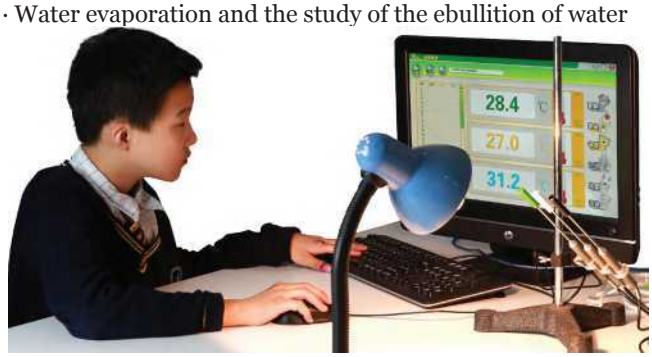
Comparison of the velocity of the small carts

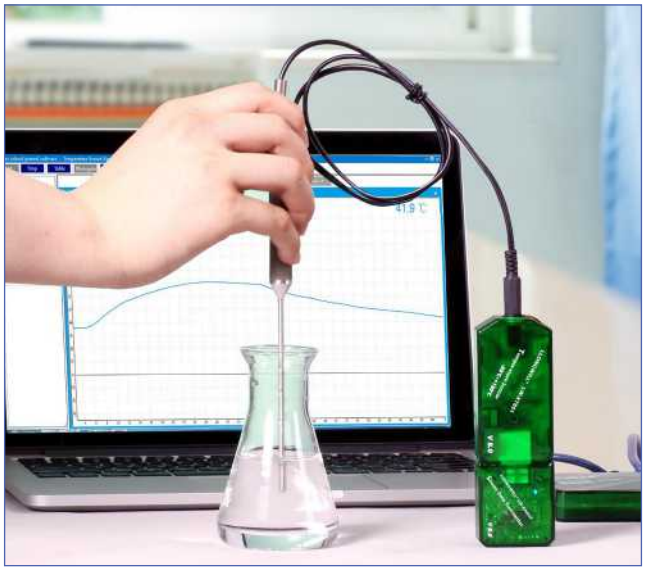
Heat

Including temperature, high-temperature, IRT, pressure sensors, etc.

Typical Applications:

· Measure the temperature change of water
· Friction generates heat
· Comparison of the thermal conductivity of different materials
· Comparison of the heat absorption capability of materials with different colors (below)
· Water evaporation and the study of the ebullition of water





Temprature change during water cooling

Sound

Including sound, sound level sensors

Typical Applications:

The three elements of sound; study on the relationship between the distance of sound source and sound intensity; the comparison of the noise during daytime and night; compare the soundproof effect of different materials.

Sound wave observation, the results as below

Light

Including illumination, dual-range illumination sensors, etc.

Typical Applications:

· Light travels in a straight line
· Light reflection of objects with different colors

The role of magnifying glass

Experiment of light reflection ability of objects with different colors, the results as below

Electricity

Including current, voltage, micro current, multi-range current, multi-range voltage sensors, etc.

Typical Applications:

Study on the electronic conductivity of different materials; fruit battery; why does the light bulb glow; the function of fuse; thermoelectric power generation; study on the solar battery; the connection of simple circuit; the measurement of normal circuit; energy conversion; the comparison of new and used battery; the ubiquitous electricity; electrical conductivity of glass items; electrical conductivity of pure water; current of human body; human power generation; magical electroplating; the principle of electromotor; magnetism produced by electricity; heat produced by electricity; installation of buzzer; study on the thermal radiation; study on electrostatic, etc.

Experiment of light reflection ability of objects with different colors, the results as below

Magnetic

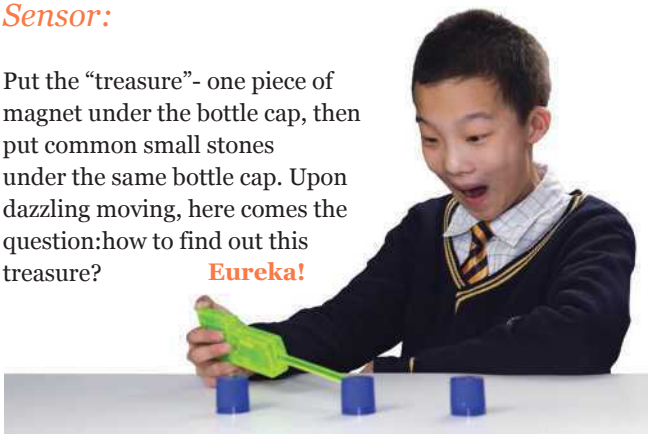
Including magnetic induction, current , voltage sensors, etc.

Typical Applications:

The magnetic intensity at different parts of a magnet; the change of magnetic force; electromagnet; electricity and magnetism; the magnetic field of earth; electricity produces magnetism and magnetism produces electricity; the magnetic line; the common of different electronic appliances; where are the magnetic items in the electronic appliances? Which is the strongest magnet? How to identify common metals and non-metals? The usage of the magnet attraction and repulsion; magnetic levitation DIY, etc.

Treasure Hunting by Magnetic Induction Sensor:

Put the “treasure”- one piece of magnet under the bottle cap, then put common small stones under the same bottle cap. Upon dazzling moving, here comes the question:how to find out this treasure? **Eureka!**



Life Science Ⅰ

Including temperature , pH, conductivity , chroma , turbidity , relative humidity, pressure sensors, etc.

Life Science Ⅱ

Including temperature, pH, conductivity, chroma, turbidity, relative humidity, pressure sensors, etc.

Typical Applications:

· The composition of the air
· Compare the air content and the exhaled gas content

To measure the heart rate using sensor

Measuring results of heart rate

Chemistry

Including pH, conductivity, high-temperature, chroma, turbidity, O_2 and CO_2 sensors, etc.

Typical Applications:

· Research of drinking water
· Observe the change of the milk
· The change of candle burning

Extensive Applications:

· Measure various kinds of bottled water
· Salinity measurement between different water sources
· Compare the pH values of juice and milk
· The water suitable for fish

Learn to use pH sensor

Measuring results of pH value of bottled soda water

Ilongwill®DISLab Lab Equipment

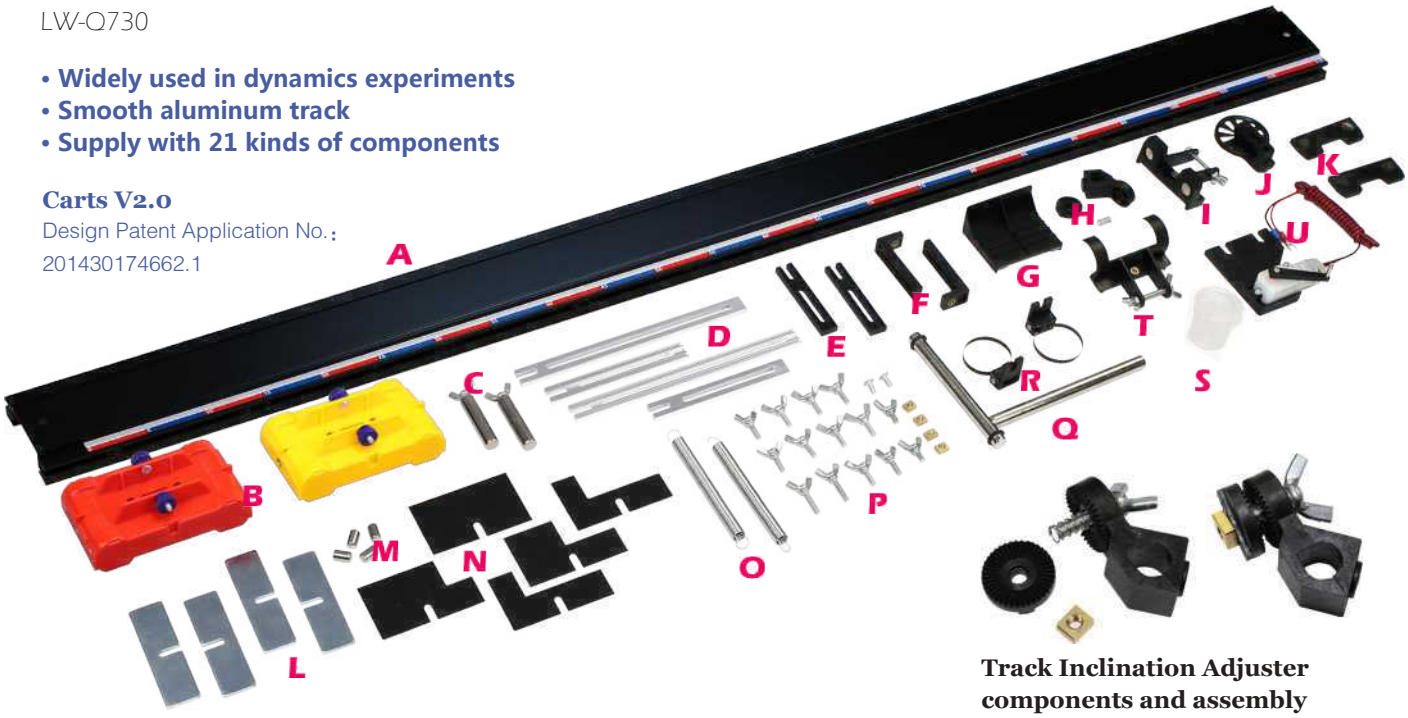
Innovative Design, Precision Manufacturing, Gaps Filling, and Comprehensive Improvement of Laboratory Equipment

llongwill® Multi-purpose Mechanical Track System V2.0

LW-Q730

- **Widely used in dynamics experiments**
- **Smooth aluminum track**
- **Supply with 21 kinds of components**

Carts V2.0
Design Patent Application No.:
201430174662.1



Track Inclination Adjuster components and assembly

System Composition of llongwill® Multi-purpose Mechanical Track:

A. Track, B. Carts (red, yellow), C. Fixed Rod, D. I-type Bracket (Aluminum), E. I-type Bracket (Plastic) , F. L-type Bracket, G. Friction Block, H. Track Inclination Adjuster, I. Magnetic Bumper, J. Pulley, K. Magnetic Sheet, L. 50g Weight Block, M. 5g Weight Block, N. Light Blocking Sheet in width of 20,40,60,80mm O. Springs, P. Fasteners, Q. T-type Track Support, R. Elastic Metal Ring, S. Bucket with String, T. Cart Absorber, U. Motor for forced vibration.

Typical Applications:

Research uniform linear motion; measurement of instantaneous velocity; measuring acceleration from *v-t* figure; Newton's Second Law; comparison of kinetic energies; theorem of momentum of variable force working; measurement of average velocity; relation between average velocity and instantaneous velocity; measurement of acceleration; theorem of momentum (constant force); work and energy; momentum conservation law; kinetic energy in the collision; conservation of mechanical energy (inclined track method), forced vibration and electromagnetic damping, etc.

Installation and Use of llongwill® track carts V2.0:

Track cart is the key equipment of mechanical track system. Refer to image below about its installation specifications.

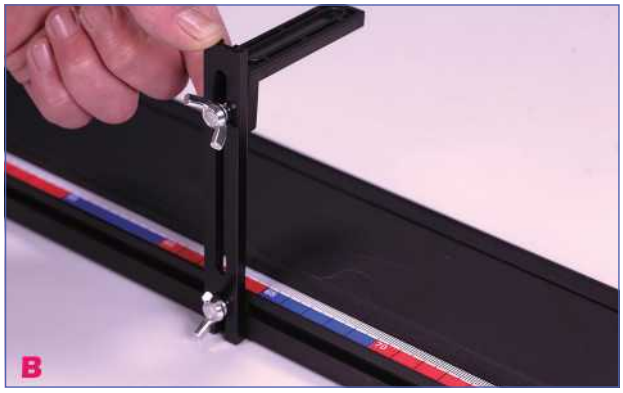
A. The cart wheels are above the bottom bodywork of, so it is only applicable to llongwill® track; B. Fix the emitter of displacement sensor (separated) on cart by using butterfly bolt through the hole reserved in the cart; C. Install light blocking sheet on the side of the cart, then tighten the bolt; D. Install the weight block on cart-insert the weight block on the side of cart, then tighten the bolt; E. Install magnetic sheet on the front or end of the cart by using screwdriver; F. Install the elastic metal ring on the front or end of cart by using screwdriver.

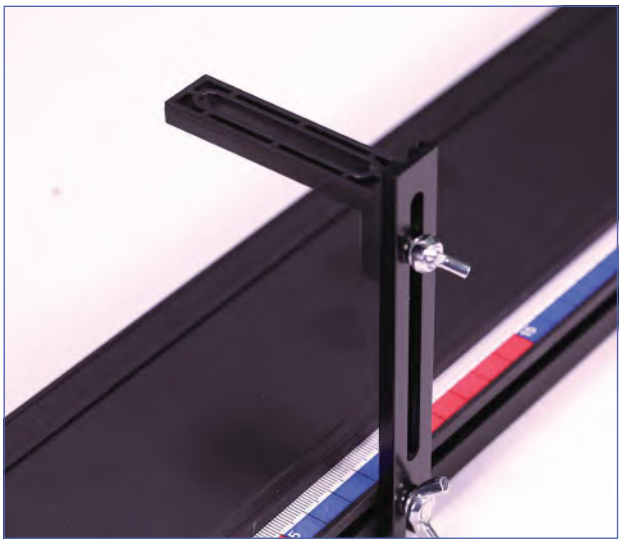
Installation and Use of T-type Track Support, Pulley and Fixed Leg:

G. the first step for assemblling T-type track support is to install track inclination adjuster, and it will be longitudinally inserted into guide slot from track port through the rectangular copper nut in the frond end of butterfly bolt of regulator teeth; H. To Assemble the track inclination adjuster, and then insert the rectangular copper nut of it into the guide slot on one side of the track; l. Install the cart absorber onto the end of the track, then install the pulley onto it; J. Install the fixed rod at the other end of the track to fasten spring or force sensor.

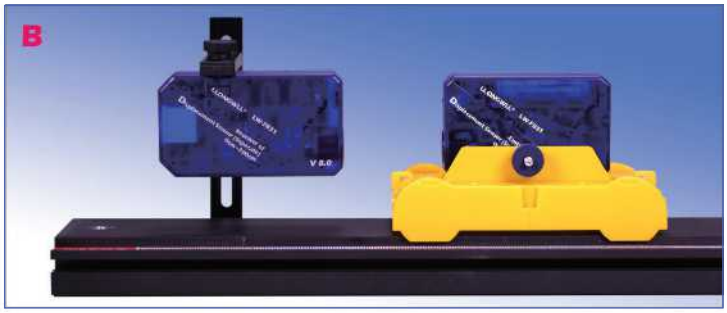
Assembly of Accessories:

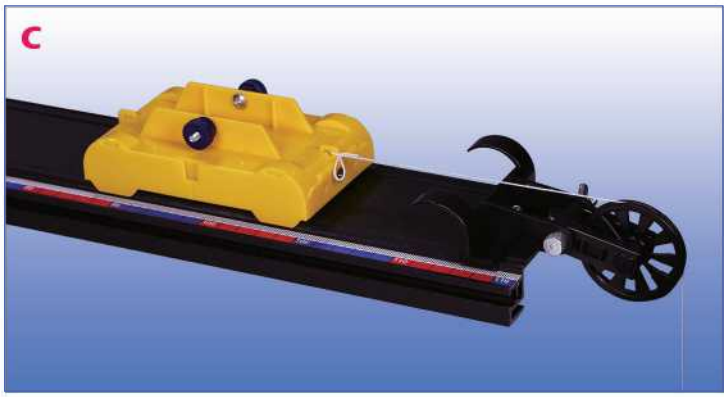
A. Mount I-type bracket on track. Many experimental facilities can be installed based on this bracket;
B. Mount L-type btacket onto I-type bracket;
C. Hoist the receiver of displacement sensor (separated); The ultrasonic export of receiver and emitter shall be aligned;

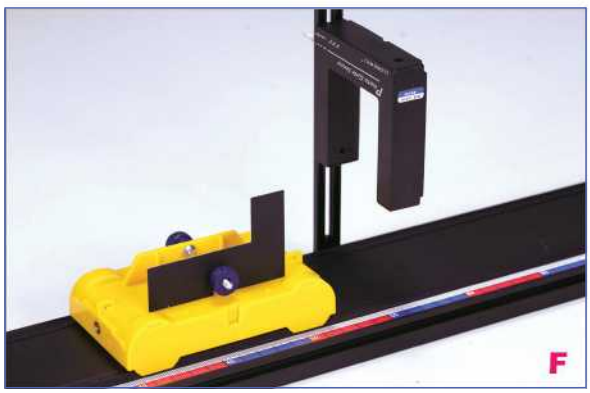




E. Mount force sensor onto fixed leg. The hook should be kept in a straight line with a spring or rope hanging from the hook;
F. Mount the photo gate sensor onto I-type bracket, and adjust the height of photo gate, ensuring the cart with light blocking sheet can go through it smoothly.

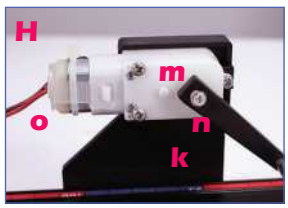


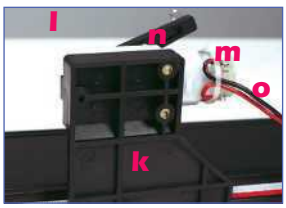


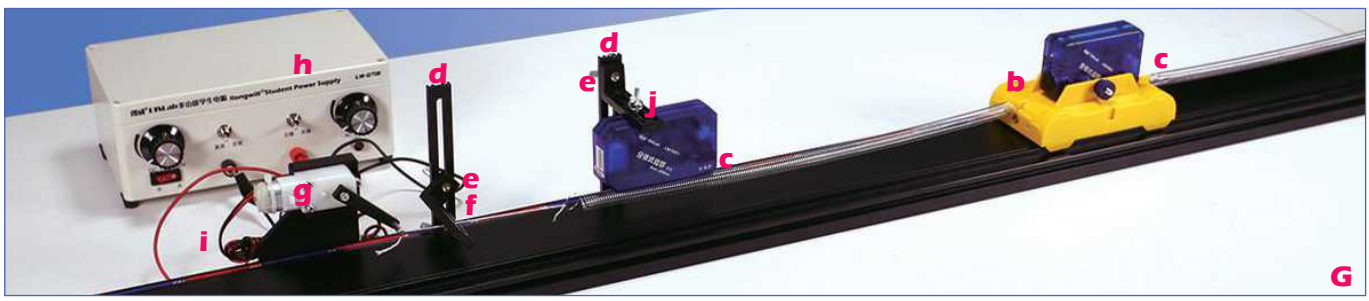


Assembly and applications:

A. B. The application of displacement sensor (separated); C. “Newton's Second Law”; D. The momentum theorem experiment under variable force; E. Damped vibration experiment— separately connect the two ends of cart with two springs fastened in the fixed rods on track; F. Determination experiment of instantaneous velocity by using light blocking sheet on cart; G. Composition of forced vibration experiment: a. Track, b. Cart, c. Spring, d. I-type bracket, j. Displacement sensor (separated); H. I. Components of forced vibration driving system (motor)—k.Assembly plate for motor; m.9V motor, n. Rocker arm, o. Power cable.







llongwill® Centripetal Force Apparatus V2.0

LW-Q859

- **Study the centripetal force and angular velocity in circular motion**
- **Using Force Sensor and Photogate Sensor (H,I in below figure)**

Utility Model Patent No.: ZL200720017884.7

Curve of relationship between centripetal force *F* and angular velocity ⍵

Experiment fitting curve (*F-m*) between the centripetal force and the mass

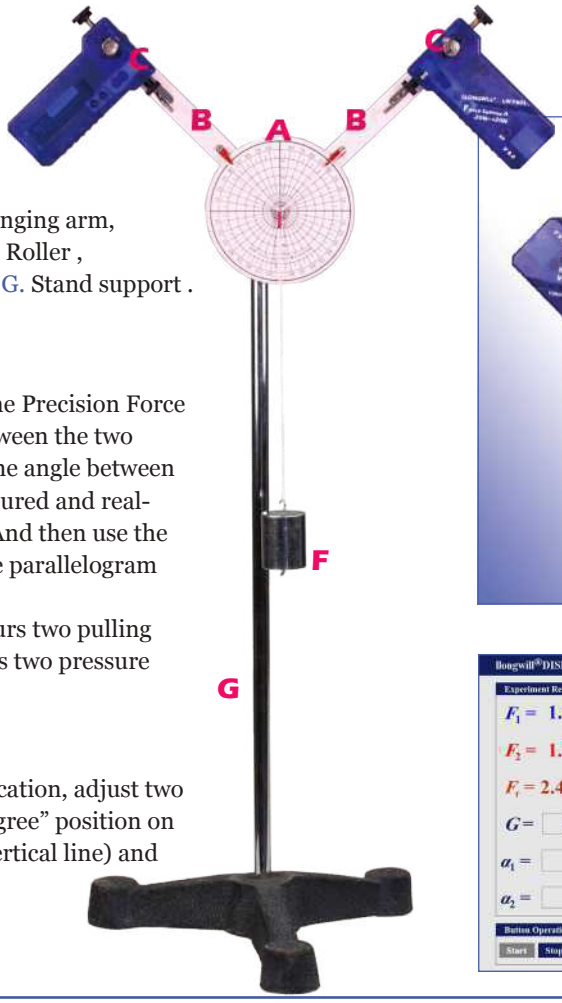
Components of llongwill® Centripetal Force Apparatus:

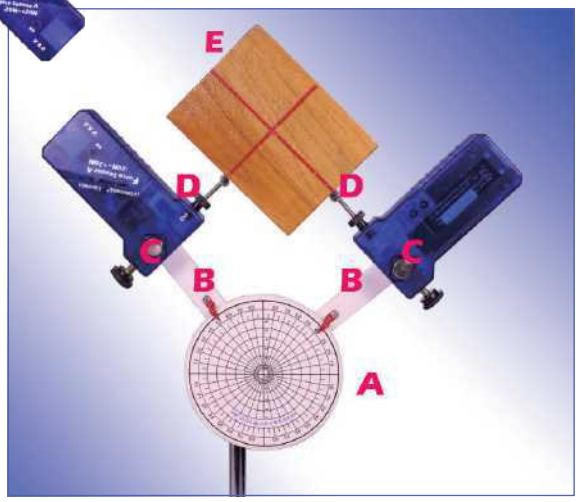
A. Main Frame, B. Base, C. Rotating Arm, D. Connecting Device (a bolt connected with the force sensor, a vertical rod and a horizontal rod), E. Weight , F. Light Blocking Rod, G. Fasten bolt: a bolt connected with the force sensor.

llongwill® Force Resolution and Composition Apparatus

LW-5305

Utility Model Patent No.：ZL200920226468.7





Components:

A. Precision Force Disc, B. Hanging arm,
C. Force Sensor Fixed Rod, D. Roller ,
E. Standard Block, F. Weight, G. Stand support .

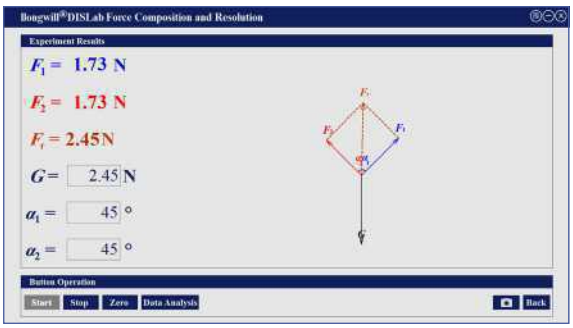
Working Principle:

Mount two force sensors on the Precision Force Disc, and adjust the angle between the two force sensors. The force and the angle between two force sensors can be measured and real-time displayed by computer. And then use the calculation result to verify the parallelogram rule.

The device on the left is measurs two pulling force. The right one is measurs two pressure force.

Notes:

Zero Calibration: before application, adjust two stern brackets to the “Zero degree” position on the Force Disc (parallel to a vertical line) and click “Calibration” button.

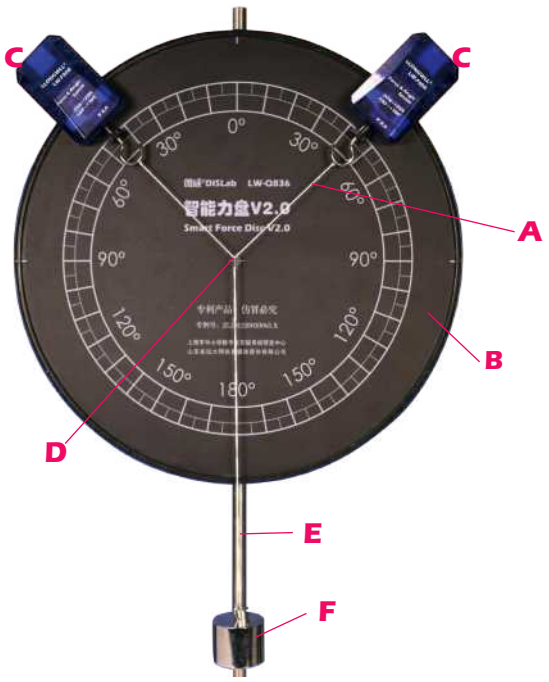


llongwill® Smart Force Disc V2.0

LW-Q836

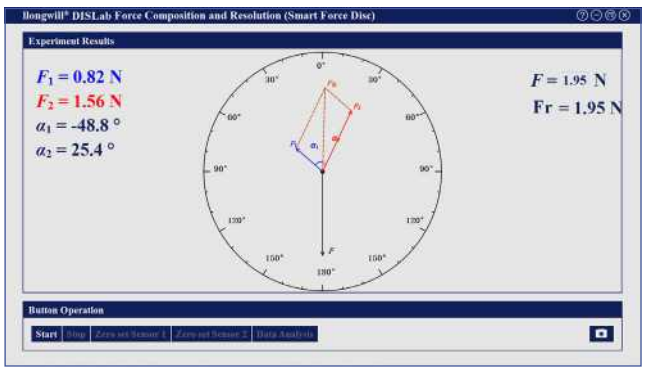
Utility Model Patent No.:ZL201220020063.X

• Intelligent apparatus used with Force&Angle Sensor.
• Real time obtain the angle data automatically, instead of manual input operation



Components:

A. String, B. Precision Force Disc, C. Force&Angle Sensors,
D. Fixed Sheath for string , E. Stand support, F. Weight .



Experiment interface of force decomposition by using Smart Force Disc

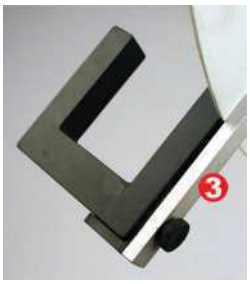
llongwill® Conservation Law of Mechanical Energy Apparatus I

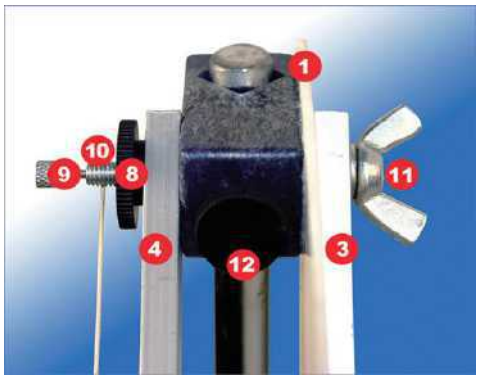
LW-5304

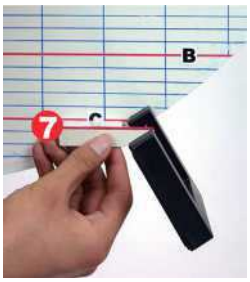
IUtility Model Patent No.: L200720017881.3

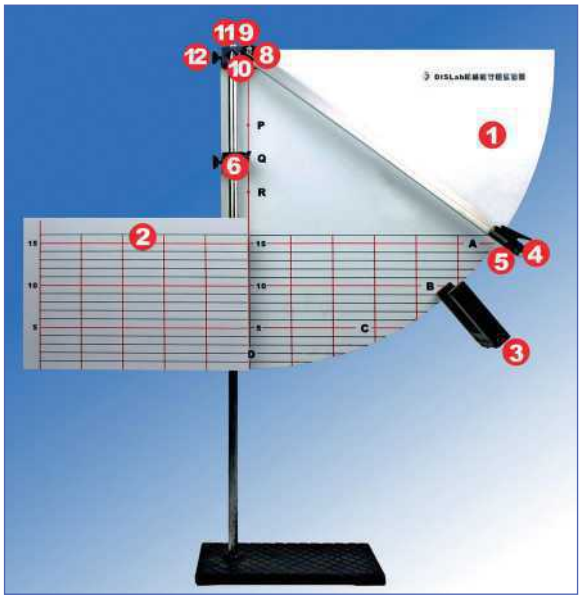
- **Verify the Conservation Law of Mechanical Energy.**
- **Using Photogate Sensor.**

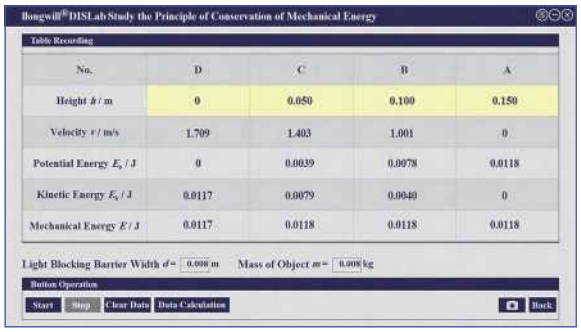
1 · Main Board
2 · Subboard
3 · Fixed Arm for Photo Gate
4 · Fixed Arm with magnetic clamp
5 · Pendulum Bob (include cord)
6 · Position Stop
7 · Planometer
8 · Central Nut
9 · Central Bolt
10 · Fixed Bolt for Pendulum String
11 · Butterfly Bolt
12 · General Bolt



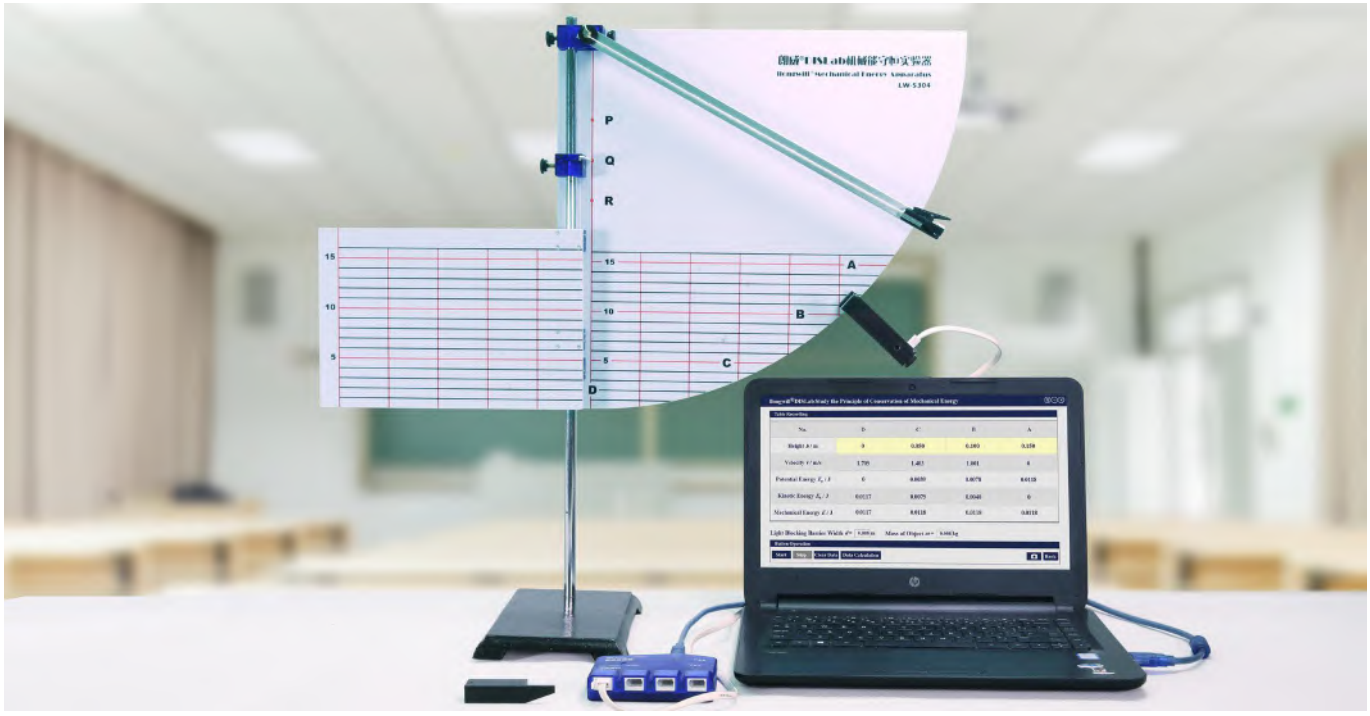








Verification of the Conservation Law of Mechanical Energy



llongwill® Action and eaction Apparatus

LW-Q862

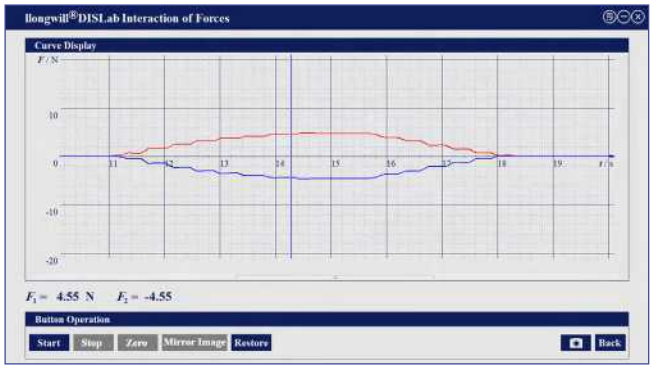
Components:

A. Base B. Sliding platform C. Distance adjusting knob D. Fixing bolt E. Fixing post F. Rubber band

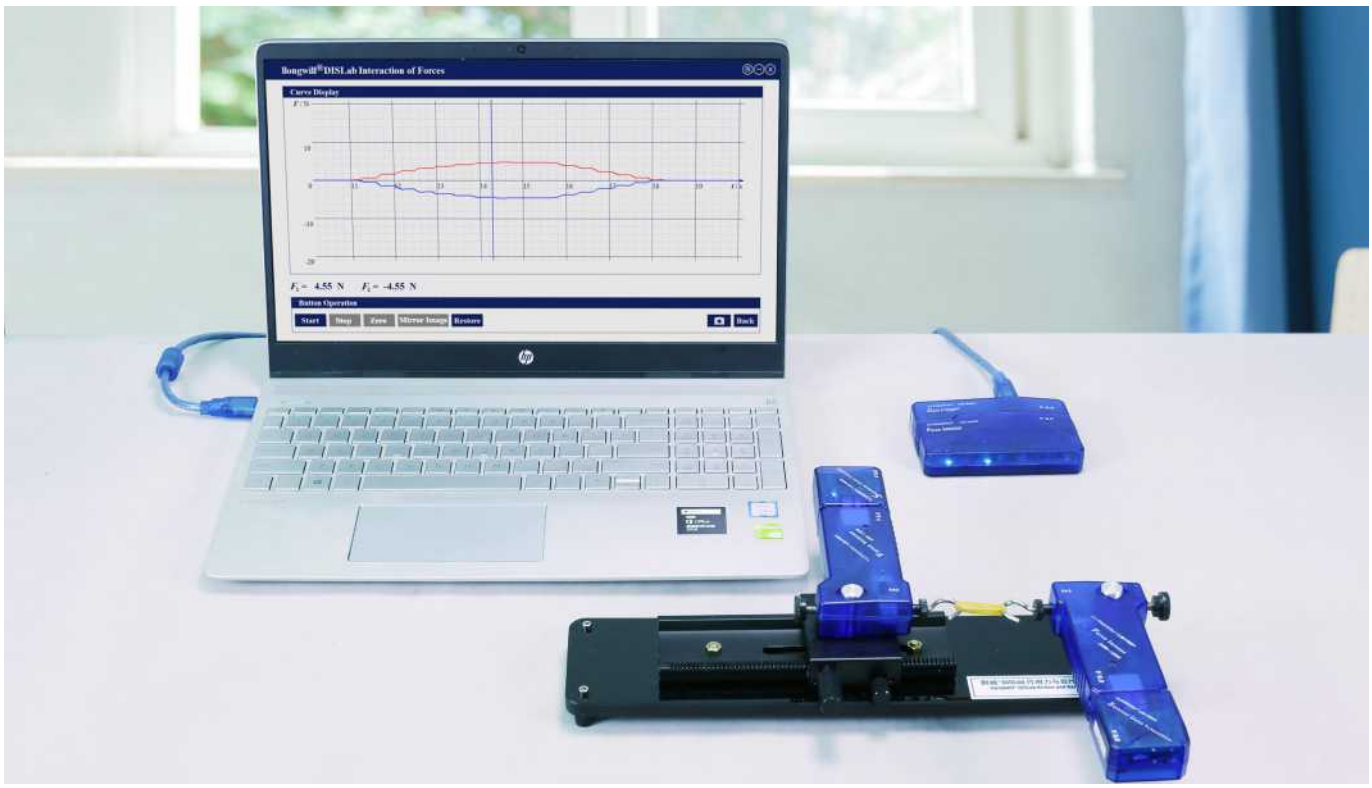
The principle statement of Newton's third law is that: for every action (force) in nature there is an equal and opposite reaction. The law was proposed by Isaac Newton in 1687 in the book "Mathematical Principles of Natural Philosophy". Newton's third law of motion, together with the first and second laws, constitute Newton's law of motion, which explains the basic laws of motion in classical mechanics.

Apparatus:

Open the physics specific software "Force Interaction", turn the distance adjusting knob to adjust the position of the force sensor, and observe the changes of the measured values of the two force sensors by moving the force sensor on one of the fixing posts. The experiment results show the changes in two *F-t* graphs(below); click "Restore" and it can be found that the two *F-t* graphs basically coincide(lower graph), indicating that the action force is equal to the reaction force.



Force interaction mirror curve(above) and reduction curve(below)

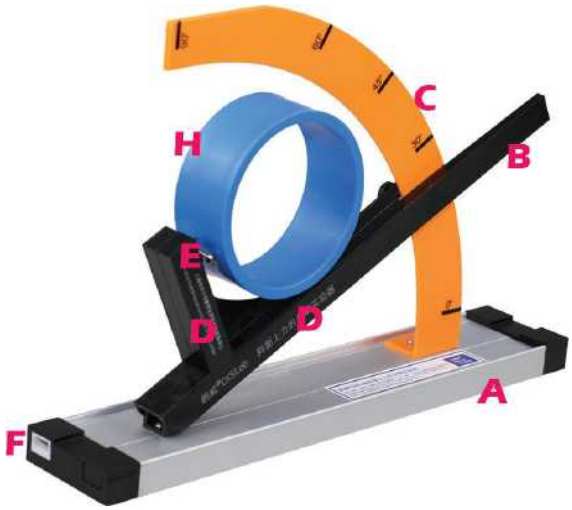


llongwill® Force Resolution on Inclined Plane

LW-Q721

Utility Model Patent No.:ZL200720017883.2

- **Sensors built-in design**
- **Simplify the study on force resolution obviously**



Components:

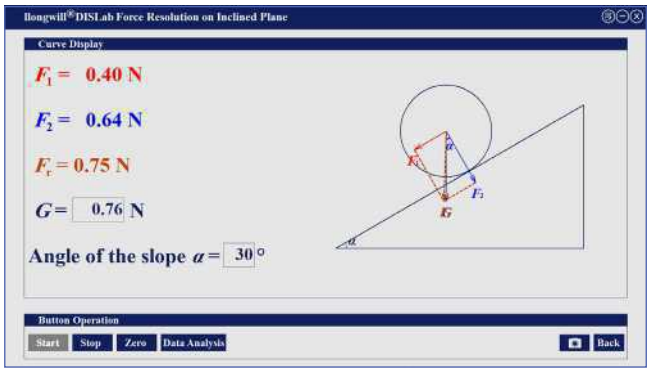
A. Base
B. L-type Rotating Arm,
C. Angle Scale
D. Build-in Force Sensors —one in the long arm and the other in the short arm
E. T-type Rollers assembled on the top of force sensors
F. Cable Port for connecting with data logger
H. Plastic ring used as a measured object

Principle and Operation:

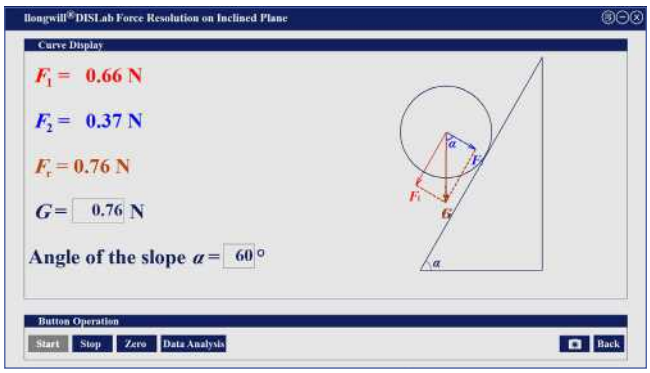
Lay the plastic ring on the T-type rollers on the top of two force sensors stably; change the inclined angle between L-type rotating arm and base; then the change of the readings of two force sensors can be observed. Parallelogram rule can be verified by substituting sensors data and the angle of any position during 0°~90° process into the formula.

Notes:

when the angle between spiral arm and base is greater than 0°, the bolt shall be tighten and fasten the rotating arm on the angle scale.

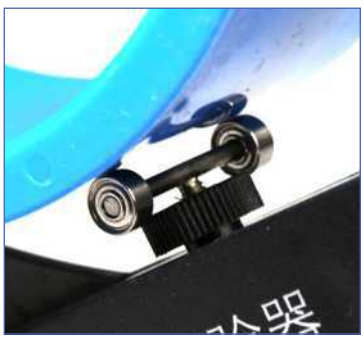


The readings of two force sensors at 30°angle



The readings of two force sensors at 60°angle

T-type roller collected in L-type rotating arm shall be vertical with rotating arm, and the horizontal side of T-type shall keep level with rotatingl arm where it locates and to completely touch to ring pieces.

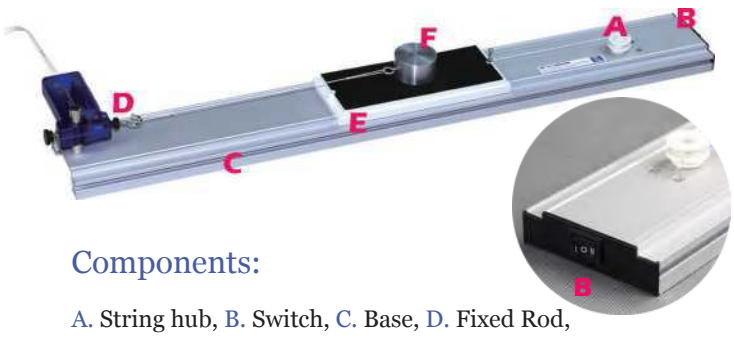


llongwill® Friction Apparatus

Utility Model Patent No.:ZL200720017883.2

LW-6341

- **Study the static friction and sliding friction.**
- **Built-in traction motor**



Components:

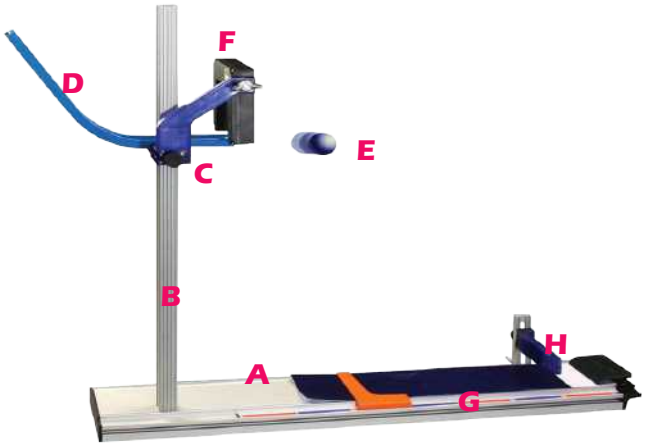
A. String hub, B. Switch, C. Base, D. Fixed Rod, E. Friction Layer, F. Friction Block.

Study on the Maximum Static Friction Force

Relationship curve between friction force F and positive pressure of friction block

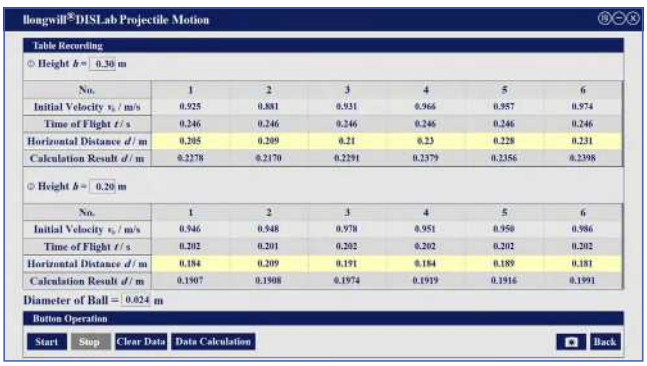
llongwill® Projectile Motion Apparatus

LW-Q722



Components:

A. Base, B. Bracket, C. Adapter, D. Track, E. Ball, F. Photo gate, gives the signal of timing end, G. Built-in touch sensor-gives the signal of timing end,H. Magnetic Absorber—with built-in magnet, used to absorb the falling ball, I. Cable port for touch sensor built-in the base.



Experiment results of Horizontal Projectile Motion

Operation:

As shown in the above figure, when the ball is released from the same height for several times, if the flying time of it in each fly is quite close, it means that the experiment operation is quite good, and the motion of the ball in horizontal direction is the uniform linear motion can be verified.

The quantitative relationship between flying time and the height of the track end will be found out by changing the height of the track and comparing the experiment results, the motion of the ball in vertical direction is the free fall motion can be verified too.

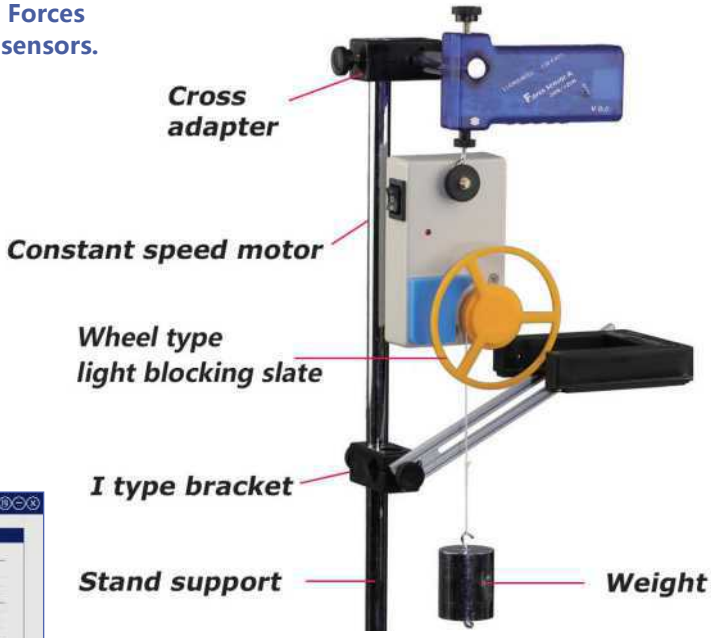
llongwill® Equilibrium of Two Forces Apparatus

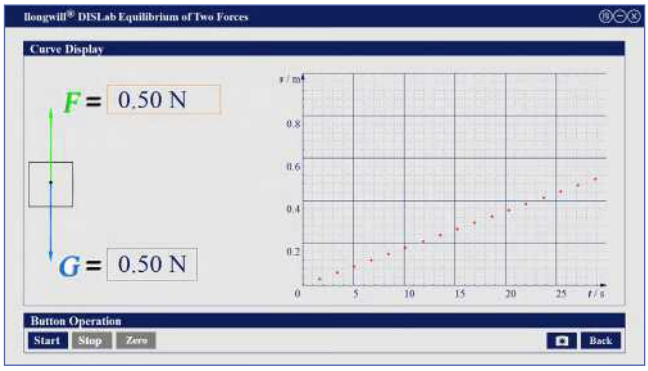
LW-Q725

- **A standard physics model of Equilibrium of Two Forces**
- **Work with stand support, photo gate and force sensors.**

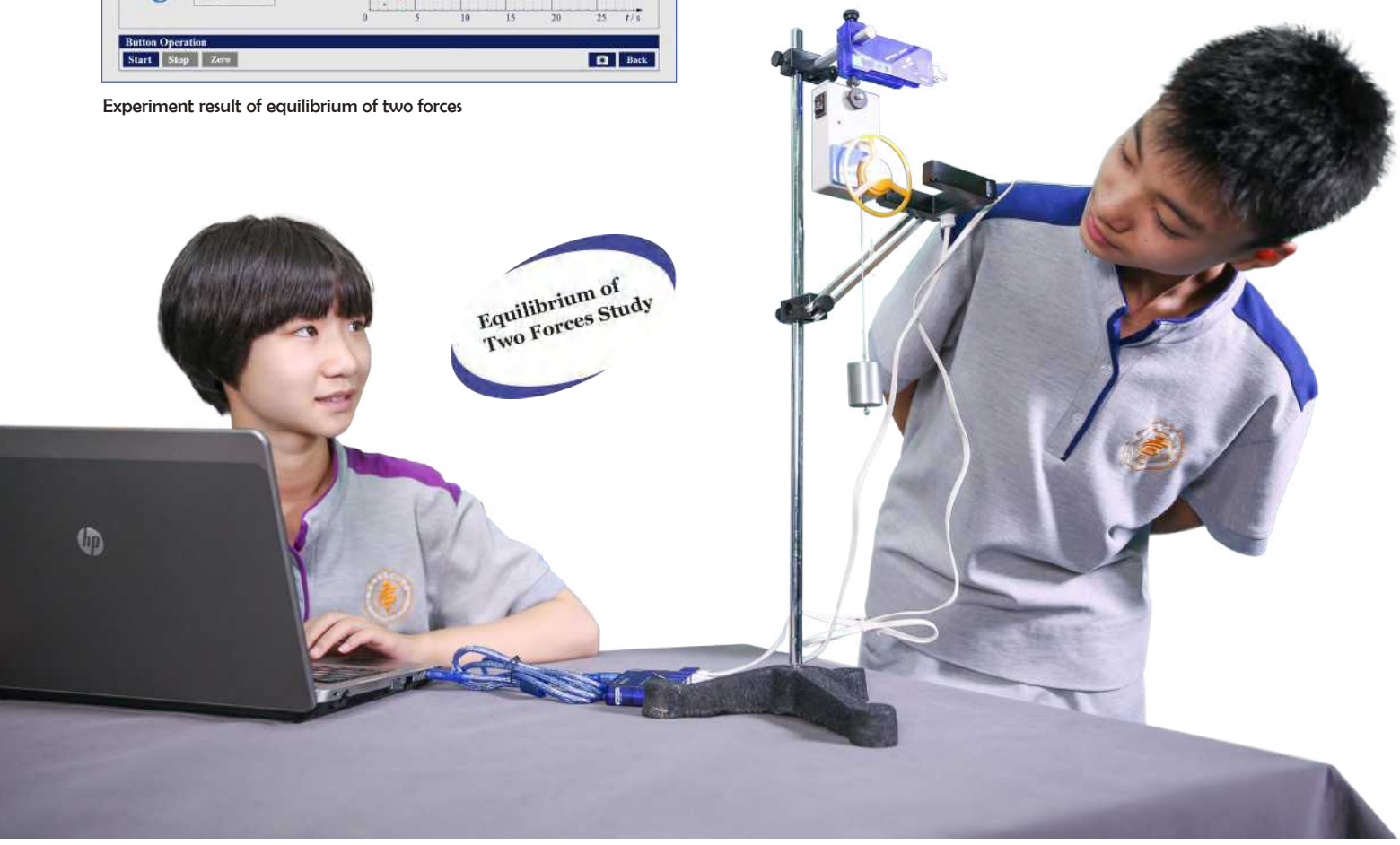
Working Principle:

Fix the constant speed motor under the force sensor; it will drive the weight to go up and down. During working, it drives the wheel-type light blocking sheet rotating through the photo gate, and the speed of the weight can be measured. If the reading of the force sensor and the speed of weight going up and down keep constant, the Law of Equilibrium of Two Forces can be verified.





Experiment result of equilibrium of two forces

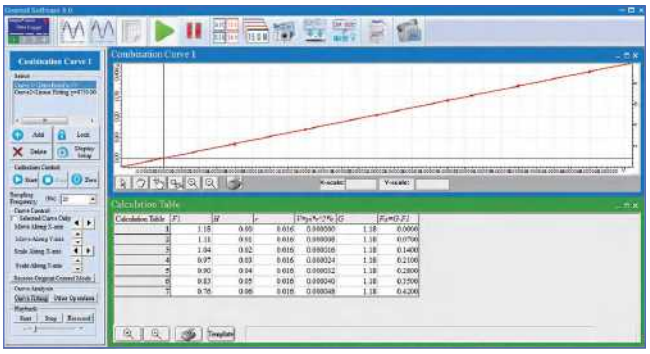


llongwill® Archimedes' Law Apparatus

LW-6327

•To measure the buoyancy acted on the sinking object

The Archimedes's law apparatus is a classic physics model including a dedicated block (consisting of five aluminum cylinders in series, each cylinder has the same bottom radius of 1cm and the same height of 1.1cm, shown as 1 in figure below), a beaker (2 in figure below), an adapter, a horizontal rod, and a stepless adjustable lifting platform (3 in figure below).

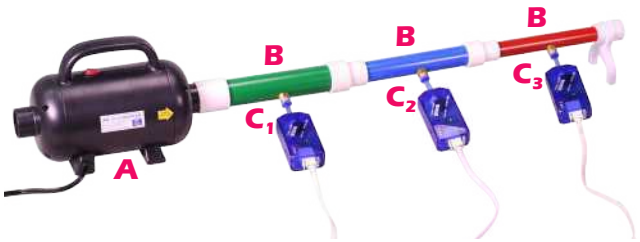


Real-time Experiment results of Archimedes' Law

llongwill® Fluid Pressure Apparatus

LW-Q733

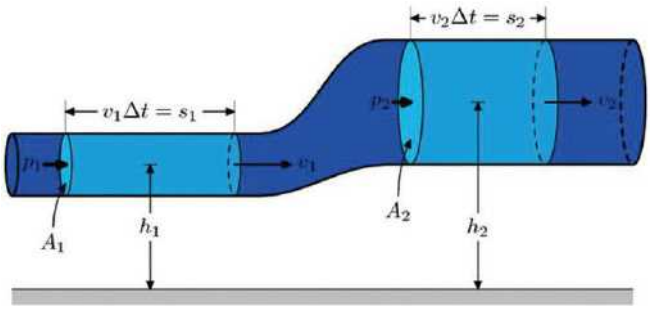
Utility Model Patent No.:201310572342.1



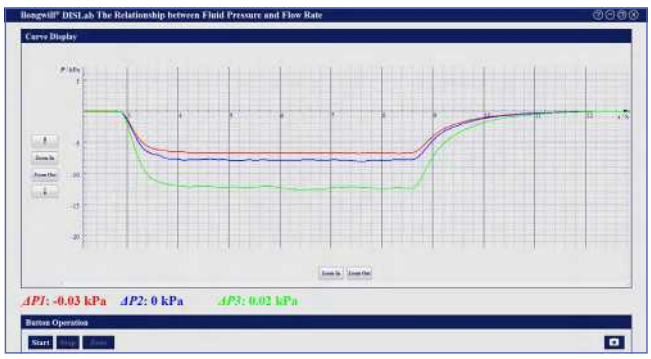
As shown in image above, this apparatus consists of A) gas pump and three-pieces of B) rigid pipes with same length and different diameters, connected in air pump and bayonets with C) locking devices, which can be used to connect with the flexible pipe of relative pressure sensors.

Design Concept:

Fluid Pressure Apparatus is also called "Bernoulli Apparatus".
It is specially designed for demonstrating the Bernoulli's Principle by using with three Relative Pressure Sensors.

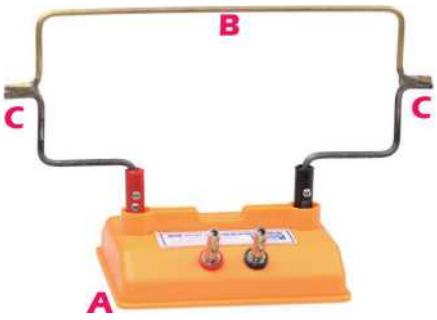


Connect these three relative pressure sensors to the apparatus; run the air pump; set up three " relative pressure-time" curves through "Combination Curve" function in the program; after the gas pump runs stablely , then the experiment result as shown in image below can be obtained. Bernoulli's principle can be primarily verified accordingly.



llongwill® Thermocurrent Apparatus

LW-6329

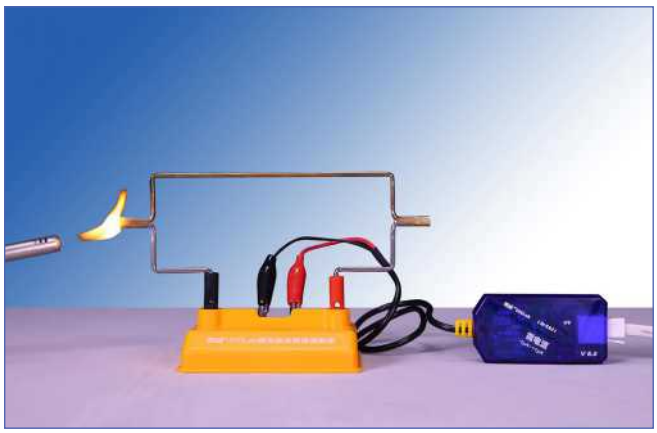


Components:

A. Base
B. Wire Frame (2 kinds of metals)
C. Metal Junctions

Working Principle:

By heating one of the metal junction, the change of temperature will produce micro current in wire frame. By using the micro current sensor, the "Heat-Electricity" energy transfer can be verified (see below).



Thermocurrent apparatus

Experiment result of thermocurrent

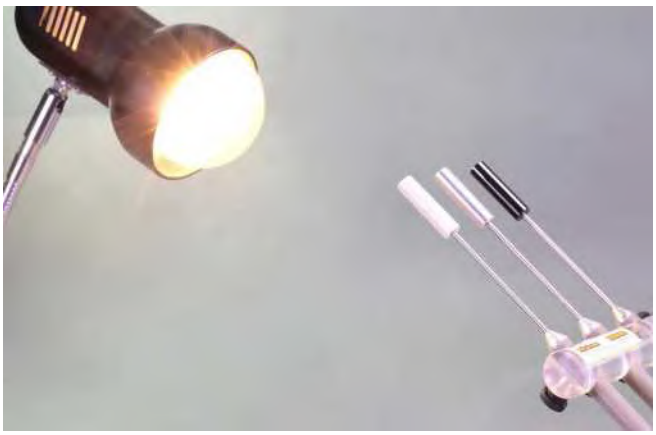
llongwill® Thermal Radiation Absorption Apparatus

LW-Q723

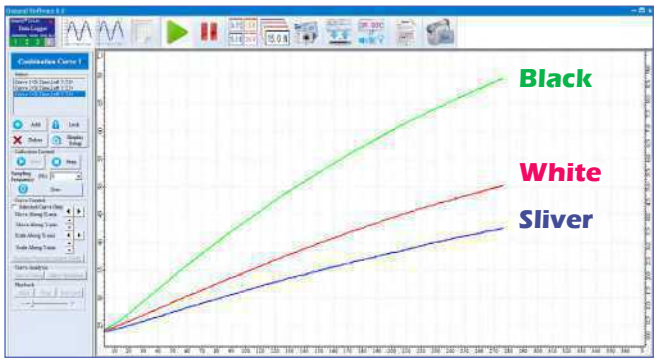
Components:

A1~A3. Block: white, sliver and black
B. Bracket
· It should be used with three temperature sensors.

Different color blocks have different thermal absorption ability. Under the same lighting condition, they will show three different readings.



Thermal radiation absorption apparatus



Experiment result of thermal radiation absorption

llongwill® Far-infrared Heater

LW-5311

Utility Model Patent No.: ZL200720017882.8

Notes:

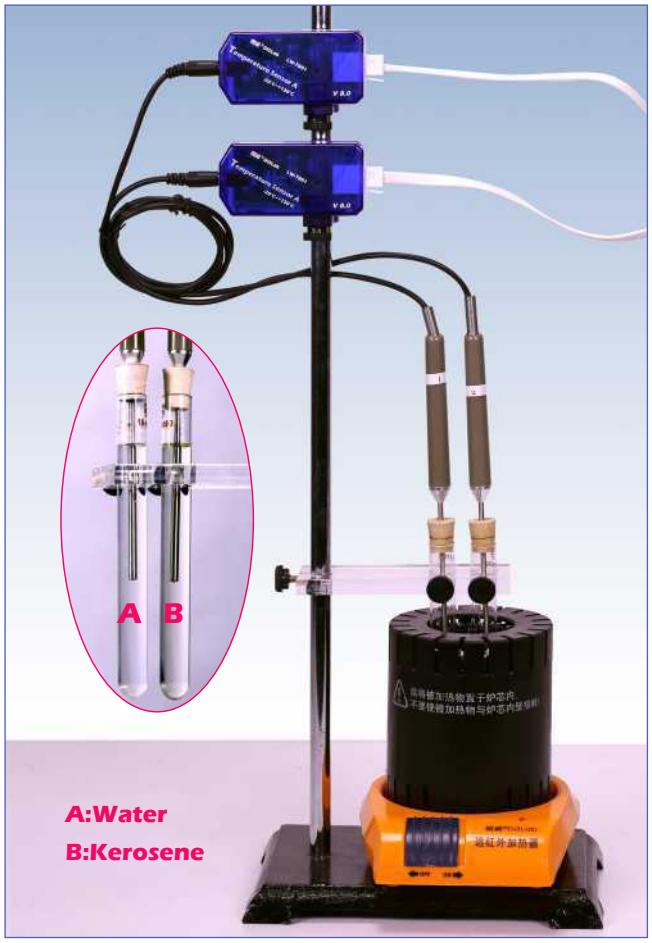
· Please use it for no more than 15 minutes
· Turn the power off after use

Components:

A. Base, B. Far-infrared Ceramic Unit, C. Outer Cover, D. Switch, E. Indicator, F. Power Jack, G.Fuse Tube.

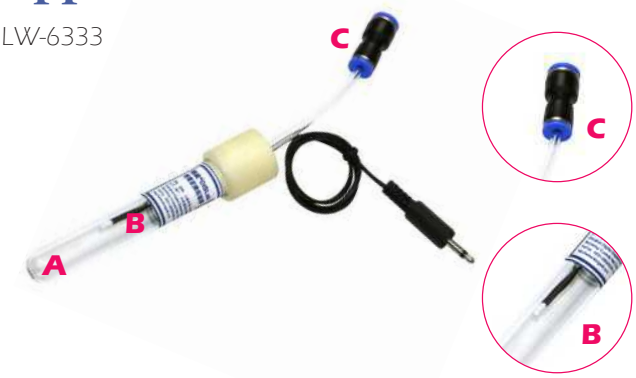
Typical Applications:

· The relationship between ideal gas pressure and temperature
· Specific Heat Capacity (see below)
· Crystal melting and solidification
· Green house effect caused by CO_2



llongwill® Charles' Law Apparatus

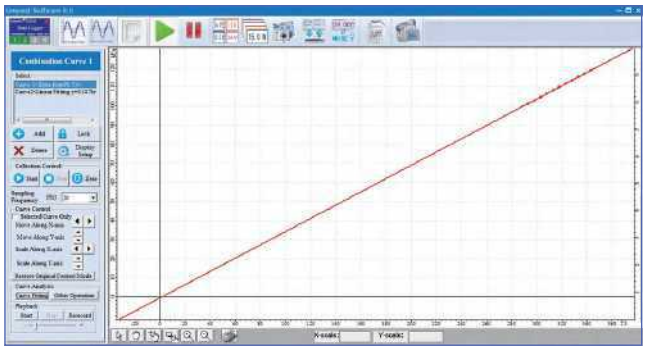
LW-6333



Components:

A. Tube, B. Fast-response Temperature Probe, C. Pressure Sensor Connector.

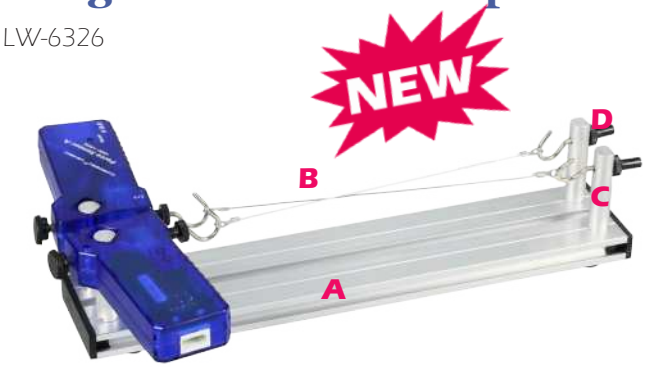
Experiment operation of Charles' Law



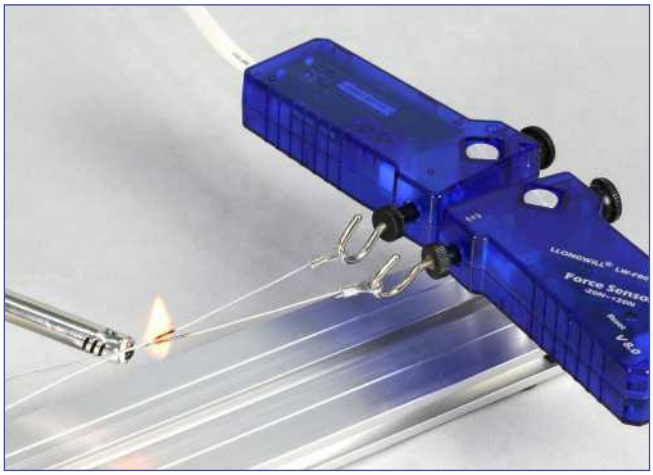
Curve of the relationship between Pressure and Temperature.

llongwill® Thermal Expansion and Contraction Apparatus

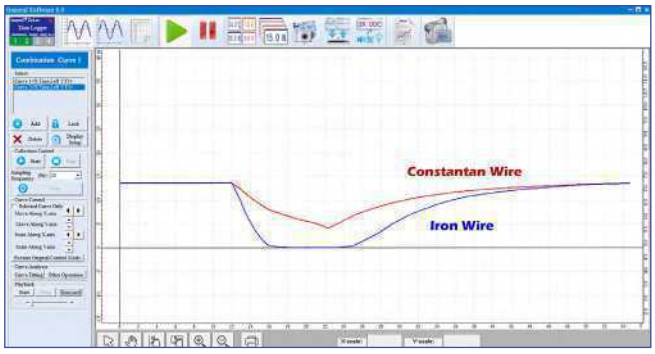
LW-6326



This apparatus can be used as a platform for quantitative study of thermal expansion and contraction. As shown in the right image, it consists of base A, metal wire B, fixed rod C and tension bolt D, force sensor. Pull the metal wire close to the tension bolt in the experiment and observe the reading of sensor; heat the mental wire with the heater, then the declined readings of sensor can be observed; when stop heating, the readings of sensor will rise again. Control the heating time and change metal wires, many parallel experiment curves can be obtained for comparison, which is helpful for teachers to introduce the concept of “thermal expansion coefficient of the metal”.



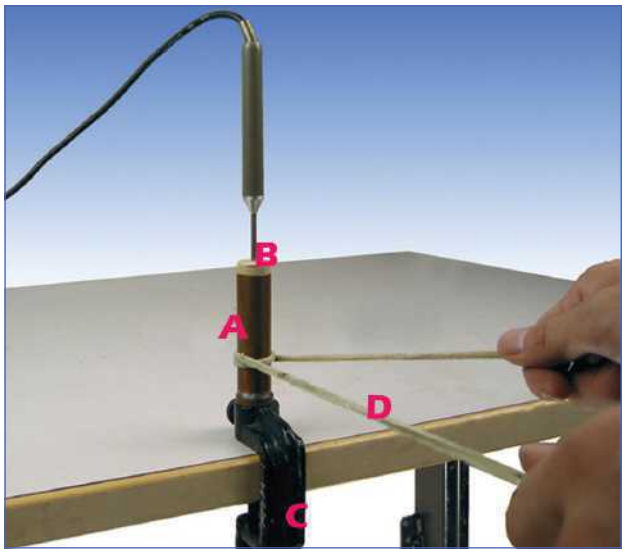
Experiment of thermal expansion and contraction of metal wire



The force curve declined during the wire being heated. It demonstrates the wire's expansion.

llongwill® Frictional Heat Apparatus

LW-6340

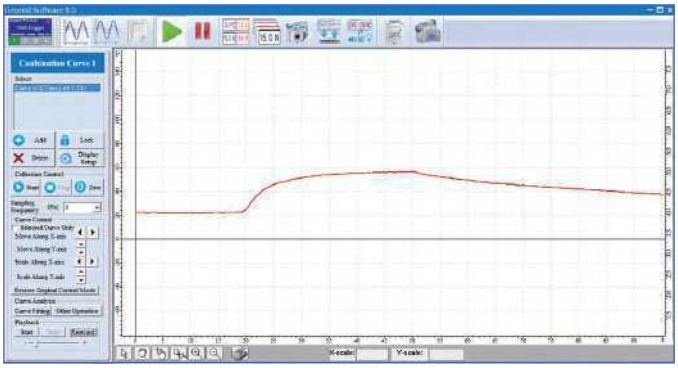


Components:

A. Copper Tube, B. Rubber Plug, C. Clamp, D. Cotton Cord

Working Principle:

Use cord to rub the copper tube quickly, then the temperature in the copper tube will increase. With the temperature sensor, the real-time temperature change can be obtained. It demonstrates the frictional work transfer into the thermal energy.



Experiment results of frictional heat to raise the temperature

llongwill® Work by Compressed Gas Apparatus

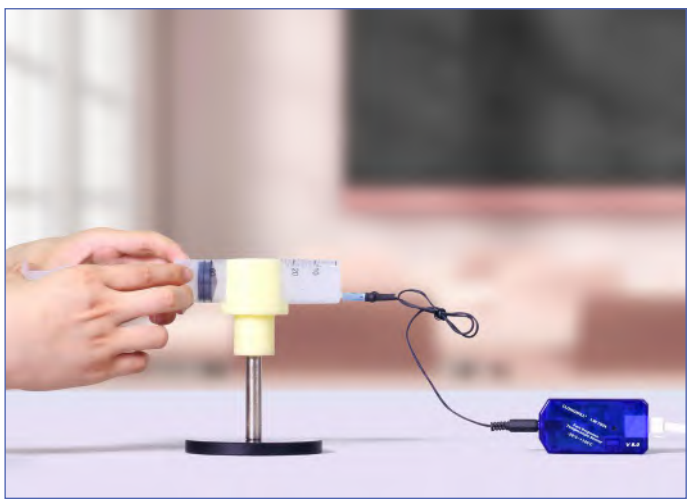
LW-6334

Components:

A. Large Size Syringe, B. Fast response temperature sensor probe, C. Base.

Working Principle:

llongwill®work by compressed gas apparatus is a combination of a large syringe A + a fast response temperature sensor, using a special base C, so that the experiment can be carried out on the desktop.



Work by compressed gas apparatus

Experiment interface of the work by comppressed gas

llongwill® Thermal Radiation Apparatus

LW-6330

• Used to study on the energy transfer between heat and electricity.
•Used with Micro Current Sensor

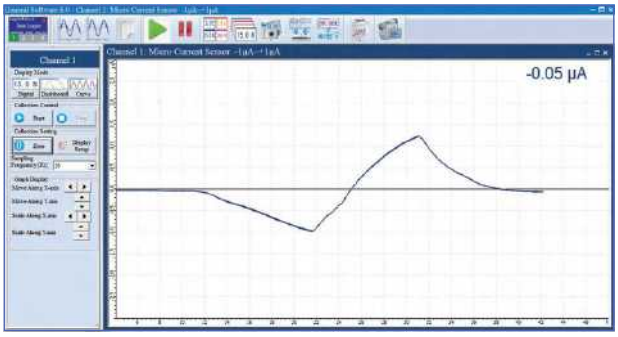
Components:

A. Thermoelectric Sensing Component
B. Specialized Experiment Board
C. Base

Working Principle:

llongwill®thermal radiation apparatus is used with the micro current sensor. The micro current curve increases when the palm is positively facing to the "thermal-electric"core element; the micro current curve decreases and turns to negative, when the palm is positively facing to the other side of the core element.

Thermal radiation apparatus



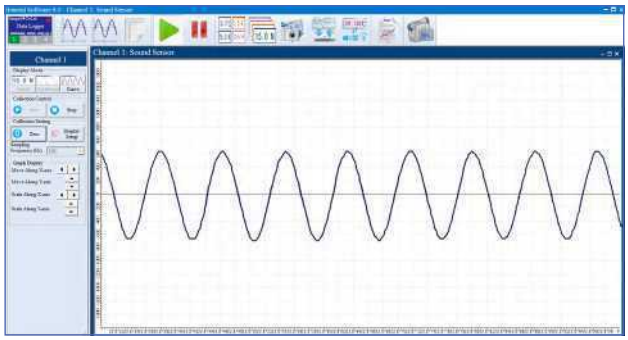
The current changes when the thermal source faces different side of thermoelectric sensing component

llongwill® Audio Signal Generator V2.0

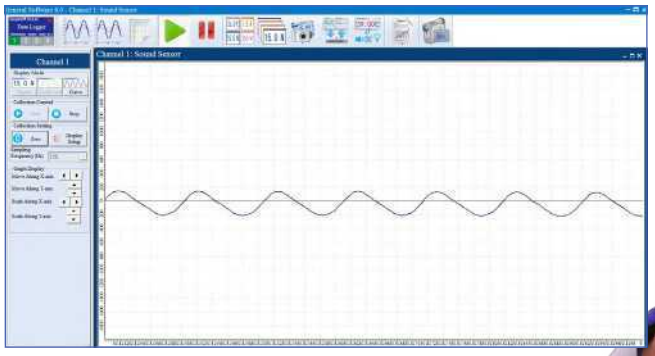
LW-Q709

- Emits soundwave through the build-in loudspeaker with frequency of the soundwave is 200Hz~2kHz.
- The loudness can be adjustable with 10Hz division. Resolution: 10Hz

Sound waves measurement of audio signal generator



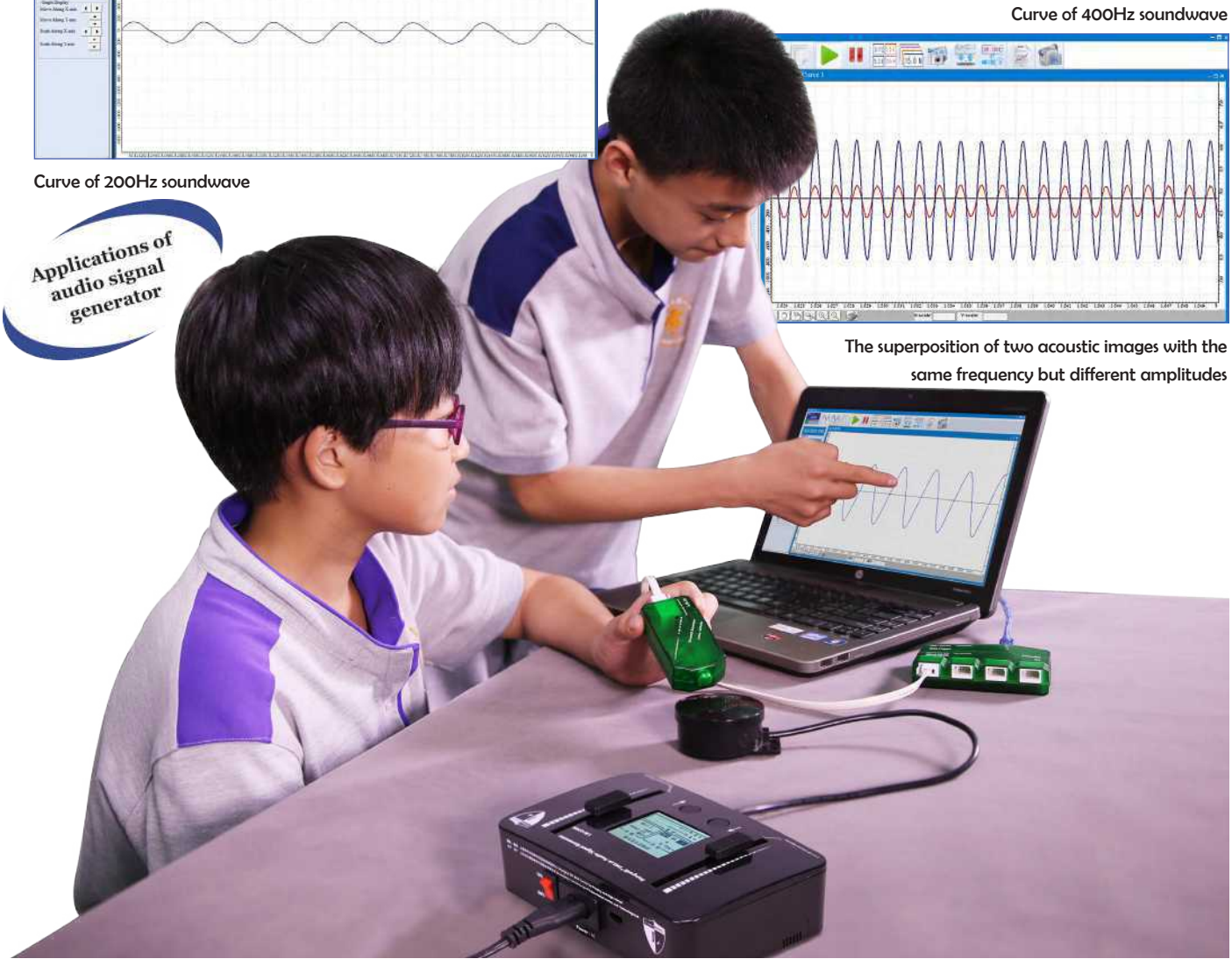
Curve of 400Hz soundwave



Curve of 200Hz soundwave

The superposition of two acoustic images with the same frequency but different amplitudes

Applications of audio signal generator



llongwill® Optics Kit

LW-5211

Components:

A. Laser Source, B. Single Slit 0.08mm, C. Single Slit 0.1mm, D. Double Slit 0.25mm, E. Polarizer
F. Special Bracket

Typical Applications :

· Light Interference
· Double-slit diffraction
· Grating diffraction
· Polarized phenomenon

0.25mm double slit on the specialized bracket

used with relative Illumination distribution Sensor

Operation Instruction:

Before application, install the bracket on the stand support; put the laser source on the top of the bracket; put the polarizer on the middle bracket, and put the slit on the bottom bracket.

The distance between top and middle bracket, middle and botom bracket should be within 100mm.

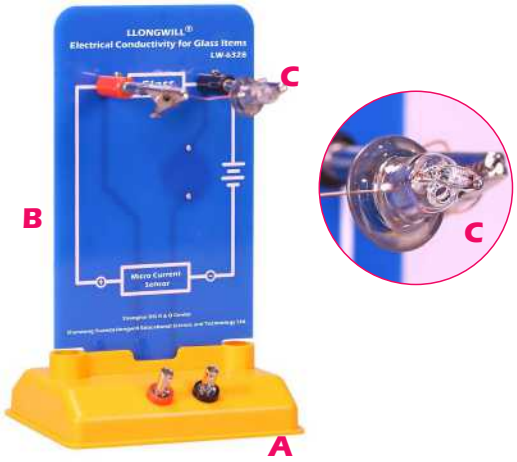
During the application, put the sensor at the bottom plate of the stand support.

Turn on the Laser source and adjust its position to make sure the laser beam can go through the light slit.

Single-slit Diffraction experiment

llongwill® Electrical Conductivity for Glass Items

LW-6328



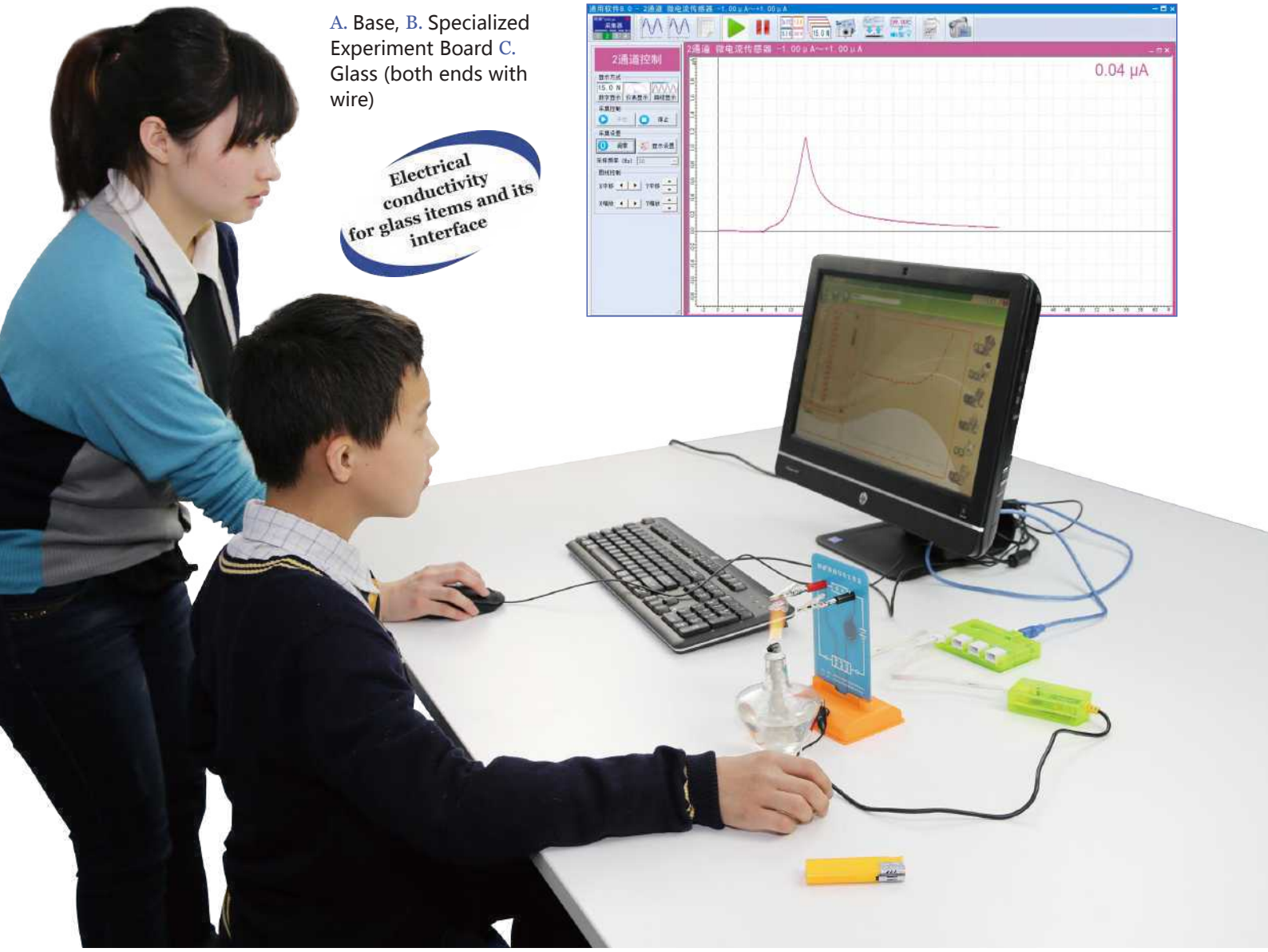
- Used to study on the glass conductivity when heated.
- Used with Micro Current Sensor.

Electrical conductivity for glass items (mobile terminal)

Components:

A. Base, B. Specialized Experiment Board C. Glass (both ends with wire)

Electrical conductivity for glass items and its interface

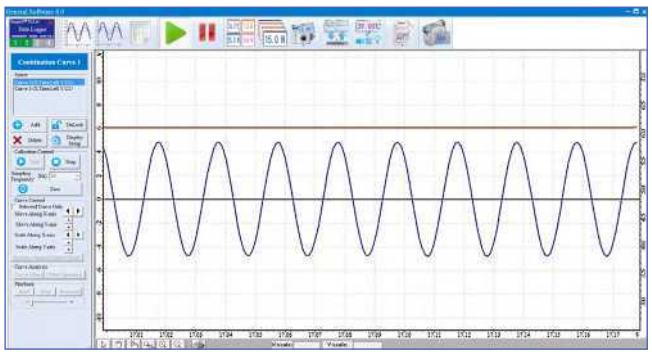


llongwill® General Power Supply V2.0

LW-Q708

Specifications:

Input: AC 220V±10% 50Hz
DC Output: 1.5V~18V continuously adjustable, rated current 1A
AC Output: 0V~6V continuously adjustable, 50Hz, rated current 1A



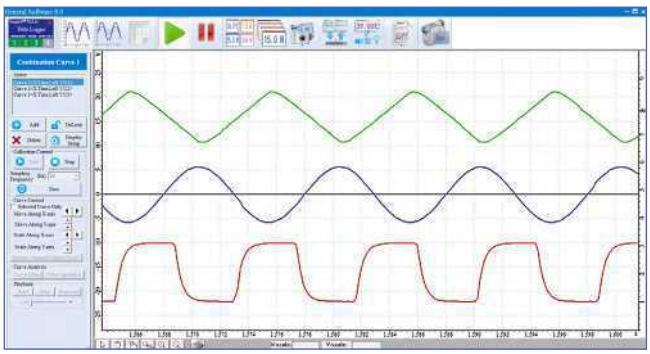
AC and DC signals output from llongwill® General Power Supply

llongwill® Low Frequency Signal Generator V2.0

LW-Q710

Specifications:

Input Power: AC 220V ±10% at 0.6A, 50Hz
Waveforms: Sine, Square, Triangle. By pressing the Adjuster, select the waveform output orderly.
Frequency Range: DC to 1Hz, AC waveform output retains its form to 2kHZ. By turning the adjuster, adjust the output requency.
Voltage Output: 0~9V continuously variable by turning the voltage adjuster.



Triangular, Sine and square wave output from llongwill® Frequency Signal Generator

llongwill® Smart Power Supply V2.0

Utility Model Patent No.: ZL201120057646.5

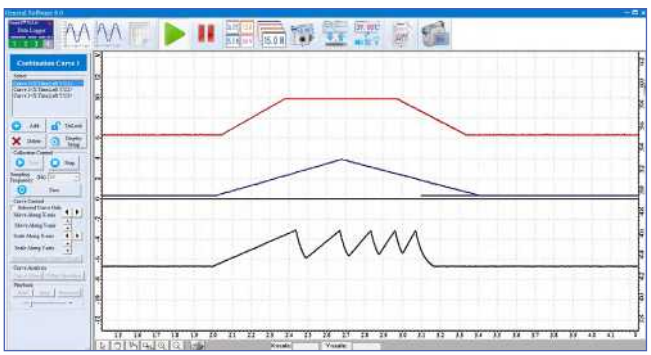
LW-Q820

llongwill® smart power supply is the key corollary equipment of llongwill® Faraday's Law Apparatus Ⅱ.

Components:
a model shifting switch button, the ascending and descending slope adjust slider, RUN button, LCD unit, power switch, power output ports and power Jack.

Specifications:
Power: 220V AC at 1A
DC Output: 1.5V~18V, continuously adjustable at 1A
AC Output: 0V~6V, continuously adjustable at 1A 50Hz

Waveforms:
1.trapezoidal wave
2.triangle wave
3.multi-periodic triangle wave.

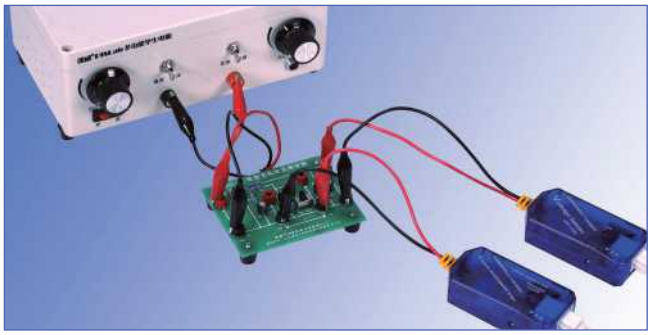


Voltage signals output from llongwill® Smart Power Supply

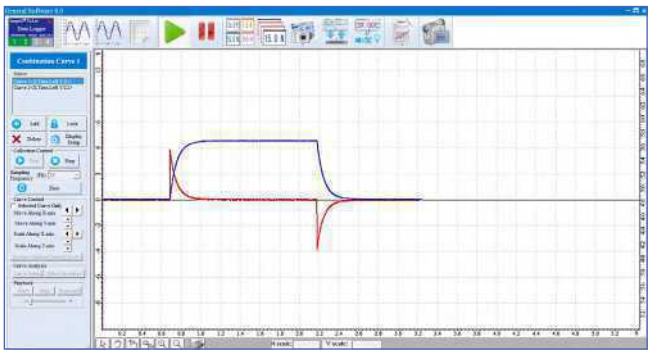
llongwill® EXB Series Circuit Board V2.0

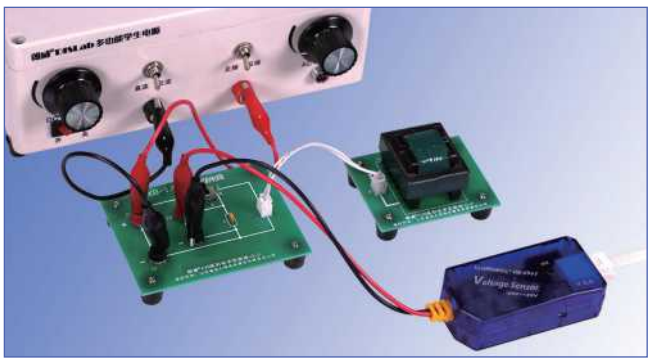
LW-6337

• Including 23 kinds of standardized experiment circuits.
• Used for more than 30 kinds of Electricity experiments.

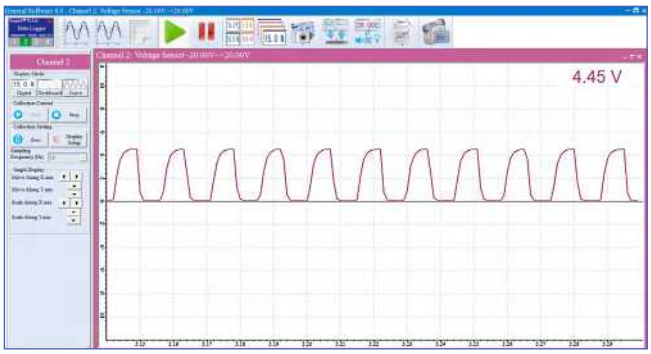


Experiment results of capacitor charge-discharge & series-parallel (below)





Experiment (above) and its results (below) of Multi-harmonic Oscillation



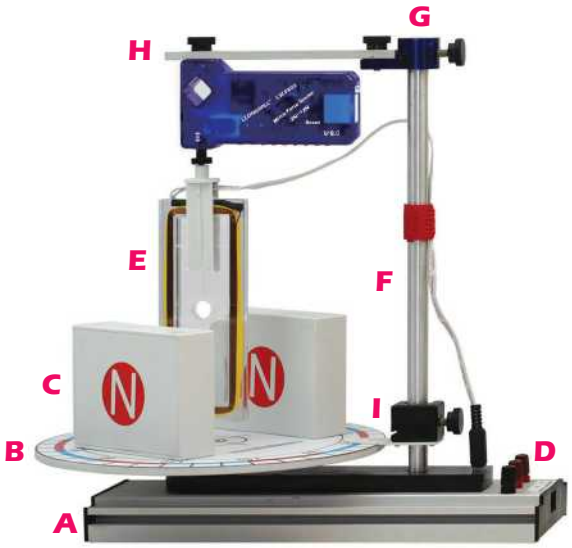
SPECIFICATION

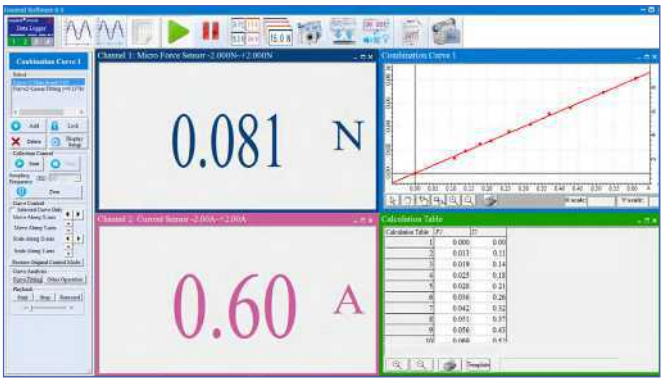
EXB-01 · Half-wave Rectification & Wave Filtering
EXB-02 · Full-wave Rectification & Wave Filtering
EXB-03 · Analysis of Complex Circuit
EXB-04 · RC & RL Phase Shift
EXB-05 · Measurement of EMF and Internal Resistance of the Battery with Voltammetry
EXB-06 · Measure EMF of the Battery with Compensation Method
EXB-07 · Partial Pressure and CurrentLimited Circuit
EXB-08 · Measure Resistance & Resistivity of the Resistance Wire with Voltammetry
EXB-09 · Diode Characteristic Curve
EXB-10 · Triode Characteristic Curve
EXB-11 · Triode Amplifying Circuit
EXB-12 · Constant Pressure Source
EXB-13 · Constant Current Source
EXB-14 · Bistable Circuit
EXB-15 · Multi-harmonic Oscillation
EXB-16 · Charge-discharge & Series-parallel
EXB-17 · LC Oscillatory Circuit
EXB-18 · Self Inductance
EXB-19 · VA Characteristic Curve of a Miniature Bulb
EXB-20 · AND Gate Circuit
EXB-21 · OR Gate Circuit
EXB-22 · NOT Gate Circuit
EXB-23 · Ohm's Law
EXB-24 · UI Characteristic of a Conductor
EXB-25 · Series and Parallel Circuits of Resistances
EXB-26 · Study on Conductors and Insulators
EXB-27 · Inductance Module (circuit board accessories)

llongwill® Ampere Force Apparatus V2.0

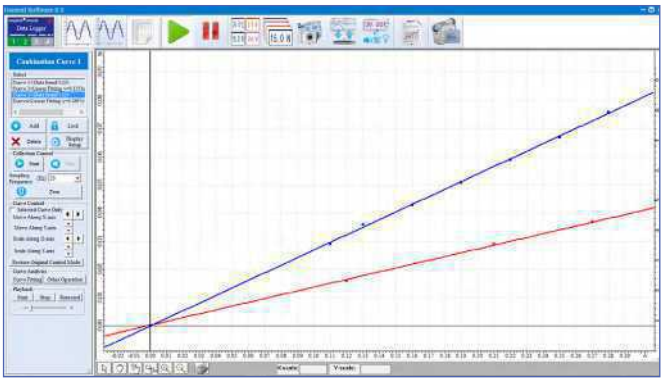
LW-Q735

Utility Model Patent No.: ZL201320517121.4





Experiment curve on the relationship between Ampere Force and current



Experiment curve on the relationship between Ampere Force and the length of the wire

Components:

A. Base, B. Disc C. Scale D. Terminal E. Wire Frame (Length-width ratio is 2:1) F. Stand Support G. Adapter H. I-type Bracket I. Pointer.

Typical Applications:

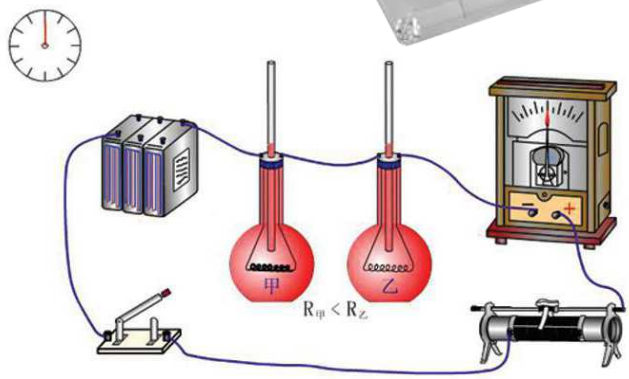
· Measurement of Ampere Force
· The effect of magnetic field on electrical wire
· Study the relationship of Ampere Force F, current flowing through the conductor I,length of conductor L,and magentic field intensity B.

llongwill® Joule's Law Apparatus

LW-Q726

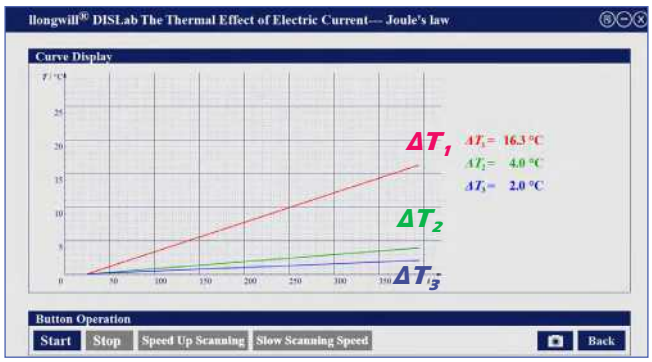
Typical Applications:

· Verify the Joule's Law
· Study on the heat effect of electric current



The classical model to verify Joule's law

Joule' law apparatus



Experiment results of Joule's Law

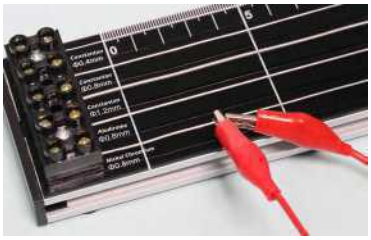
llongwill® Resistance Law Apparatus

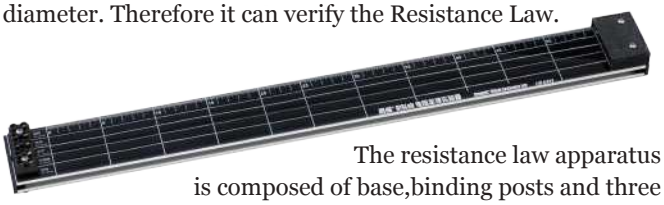
LW-6343

NEW

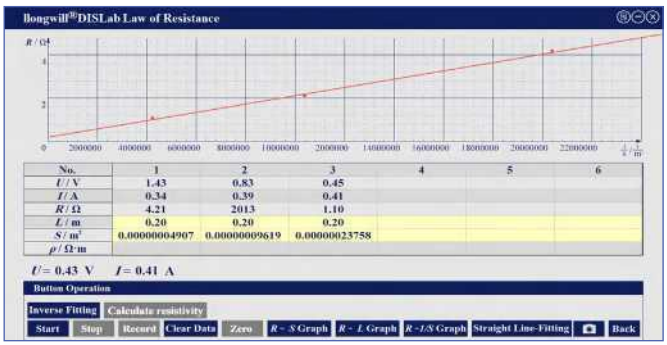
Design Concept:

Comparing with traditional instrument, Resistance Law Apparatus improves the measuring method by using current sensor and voltage sensor. It can accurately determine the relationship among metal resistivity, material, length and diameter. Therefore it can verify the Resistance Law.

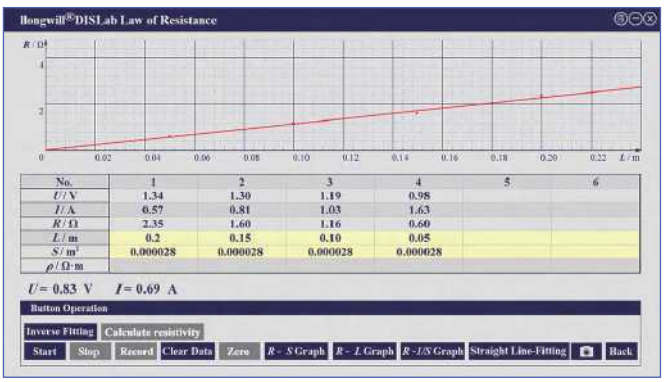




The resistance law apparatus is composed of base,binding posts and three kinds of metal wires with different materials.The materials of the three kinds of wire are constantan,aludirome and nickel chromium, among which constantan wires are equipped with three specifications of thickness, with different cross-sections. With current and voltage sensors, the relationship between the resistance of conductor and the length, and the cross sections of materials can be studied by using the resistance law apparatus, so as to verify the resistance law.



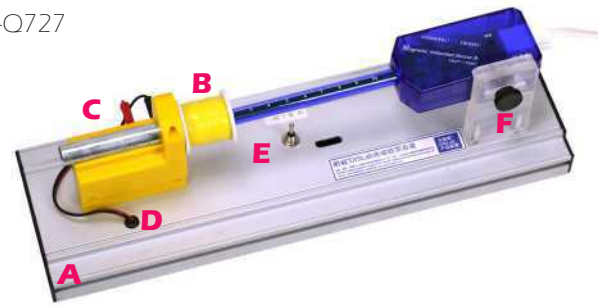
Relationship between resistance of metal wire and the reciprocal of its cross section



Graph of the resistance of a wire to its length

llongwill® Electromagnet Apparatus

LW-Q727



Components:

A. Base, B. Multiturn Coaxial Coils (turns: 200,400,600) C. Iron Core, D. Power Supply, E. Bilateral Switch, F. Dedicated Bracket.

Operation Instruction:

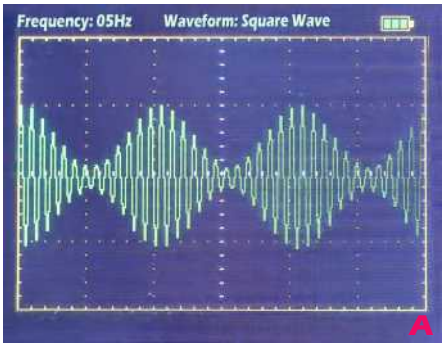
· Electromagnet Apparatus should be used with magnetic induction sensor.
· During application, fix the magnetic induction sensor on the base. The measuring point of the sensor (Hall element on the top end of the probe) is just on one side of the coil's axis.
· There is a coil options and voltage switch; turn the switch to create a certain experimental condition.

Experiment result of factors affecting the magnetic induction of a electromagnet

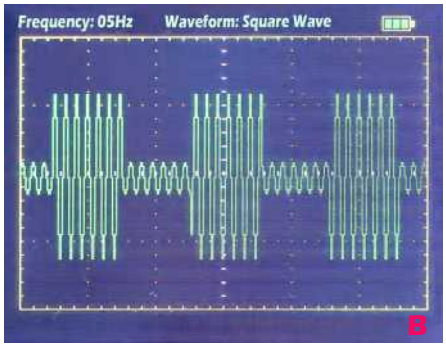
llongwill® Propogation of Electromagnetic Wave Apparatus

LW-Q745 & LW-Q746

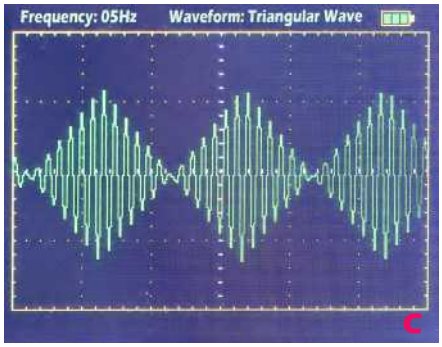
llongwill® propagation of electromagnetic wave apparatus consists of electromagnetic waves transmitting module and receiving module. The transmitting module emits the carrier frequency of 800Hz and owns the function of amplitude modulation. The modulation wave has three modes: sine wave, square wave and triangular wave, and the waveforms can be displayed through the transmitting module screen (see A, B and C below). The receiving module receives the modulation waves and displays them in the PC software (see D and E below). The above three waveforms can be converted by the button on the receiving module for demodulation demonstration (see F below).



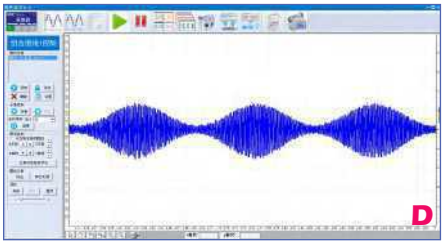
Transmitting module output signal—sine wave



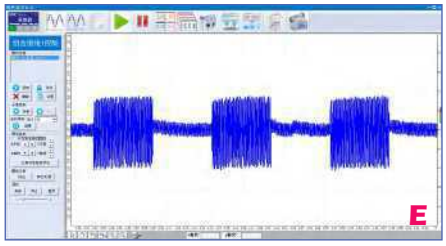
Transmitter output signal—square wave



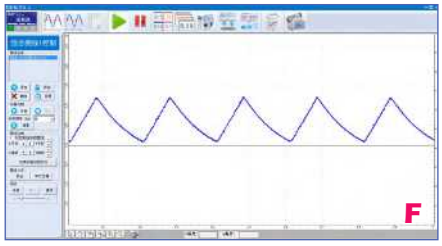
Transmitter output signal—triangular wave



Sine wave before demodulation



Experimental interface of square wave



Triangular wave after demodulation

llongwill® High-sensitivity Coils

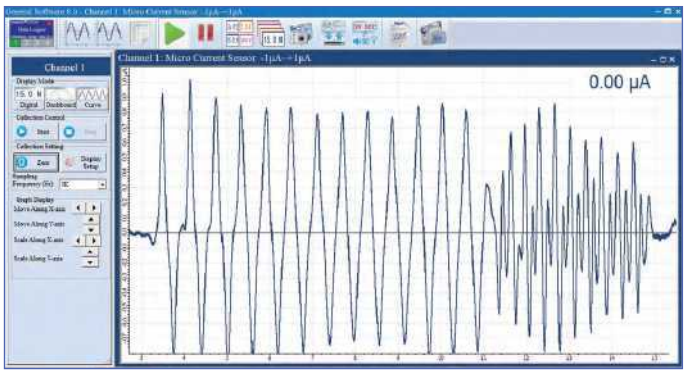
LW-Q813

Features:

· By using with Micro Current Sensor, hold high-sensitivity coils and rotate, then the induced current produced by cutting geomagnetic field lines can be measured with the micro current Sensor.

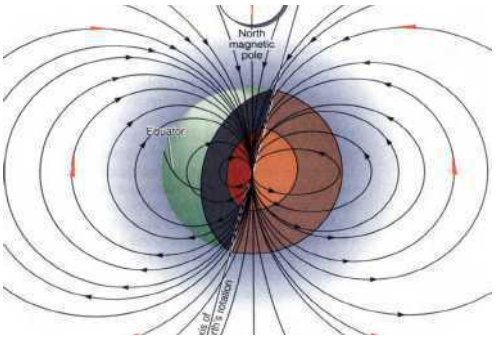
Typical Applications:

· Obtain induced current by cutting the geomagnetic field lines
· Measure the electric radiation intensity of electric appliances



The induced current measured by Micro current Sensor from the High-sensitivity Coils

Using High-sensivity coils and Micro Current Sensor in experiment



Geomagnetic Field

llongwill® Geomagnetic Field Generator

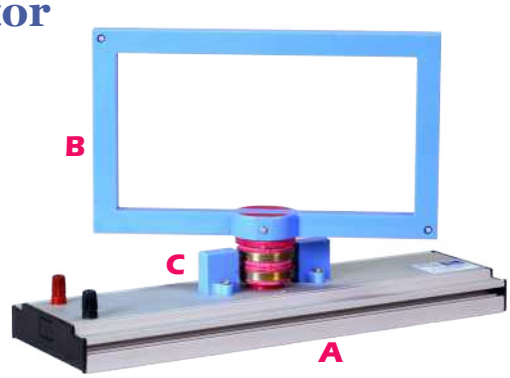
LW-6332

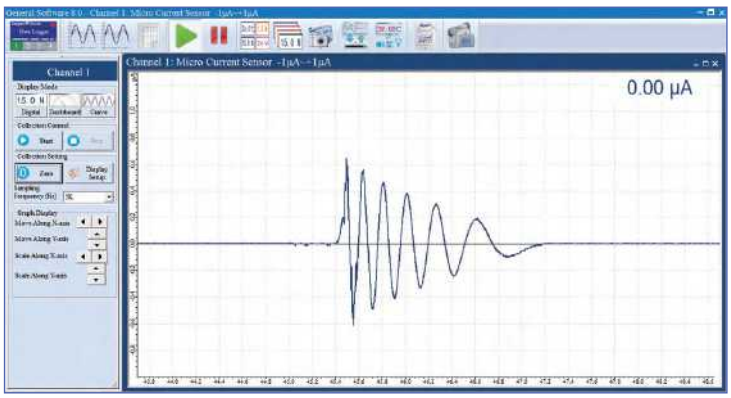
Components:

A. Specialized Base, B. Rectangular Coils, C. Connecting Bearing

Features:

·It is a standard physics model of power generator. Rotate the coils frame, and the induced current will be produced by cutting the geomagnetic field and measured by the micro current sensor.





Curve of induced current produced by geomagnetic field Generator

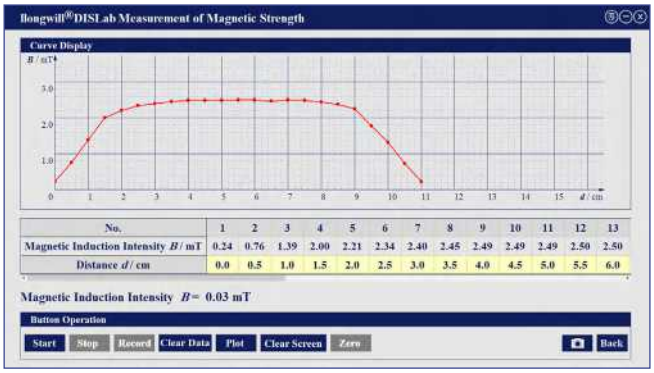
Study the geomagnetic generation

llongwill® Uniform Magnetic Field Solenoid

LW-5308

Features:

· More thinner and longer than traditional solenoid.
· Well-designed after calculating its diameter and coil turns.
· It can produce a uniform magnetic field, which covers 3/5 length area of the solenoid.



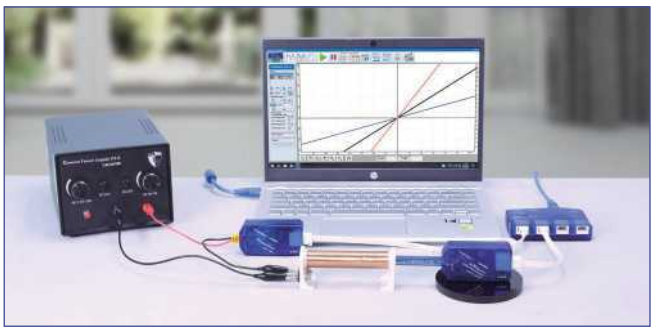
Coordination curves of magnetic induction-current

Experiment Extension of llongwill® Solenoid:

A study of the distribution of magnetic induction intensity in a solenoid with displacement sensor (separated).

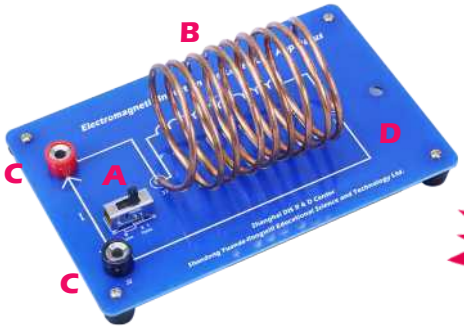
Apparatus: llongwill® data logger, llongwill® general power supply, solenoid, magnetic induction sensor, wires, etc(refer to the image below).

Procedures: By moving the combination of magnetic induction sensor and a displacement sensor, the magnetic probe will pass through the uniform magnetic solenoid; the curve of the magnetic induction intensity and displacement can be obtained. Change the current in the solenoid; repeat the above operation; another two curves can be obtained (as shown below).



llongwill® Electromagnetic Induction and Lenz's Law Apparatus

LW-868



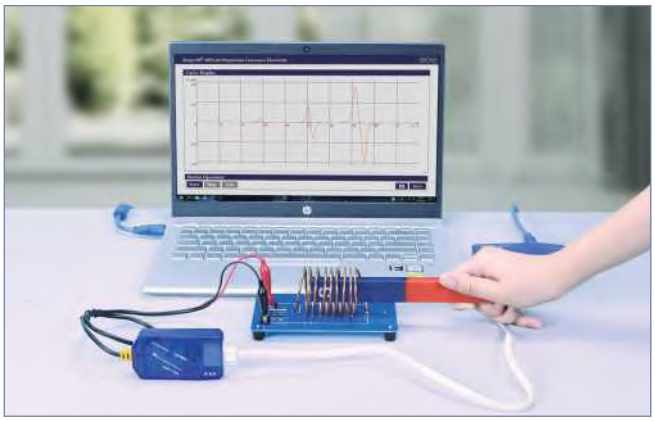
NEW

• Used with milti-range current sensor to study electromagnetic induction

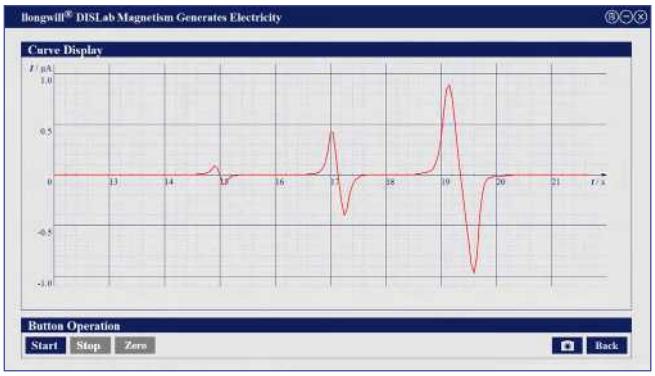
Components:

A. Multi-way switch, B. Coil, C. Binding posts, D. Base board.

The electromagnetic induction and Lenz's law apparatus is used in the research of electromagnetic induction with micro current sensor and magnet. The experiment setup is shown in the figure, by which, the change of current can be studied by moving the magnet towards or away from the coil.



Experiment with Electromagnetic Induction and Lenz's Law Apparatus



Interface of Lenz's law experiment

llongwill® Block Circuit

LW-SI816

Components:

A. Wire module, B. Electronic component module, C. Measurement module, D. Load module, E. Switch module, F. Power module, G. Expansion module, H. Accessories.

Electronic component module: variable resistance module, potentiometer module, photoresistor module, thermistor module, Diode module and NPN transistor module.
Load module: motor, relay, miniature bulb, buzzer
Measurement module: voltmeter module, amperemeter module
Switch module: one-way switch, two-way switch
Wire module: right-angle wire module, T-type wire module, straight wire module
Expansion module: expansion board module, expansion board(in parallel) module
Accessories: 1kΩ resistance, 2kΩ resistance, 100uf capacitor, 200uf capacitor, 2 turns of inductance, magnet, 50 turns of inductance, wire.

Typical Applications:

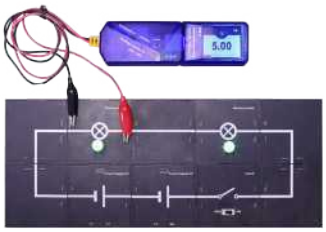
Middle school experiments: measuring current and voltage, series and parallel circuit, dimming circuit, speed controller circuit, Ohm' s law, etc.
High school experiments: capacitor charging and discharging, rated power of miniature bulb, light control circuit, temperature control circuit, UI characteristic curves of resistance, miniature bulb and diode, Lenz' s law, internal resistance and electromotive force measurement of potato battery, corridor lights, etc.

Experiment of UI characteristic curve of miniature bulb

Application advantages:

•Specially designed for the curriculum: It is designed according to the circuit, magnetic field and other contents involved in the High School Physics Curriculum Standard (2017 edition) of the Ministry of Education of the People's Republic of China, and it closely follows the teaching content.•Adopt magnetoelectric connection: eliminate the interference of disordered wires, with clear circuits and simple operation.
•Based on mobile platform: high-speed sampling and remote recording. Tablets and mobile phones that support Android/iOS system scan the QR code on the corresponding "block" for experiments.
•Improve teaching functions: intuitive and simple design, convenient and reliable connection, more easy to understand, which conforms to the law of cognition.

Lenz'e law

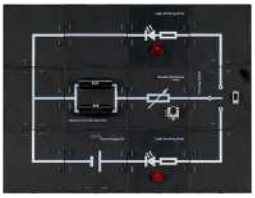


Series circuit (connected to sensors)

Parallel circuit

Series circuit (using measurement modules)

Ohm's law



Capacitor charging and discharging

llongwill® Online Electronic Balance

LW-F806

Components:

The online electronic balance is composed of electronic balance A, microUSB data cable B and wireless receiver C. The data can be read through its own display screen, and can also be upload to the host computer or mobile device through wired or wireless data transmission. The measurement range is 0~1000g, the division is 0.1g, and the measurement accuracy s 0.05%FS. The measurement unit is grams (g), ounces (oz), troy ounces (ozt), deadweight tons (dwt), carats (ct) and grains (gn). The default measurement unit is g. Press the switch key (M key) to switch the unit.

Typical Applications:

Mass measurement, law of buoyancy, conservation law of mass, etc.

Wireless data reading of online electronic balance

llongwill® Ice-water Interconversion Apparatus

LW-Q863

An excellent tool for primary school STEM teaching

Components:

A. Main body, B. Power adapter, C. Absorbent paper, D. Temperature probe, E. 5mL syringe, F. magnet

Product principle:

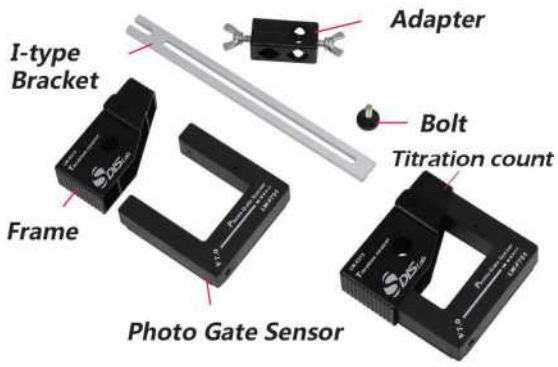
The ice-water interconversion apparatus uses semiconductor refrigeration technology to make the water condense into ice, and then the ice melts into water at room temperature or by heating, so as to realize ice-water interconversion. The apparatus is equipped with a magnetic stirring device, which can control the stirring speed of the magnet through the speed control knob, so that the cooling or heating of the liquid is more uniform.

Ice water interconversion apparatus and experiment results

llongwill® Neutralization Titration Apparatus

LW-6212

Utility Model Patent No.:ZL200920019408.8



Design Concept:

Neutralization Titration Apparatus is developed based on the light blocking principle of Photo Gate Sensor. Because every droplet has similar volume, therefore the titration volume can be calculated after obtaining the number of the droplets.

Neutralization Titration Apparatus should be used with pH Sensor or Conductivity Sensor.

Use CH_3COOH solution to titrate with $NH_3 \bullet H_2O$ solution

Operation Instruction:

Before application, put Photo Gate Sensor into Frame , then these two parts make up a titration counter.

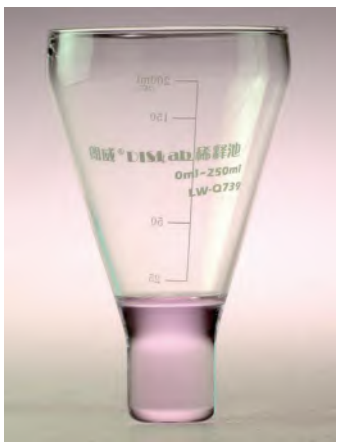
During application, adjust the titration counter to make sure there is a effective light blocking when the droplets pass the Photo Gate Sensor.

Open the software automatic record function; input the droplet volume and then record the number of droplets. Therefore the volume of titration can be calculated and the titration process is graphed on the software.

llongwill® Dilution Vessel

LW-Q739

Utility Model Patent No.:201320572799.2



Design Concept:

Dilution Vessel is specially designed to research the glacial aceticacid dilution.

Doing this experiment requires to measure the conductivity changes with the sensor during the glacial acetic acid dilution process, therefore the change of the ion concentration can be obtained.

Product Structure:

It looks like upside-down conical beaker, with a small bottom and big open.
Experimental operation using the Dilution Vessel (is shown as image A).

The graph shows the experimental results of the glacial acetic acid dillution

llongwill®Multifunctional Support

LW-Q731/LW-Q743

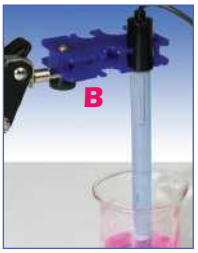
Design Patent No.:ZL201330383519.9

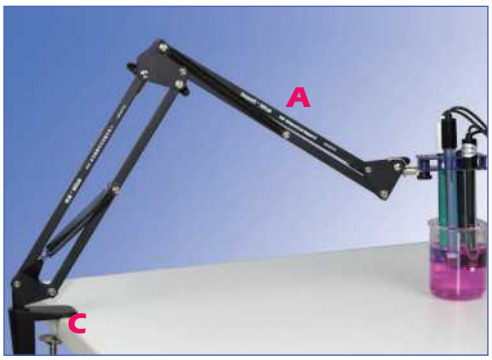
Utility Model Patent No.:201320487473.X

Composition and Typical Applications:

As shown in the figure on the right, llongwill® multifunctional support is composed of mechanical arm A, the sensor electrode holder B, and aluminum clip C, The mechanical arm is fixed at the edge of the experiment table without occupying any table space. It can be folded and expanded. It can be moved flexibly and accurately located in the three-dimensional space with good stability.

The electrode clips are installed at the front end of the arm, whose diameter adapts to the electrodes of various biology and chemistry sensors. The multifunctional support can fix the electrodes of biology and chemistry sensors effectively, which is convenient for the operation of biology and chemistry experiments.





Experiment with multiple sensors using the Multifunctional Support

llongwill®Pocket Sealing Apparatus

LW-Q716

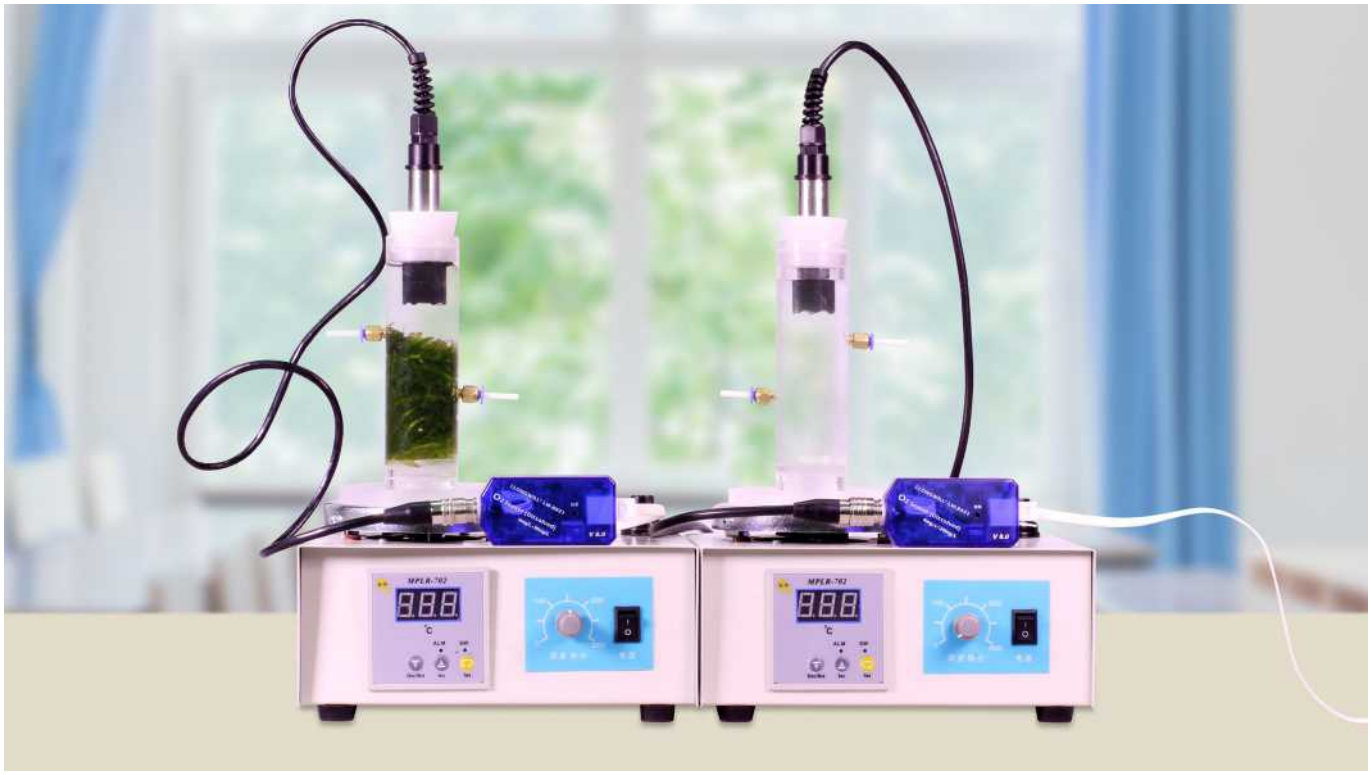
Components:

· Sealing Container
· Double-pass
· Double-pass Valves
· Sealing Plug

Typical Applications:

· Study photosynthesis of a single leaf
· Study capillarity action of plant root
Expand more experimental functions according to teaching requirements

Study on the photosynthesis of aquatic plants (as shown below)



llongwill® Sealing Apparatus

LW-Q749

Typical Applications:

· Photosynthesis and respiration of terrestrial plants
· Respiration of animals
· Seed Germination
· The characteristics of enzyme
· Burning characteristics
· Transpiration

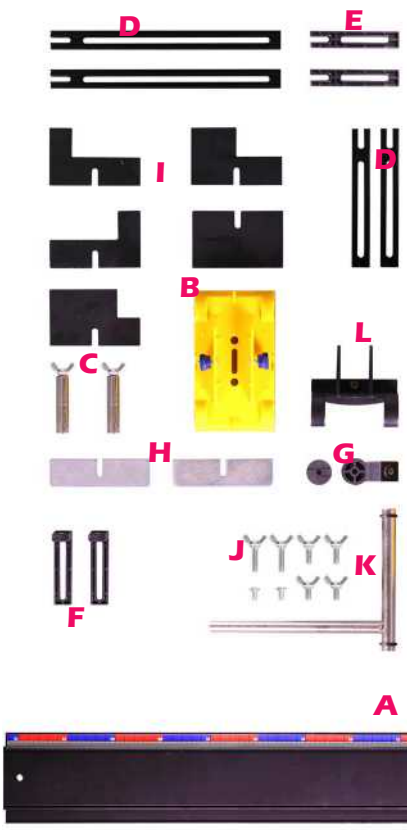
This apparatus can load liquid, plants, other vessels and even some small animals. It creates a relative sealing experiment condition, by which some environment parameter can be controlled.

Experiment results of plant photosynthesis

Study on photosynthesis using sealing apparatus (as shown below)

llongwill® Multi-purpose Track System (Primary School)

LW-XQ783
Range: 0 ~80cm



Twelve categories of components (A~L) are included in a llongwill® Multi-purpose Track System (primary school Version): A. aluminum alloy track (0.8m,1 pc), B. cart (1 pc). C. fixed rod (2 pcs),D. aluminum alloy I-type bracket (4 pcs, two short, two long), E. I-type black plastic bracket (2 pcs), F. L-type black plastic hanger (2 pcs), G. Track inclination adjuster (1 set, use together with the T-type track support to adjust the track angle), H. weight sheet (50g, 4 pcs), I. light blocking sheet (5 pcs in total, width of 20mm is 2, widths for left three respectively:40mm, 60mm,80mm). J. Fastener (1 parcel), K.T-type track support (1 set), L. Cart base (1 set).

Typical Applications :

With the supported corresponding sensors, different kinds of experiments, such as, speed comparison for the moving small carts, factors analysis of movement speed, the relationship between the slope and the motion speed, force saving for a moving object on a slope, etc. The special design of the cart structure helps students to understand the kinematics experiments, and can motivite students' interests in science exploring.

Speed comparison of cars (above) and experiment results (below)

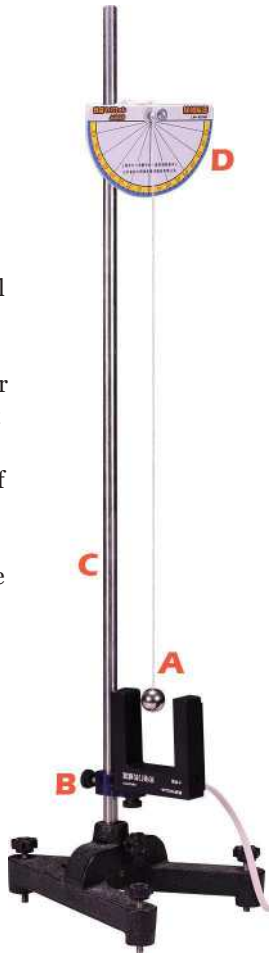
llongwill® Pendulum

LW-XQ780

Components of llongwill® Pendulum:

llongwill® Pendulum Apparatus is composed of A) simple pendulum ball set, B) adapter, C) stand support, D) dial fasteners.

Applications of llongwill® Pendulum Apparatus:



With llongwill® Pendulum Apparatus the experiment can be conducted together with photo gate sensor; the times of the pendulums swing in a certain period of time can be measured; Also the relation between swing times and pendulum length, and quality of pendulum ball can be measured.
In the experiment, llongwill® Photo Gate Sensor is fixed on the stand support by the adapter, and the fix dial is fixed on the bracket of the stand support with the butterfly bolt; then fix one end of pendulum wire on the bracket, and clamp it with the knurled bolt. Adjust the pendulum length and height of the horizontal rod to ensure the center of the ball in the middle of the two holes of photogate.
Connect the sensor with the data logger, and connect the data logger with the computer. Click primary school science software; set up the photo gate sensor as counting function; after releasing the ball, the swing times that the ball passes through photo gate can be counted in a certain period of time.

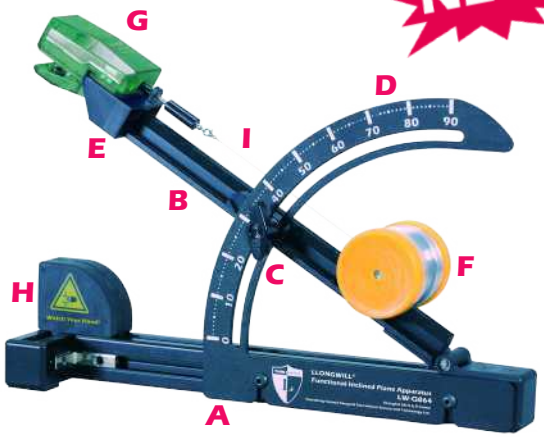
Typical Applications:

With the change of pendulum ball mass, the relation between swing times and pendulum ball mass can be studied; also with change of the ball pendulum length, repeat the procedures above, then the relation between swing times and pendulum length can be studied.

llongwill® Functional Inclined Plane Apparatus

NEW

LW-Q864



Components:

It is composed of main body (including base A, cantilever B, cantilever fixing bolt C, arc scale D, and sensor holder E), I-type block F, force/angle sensor G and anti-pinching rubber pad H and string I, which can be used for labour saving experiment.

Use of llongwill® functional inclined plane apparatus:

Install the force/angle sensor on the sensor holder at the top of the cantilever, use the sensor cable to connect the force/angle sensor to data logger and use the computer communication cable to connect the data logger with computer. Open Labour Saving experiment entry for primary school science mechanics software and start the experiment.

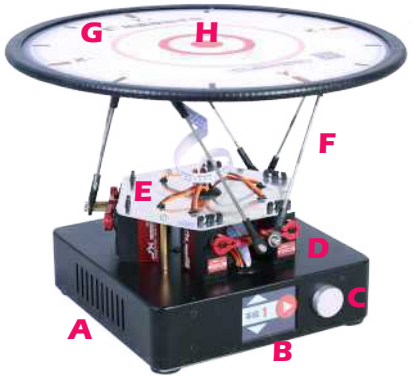
Notes:

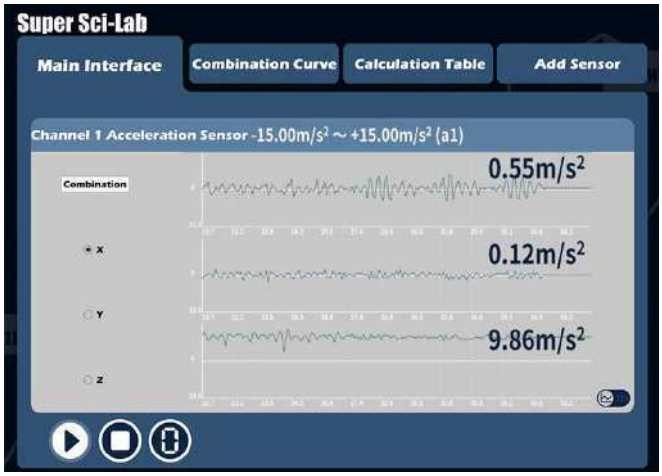
- Every time when changing the tilt angle of the cantilever, it is necessary to zero F and make sure the force/angle sensor is not pulled by the I-type block.
- When the tilt angle of the cantilever is greater than 10 degrees, it is recommended to install the anti-pinching rubber pad on the base to prevent pinching.
- Please perform experiments on a horizontal table or bench.

llongwill® Earthquake Simulation Platform

LW-SI817

NEW





An excellent tool for primary school STEM teaching

Components:

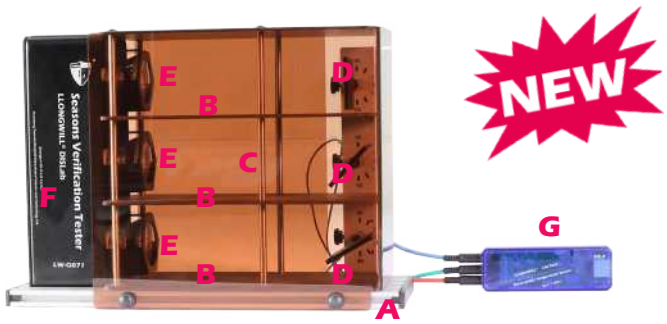
A.Base, B. Display module, C. Selection knob, D. Steering gear, E. Steering gear fixing plate, F. Motion links, G. Load platform, H. Built-in motion attitude sensor.

By touching and clicking the screen located on the base or rotating the knob on the right side of the screen to select the earthquake level (1/2/3) and start the device, the earthquake simulation platform can simulate the P-wave, S-wave and surface-wave successively occurred during the earthquake.

llongwill® Seasons Verification Tester

LW-Q871

NEW



An excellent tool for primary school STEM teaching

Components:

A. Heating furnace, B. Pole, C. Erlenmeyer flask,
D. Water tray, E. Silicone rubber plug with catheter,
F. Cross adapter, G. Condensation plate connecting rod
H. Condensation plateplatform.

llongwill® Sensor Automatic Control Circuit Module

LW-SI822

An excellent tool for primary school STEM teaching

Components:

The sensor automatic control circuit consists of white control module A, blue sensor module B (including temperature sensor, humidity sensor, illumination sensor, sound level sensor and touch sensor), yellow actuator module C (including colored light module, buzzer module, fan module, humidifier module, water pump module) and accessories D (including humidifier, DC water pump, charging cable and charger). The design and operation of sensor control related experiments can be carried out by "connecting finger" plugging.

llongwill® Telephone Apparatus

LW-Q874

An excellent tool for primary school STEM teaching

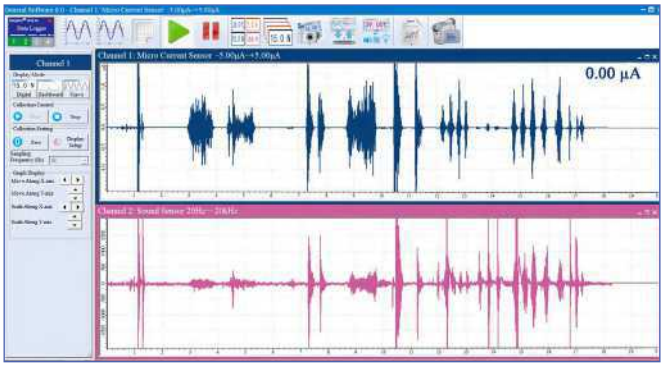
Components:

A. Telephone module, B. Telephone cable, C. Multi-range current sensor, D. Micro current sensor.

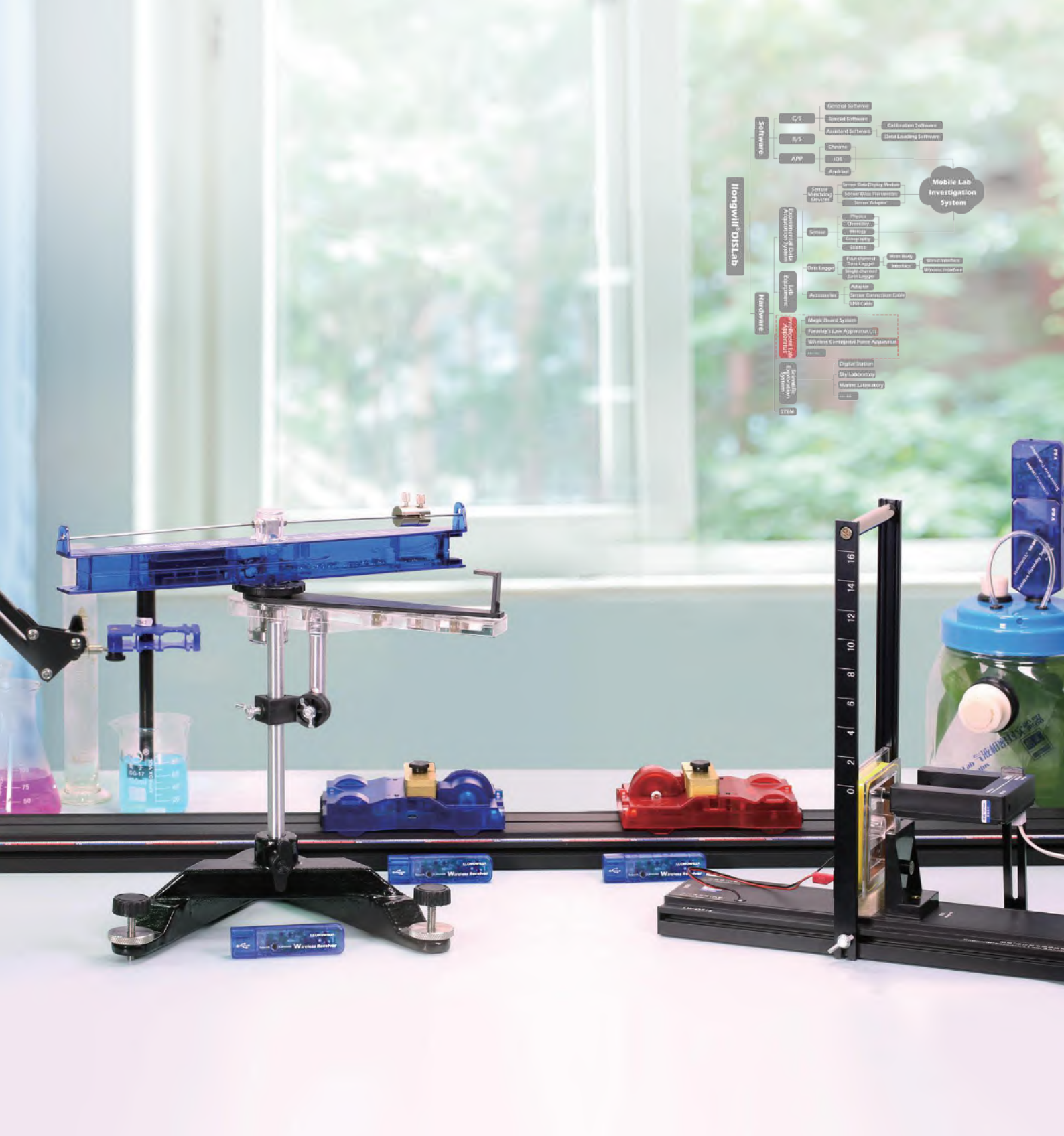
Use of llongwill® Telephone Apparatus:

The apparatus can switch to microphones or earpieces by pressing the key. It can be used in conjunction with sound sensor, multi-range current sensor and micro current sensor to draw real-time curves of sound and current during the conversion of sound and current.

"Energy Conversion: Acoustic Energy to Electrical Energy" Experimental Scene



Waveform and sound of current at the receiving end



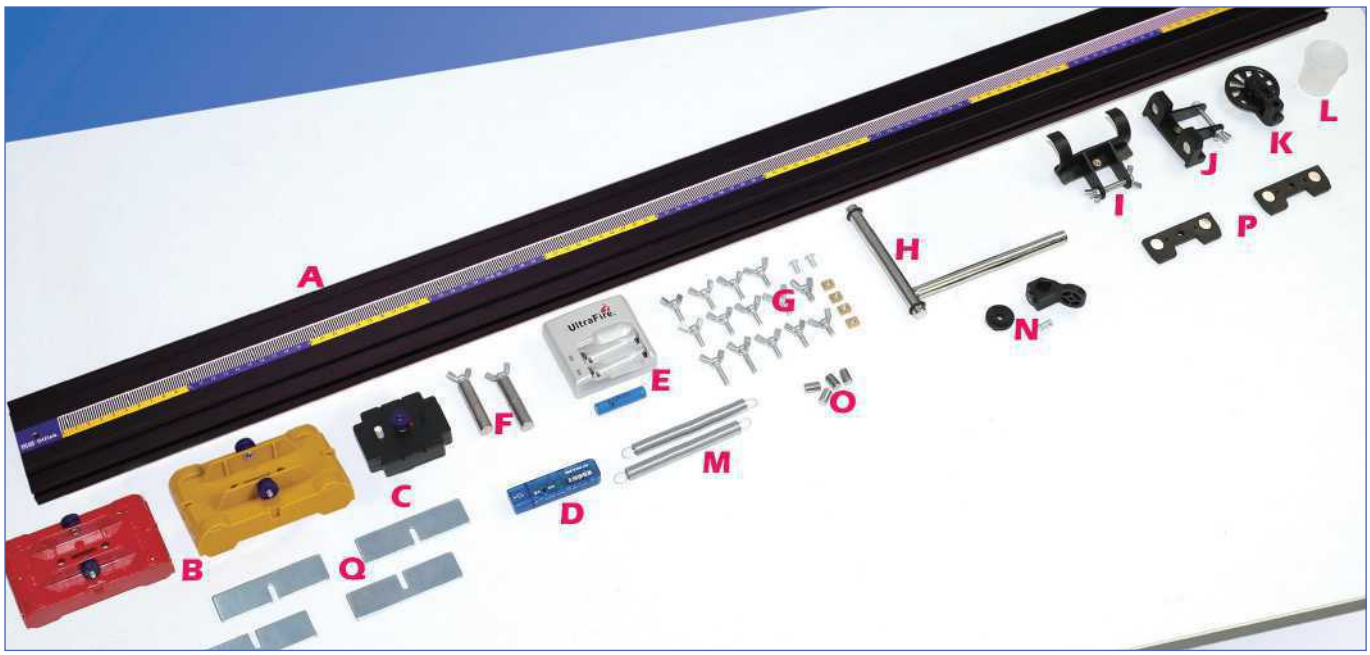
Ilongwill®DISLab Intelligent Lab Apparatus

INTEGRATING HIGH-TECH, FULLY INDEPENDENT PROPERTY RIGHTS, LEADING THE TREND OF INTERNATIONAL EXPERIMENT TEACHING

llongwill® Digital Photoelectric Track System

LW-Q732
Range: 0 ~110cm

Utility Model Patent No.: ZL201220075995.4



The Digital Photoelectric Track System is composed of 18 kinds of components as below

Typical Applications:

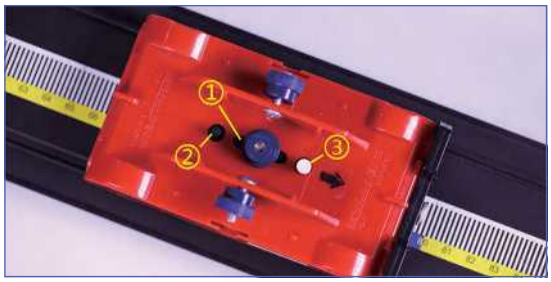
Research uniform linear motion, measure acceleration from *v-t* figure, Newton's Second Law, comparison of kinetic energies, kinetic energy conservation in the collision, curve features of *s-t* figure under different states of motion, forced vibration and electromagnetic damping etc.

System Composition of llongwill® Digital Photoelectric Track:

A. Digital Track; B. Carts; C. Scanner; D. Wireless Receiver; E. Charger and Batteries; F. Fixed Rods; G. Fasteners; H. T-type Track Support; I. Cart Base; J. Magnetic Bumper; K. Pulley; L. bucket with string; M. Springs; N. 5g Weight; O. Adjustable Inclination Unit (used with T-type Track Support); P. Magnetic Sheet (assembled on the cart); Q. 50g Weight.

Measure the displacement and velocity by using llongwill® digital photoelectric track

Assemble the scanner into the cart



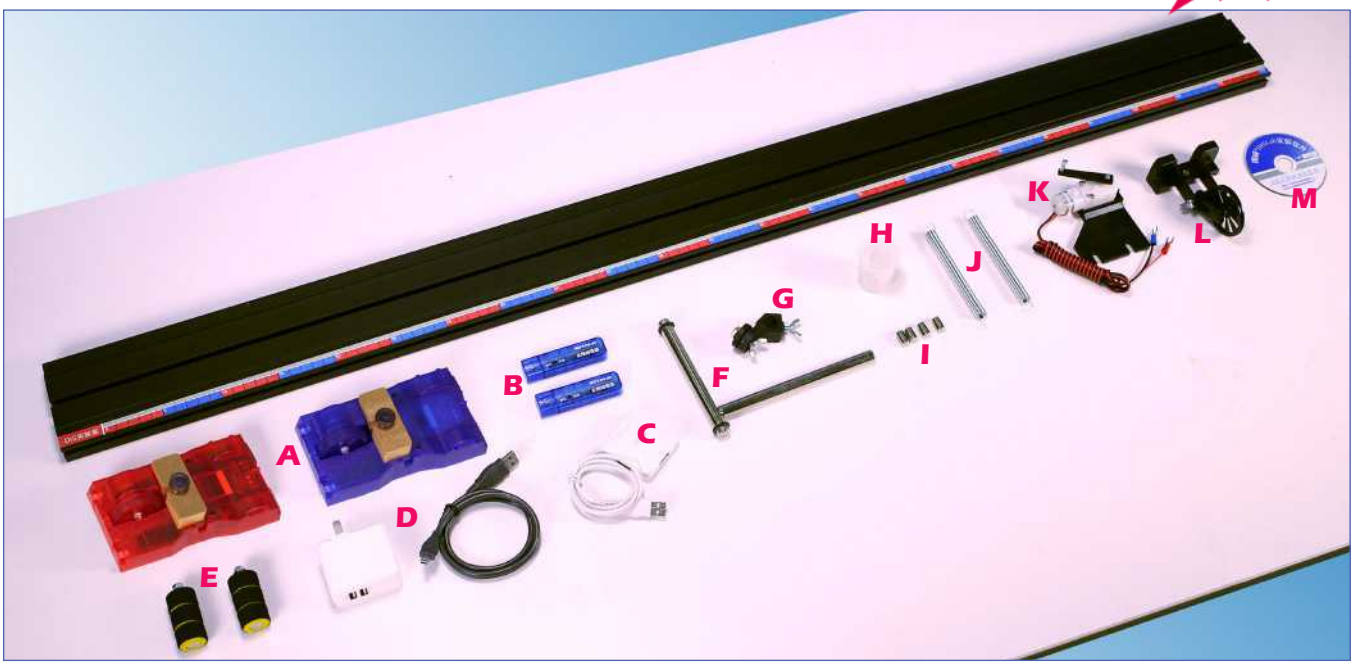
① · Power Indicator ② · Reset Button ③ · Power Switch

The experiment results of measurring the displacement and velocity by using llongwill® digital photoelectric track

llongwill® Photoelectric Range Finder (π System)

LW-Q756

Invention Patent No.: ZL201210413579.5



Components:

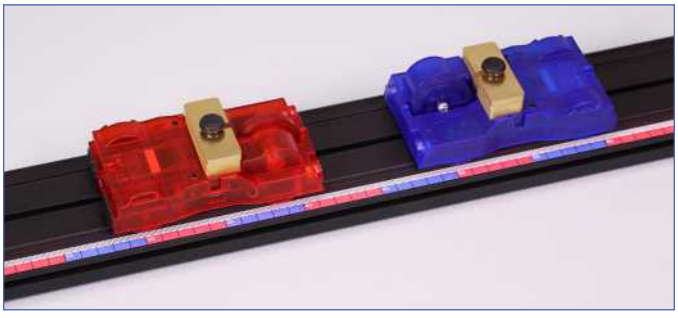
llongwill® photoelectric range finder(π System) includes: A. Photoelectric Range Finder device(including 1 red cart, 1 blue cart, 2 lithium batteries, two 100g weights, two 200g weights and two M5×30 plastic cap bolts), B. Wireless Receiver, C. USB Hub, D. Charger, Track Accessories (including E. Bumper, F. T-type Track Support, G. Track Inclination Adjuster, H. Bucket, I. Weight, J. Spring, K. Motor, L. Magnetic Bumper(including pulley)), M. Special Software, N. Special Track.

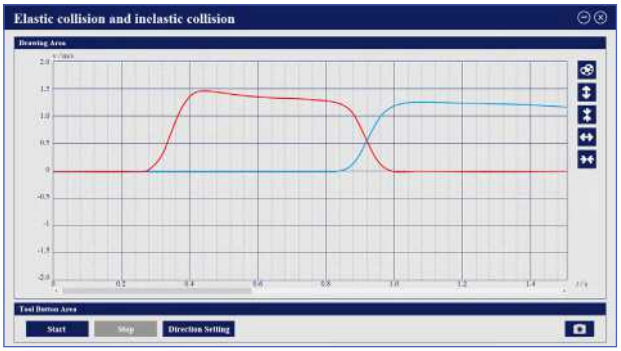
Design Concept:

llongwill® Photoelectric Range Finder(π System) transmits data through wireless communication mode, whose main wheel embedded with self contained grating encoding disk is used to collect its own velocity according to the grating distance measurement principle. The relevant kinematics experiments can be performed by using the special software, and the trackless acquisition can be carried out without the special track.

Typical Applications:

Displacement and velocity measurement, the acceleration obtained from the *v-t* graph, Newton's Second Law, vibration image of spring oscillator, forced vibration, elastic collision and inelastic collision(figures below), etc.





Experiment result of elastic collision(figure above) and inelastic collision(figure below)

llongwill® Wireless Centripetal Force Apparatus

LW-Q711 Invention Patent No.:201210013683.5

worlddidac AWARD 2014

THIS PRODUCT WON THE 16TH WORLDDIDAC INNOVATION AWARD FOR EQUIPMENT GROUP

- **An integrate system with the functions of data collection, data processing and wireless communication**
- **No need of data logger**
- **Study on the centripetal force at any arbitrary angle by adjusting the inclination of the bracket**

A. Base
B. Connecting Rod
C. Rotating Arm Base
D. Rotation Arms
E. Weights
F. Force Sensor(build-in)
G. Photo Gate Sensor (build-in)
H. Wireless Transmitter
I. Wireless Receiver
J. Light Blocking Rod

Application of Wireless Centripetal Force Apparatus

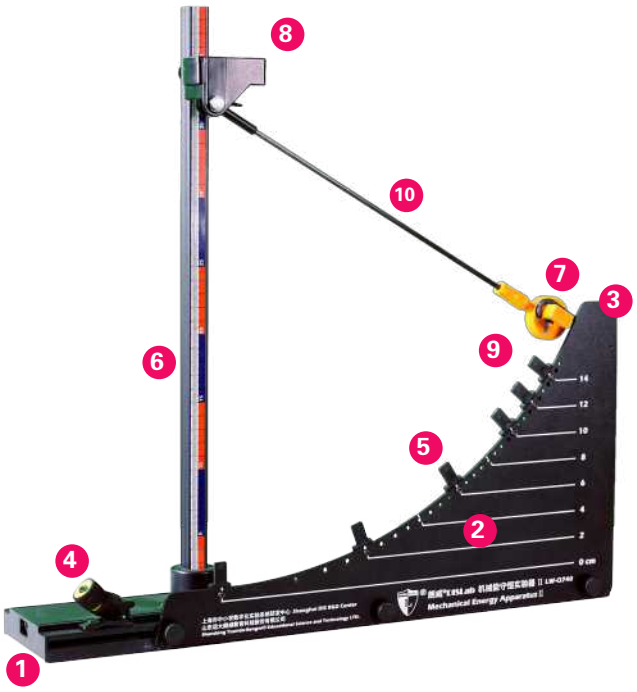
Experiment results of the relationship between the centripetal force *F* and angular velocity ω

Experiment fitting cure (*F*-*r*) on the centripetal force and radius

llongwill® Conservation Law of Mechanical Energy Apparatus Ⅱ

LW-Q740 Invention Patent Application No.:201410233893.4

- **Verify the Conservation Law of Mechanical Energy.**
- **Using Photo Gate Sensor**

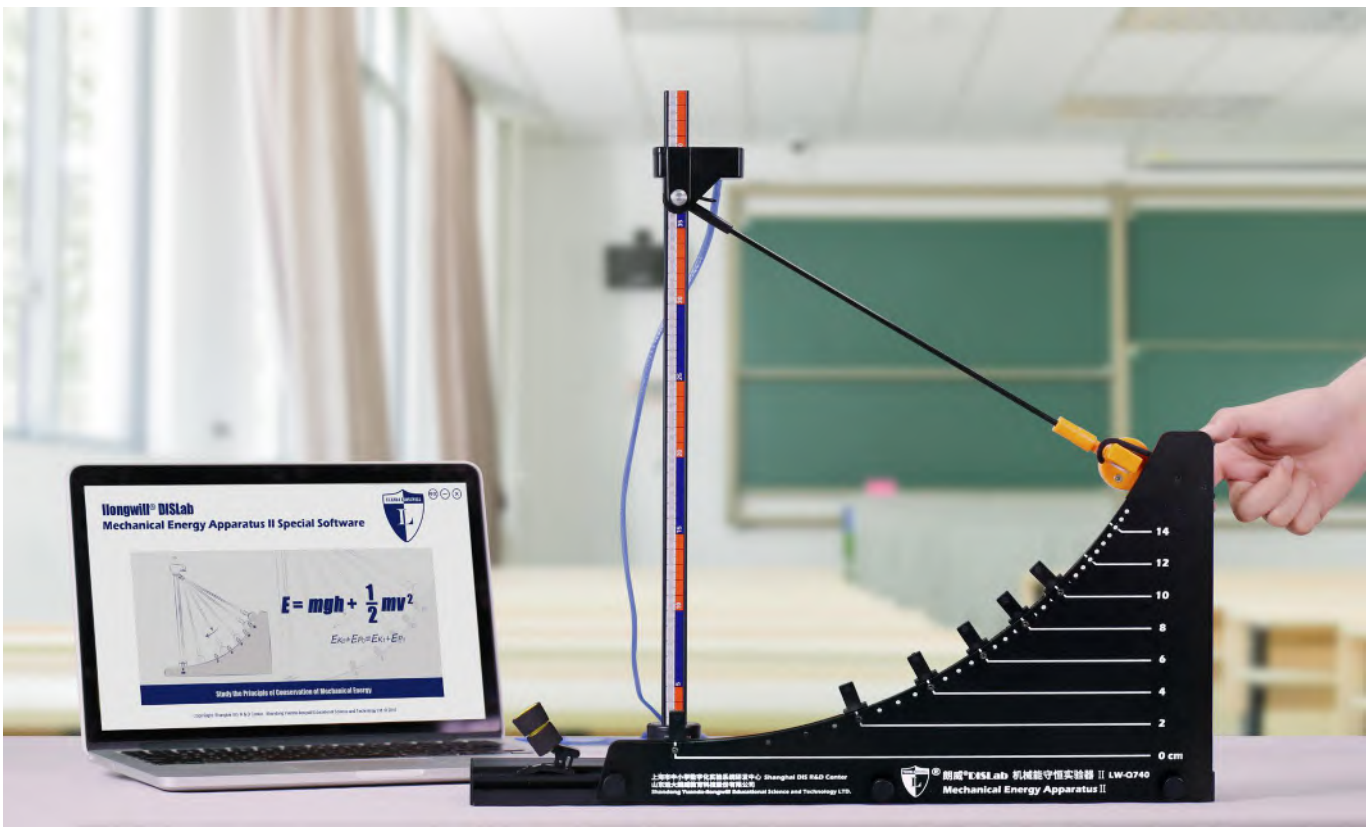


Components:

① · Base; ② · Scale plate; ③ · Releaser; ④ . Absorber ⑤ · Light Blocking Sheet; ⑥ · Standing support; ⑧ · data processing and communication circuit with USB port; ⑨ · Pendulum bob (⑦. Photo Gate and weight); ⑩ · Pendulum Rod.

Operations:

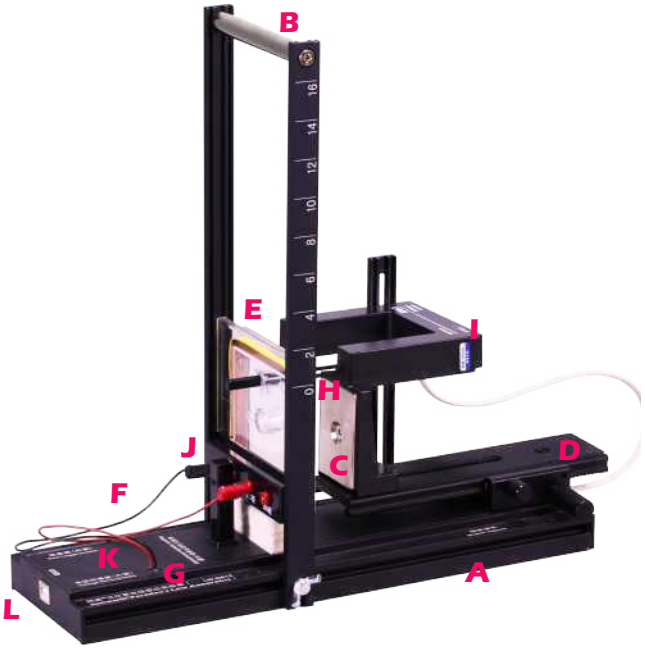
Release the pendulum embedded with a photo gate sensor, which passes through six light blocking sheets at different heights one time; the system automatically records the speed of the pendulum through each light blocking sheet, and calculates the kinetic energy and potential energy of each point by clicking the “Data Calculation”. The three lines represent the changing trends of kinetic energies, potential energies and mechanical energies at different heights.



llongwill® Faraday's Law Apparatus I

LW-Q812

Utility Model Patent No.: ZL201020569120.0



Components:

A · Base
B · Vertical Track
C · Rectangular flat magnet with magnetic field of horizontal direction
D · Movable holder for the rectangular flat magnet, to change magnetic induction by changing position of the rectangular flat magnet
E · Coils
It can fall down from different heights
F · Thin wire
G · Build-in voltage Sensor
H · Light Blocking Sheet
I · Photo Gate Sensor
J · Magnetic field tube
K · Data Logger Circuits
L · USB Port

Working Principle:

It is a physics model of “conductor falling and cutting the magnetic field". By measuring the features of conductor, the relation of four physics quantities: *E*, the motional electromotive force; *v*, the falling speed of the conductor; *n*, the turns of coil in the conductor; and *L*, the length of the conductor, can be shown as $E \propto nBLv$.

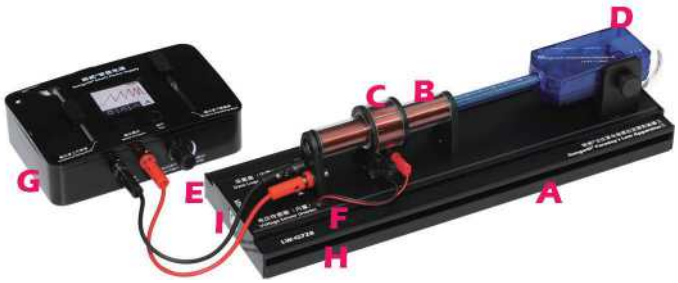
Experiment Example:

In this experiment, the three curves show the relation of motional electromotive force and the falling speed of conductor of different coil turns (100 turns, 200 turns and 300 turns) respectively. Each curve shows that the motional electromotive force is liner relationship with the falling speed of conductor; When the speed is certain, the ratio of the three values of motional electromotive force is close to 1:2:3, which is the turns ratio of three coils.
The experiment verifies $E \propto nv$, when the value of B and L is certain, the formula of $E \propto nBLv$ can be deduced.

llongwill® Faraday's Law Apparatus Ⅱ

LW-Q828 Invention Patent No.: ZL201110053949.4

Components:



A· Base, B· Primary Coil, C· Secondary Coil
D· Magnetic Induction Sensor, E· Thread, F· Built-in Voltage Sensor, G· Smart Power Supply, H· Build-in Data Logger, I· USB Port.

The Faraday's Law II should be used with Magnetic Induction Sensor and Smart Power Supply.

Working Principle:

The primary coil generates a magnetic field by using the smart power supply. The internal magnetic field of the primary coil can be regarded as a uniform magnetic field and can be measured by the sensor. The external magnetic field of the primary coil passes through the secondary coil which is nested outside of the primary coil. If we adjust the smart power supply, the induced electromotive force will be produced in the secondary coil because the magnetic field of the primary coil has been changed. The induced electromotive force can be measured by the voltage sensor.

Therefore, *B*, the magnetic induction intensity of the primary coil, and *E*, the induced electromotive force produced in the secondary coil because of the change of the magnetic induction intensity of the primary coil, can be measured by sensors. The change ratio of *B* in a certain duration namely slope *K* can be calculated based on the data of *B-t*, i.e. $K=\Delta B/\Delta t$.

Figure 1 shows the initial interface of the software of this experiment, there are three partsfrom top to bottom, including *B-t* line area, *E-t* line area and calculation table area;

Figure 2 shows the *B-t* and *E-t* lines obtained by using the trapezoidal wave output mode of smart power supply. It indicates that the value of *E* is related to the change ratio of *B*.

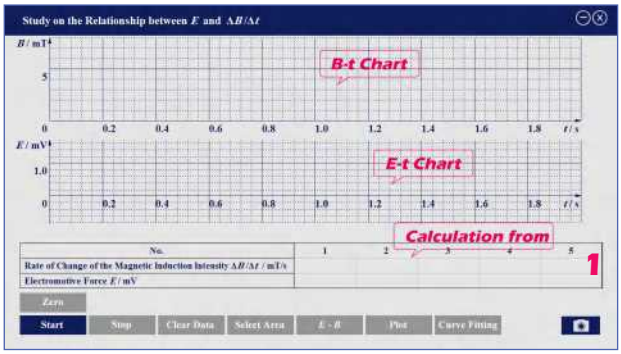
Figure 3 shows the continuously changing *B-t* and *E-t* lines obtained by using the Combined saw tooth wave output modeof smart power supply. Thus, we can obtain a set data of slope *K* of *B-t* line, and the corresponding *E* value.

Figure 4 is the "*E-K*" line based on the data obtained from

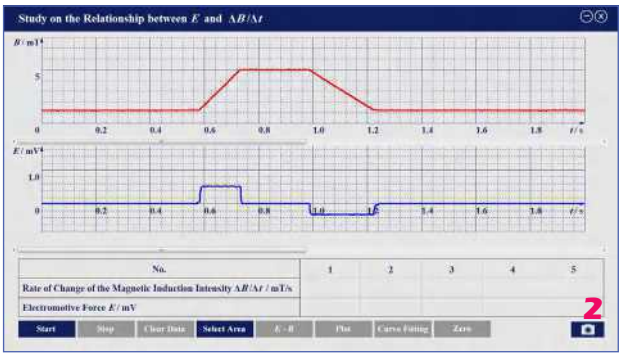
It can be inferred from Figure 4 that $E \propto K$, i.e. $E \propto \Delta B/\Delta t$.

According to the magnetic flux $\varphi=BS$, when *S* is constant, $\Delta\varphi \propto \Delta B$, So:$E \propto \Delta\varphi/\Delta t$.

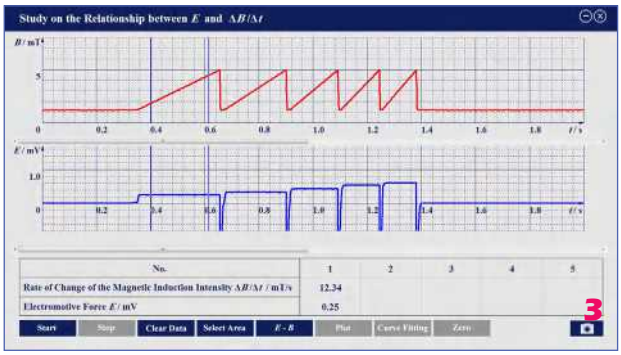
This is the ultimate expression of Faraday's law of electromagnetic induction.



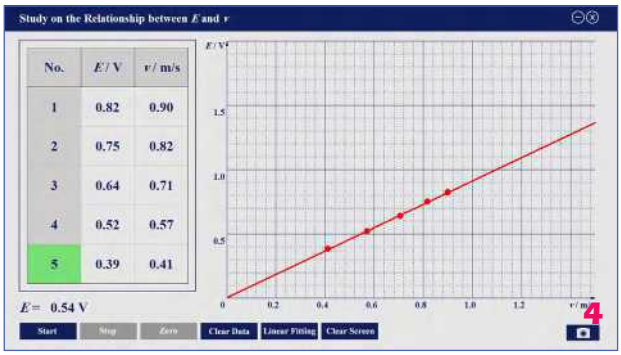
Software interface



Obtain the graph of "*B-t*" and "*E-t* " under the output of trapezoidal wave



Under the output of triangle wave, changing the ratio of B, the rising slope of *B-t* curve is increasing and E also increases



Fitting curve of "*E-K*" passes through the origin and illustrates the E is propotential to *ΔB/Δt*

llongwill® Magic Board System

LW-Q858

Invention Patent No.: 201610074750.2
Utility Model Patent No.: 201620107722.1

Typical Applications:

By using llongwill Magic Board (Electromagnetic Positioning System), the projectile motion, single pendulum, oblique projectile motion, centrifugal track, Galileo's inclined plane experiment(2D), direction of circular motion velocity, free fall motion, conservation law of mechanical energy, projection of circular motion, damping vibration and motion synthesis can be completed.

Projection and fitting curve of projectile motion trajectory

Experiment result of the acceleration in vertical direction of projectile motion

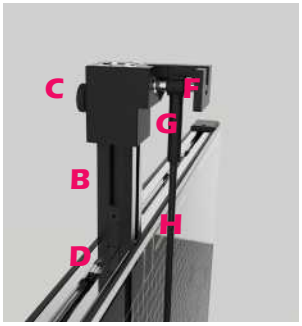
Components:

A. Locating board, B. Catapult, C. Signal transmitter,
D. Horizontal and, E. Lengthways buffer slot,
F. Support frame, Fixed pieces and accessories.

llongwill® Magic Board System - Conservation law of mechanical energy apparatus

Components:

llongwill® magic board - Conservation law of mechanical energy apparatus consists of bracket assembly A (including pole B, bracket C and angle slot connector D), pendulum rod E (including shaft F, T-type connecting rod G, carbon fiber rod H, signal source clamp I) and fasteners, which are used in conjunction with the electromagnetic locating board J and the signal source K to perform the experiment of conservation of mechanical energy.



llongwill® Magic Board System - Pendulum apparatus

Components:

llongwill® magic board system - Pendulum apparatus consists of pole A, bracket B, pendulum rod C (including shaft D, T-type connecting rod E, carbon fiber rod F, signal source clamp G and weight block H), dial I, corner brace J and fasteners, which are used in conjunction with the electromagnetic locating board K and the signal source L to perform the pendulum experiment.

Ilongwill®DISLab Scientific Exploration System

WEATHER STATION, WATER ANALYSIS, UAV, USV, HUMAN BODY EXPLORATION……

llongwill® Digital Weather Station

LW-W3000 Utility Model Patent No.: 201420296624.8

A · Wind direction sensor
B · Wind speed sensor
C · Thermometer screen (including mainboard, which contains signal processing and measuring circuit of each sensor, interface of each sensor and power interface)
D · Total solar radiation sensor
E · Lightning rod
F · Solar panels
G · Main support
H · Evaporating barrel and evaporation sensor
I · Rainfall sensor

llongwill® Digital Weather Station is an unattended meteorological monitoring system, integrating the meteorological data collection, transmission, storage and analysis functions. Air temperature, air pressure, air humidity, soil temperature, rainfall, wind direction, wind speed, evaporation, solar total radiation and other meteorological data can be collected for using in school meteorology and environmental science teaching activities.

llongwill® Campus Environment On-line Monitoring System

LW-W4000

Components:

A . Sensor Bracket
B . Wind Vane
C . Anemometer
D . UV Ratings Sensor
E . Visible Light Sensor
F . Thermometer Screen
G . Bracket

Components of Thermometer Screen:

The thermometer screen contains the circuits of temperature sensor, humidity sensor, atmospheric pressure sensor, noise sensor, CO_2 sensor, PM2.5 sensor, SO_2 sensor, NO_2 sensor, wind direction sensor, wind speed sensor, UV ratings sensor, Visible light sensor sensor and power adapter.

Applications:

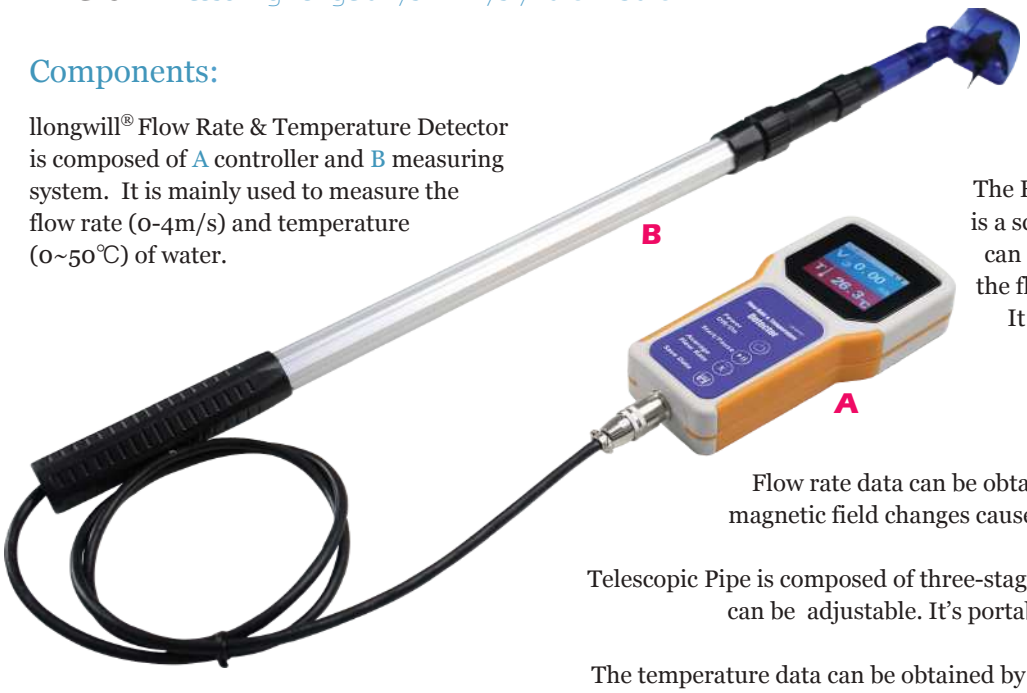
This weather and environment monitoring and logging system, which integrates the data collection,transmission, storage and statistic analysis of the meteorological environment in campus, is mainly used in the teaching practice of school meteorological and environmental science.

llongwill® Flow Rate & Temperature Detector

LW-Q757 Measuring Range:0m/s ~ 4m/s / 0℃ ~ 50℃

Components:

llongwill® Flow Rate & Temperature Detector is composed of A controller and B measuring system. It is mainly used to measure the flow rate (0-4m/s) and temperature (0~50℃) of water.



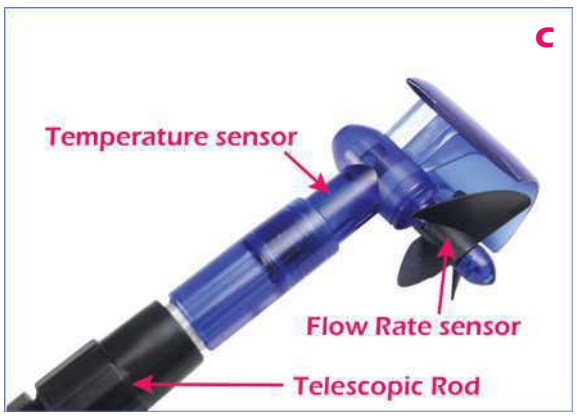
Features:

The Flow Rate & Temperature Detector is a scientific education instrument that can make an accurate measurement of the flow rate and temperature of water. It can be widely used in any kinds of liquid measurement and support students to explore the nature as a reliable tool.

Flow rate data can be obtained according to measurement of magnetic field changes caused by the rotation of turbine blade.

Telescopic Pipe is composed of three-stage aluminium drivepipes. Its length can be adjustable. It's portable, solid and corrosion resistance.

The temperature data can be obtained by using of the temperature sensitive component built-in the temperature probe. The high quality temperature sensitive component enables student to make an accurate measurement.



The screen of the controller (Fig.C) is a 2.4-inch LCD color display. By using panel buttons, the instantaneous flow rate, average flow rate and temperature data can be displayed or stored. Measuring system (Fig.D) is composed of a 1.5m telescopic rod, temperature sensor and flow rate sensor. It can be connected to the controller.

Typical Applications:

· Study on the water environment
· Study on the eco-environment of wet land
· Study on the surface runoff changes vary with climates and seasons
· The effect of depth on water temperature

llongwill® Sky Laboratory on UAV

LW-SI802 **An excellent tool for primary school STEM teaching**

NEW

Components:

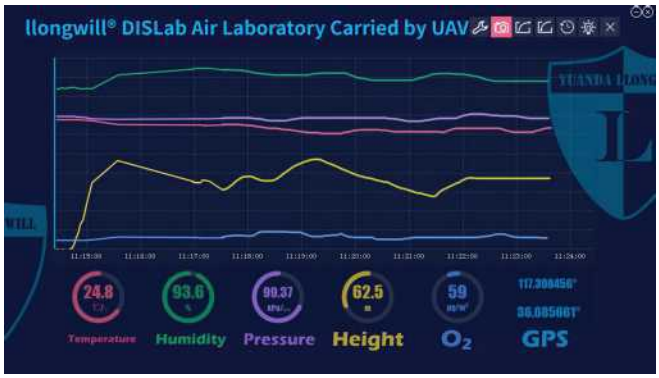
A. Wireless receiver
B. Data logger
C. Traction connector
D. Water intake device
E. Soil intake device
F. Carbon dioxide sensor
G. Oxygen sensor
H. PM2.5 sensor
I. Connecting rod
J. OTG adapter
K. Data cable
L. Remoter control
M. UAV
N. Velcro

Typical Applications:

The UAV is used to measure the atmospheric temperature, humidity, air pressure, oxygen content, and carbon dioxide content at different altitudes, and can retrieve a certain amount of surface water samples and soil samples.

llongwill® sky laboratory on UAV software (see p123 for details):

From left to right, the function buttons in the upper right of the software interface are screenshot, export data, import data, historical data list, outdoor and indoor mode switching, and collapse the toolbox. The middle is the data changing curve area, while the bottom is the real-time data display area.



llongwill® Marine Laboratory on USV

NEW

LW-SI804 **An excellent tool for primary school STEM teaching**

Components:

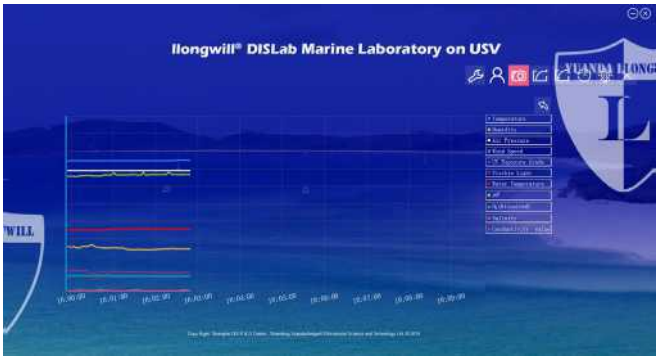
A. Monitoring vessel
B. Wireless receiver
C. OTG adapter
D. Remote control
E. Remote control charger
F. vessel charger

Notes:

- This system can monitor the related parameters of oceans, lakes or rivers, but it is not suitable to measure in the sewage with a large amount of solid particles and suspended matter.
- The wireless communication distance between the data terminal (computer, tablet or mobile phone) and the monitoring vessel should be within 300m of visible range. If it exceeds the range, communication interruption may occur.
- It is necessary to pay attention to the power information in real time. If the power is insufficient, the data collection and communication functions will be affected, especially the wireless communication function.
- It is recommended to clean the pH sensor electrode once a month, calibrate it once every three months, and replace the electrode once a year.
- It is recommended to calibrate the dissolved oxygen sensor every half a year and replace the electrode membrane head once a year.
- It is recommended to clean the conductivity sensor electrode once a month and calibrate every three months.

llongwill® marine laboratory on USV software (see p123 for details):

From left to right, the function buttons in the upper right of the software are calibration, screenshot, export data, import data, historical data list, outdoor and indoor mode switching, and collapse toolbox; the middle area is the real-time data display area. Click the drawing button in the lower right of the data display area to plot a graph of measurement data over a period of time.



llongwill® Online Monitoring System for Water Quality of River and Lake

NEW

LW-SI803

An excellent tool for primary school STEM teaching

Typical Applications:

The system is easy to operate and adopts a movable design. It has a built-in GPS system, power supply system, pumping system and various sensor acquisition systems. It can be used to perform measurements of water pH, dissolved oxygen, conductivity, water temperature, total ammonia nitrogen, and turbidity. In combination with a computer or tablet, the target waters can be automatically collected and analyzed for water quality conditions, and the monitoring results can be reported, thereby achieving the purpose of multi-point water quality monitoring of the target waters to realize real-time monitoring of river and lake water quality.

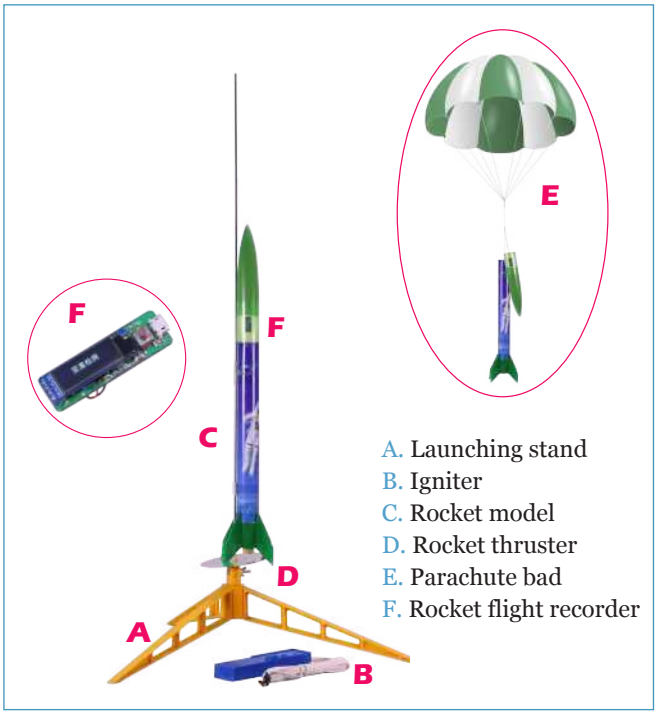
Components:

A. Water quality monitoring box
B. Water inlet pipe
C. Water outlet pipe
D. Wireless receiver
E. OTG adapter
F. Power charger

llongwill® Rocket Flight Recorder

NEW

LW-SI806 **An excellent tool for primary school STEM teaching**



A. Launching stand
B. Igniter
C. Rocket model
D. Rocket thruster
E. Parachute bad
F. Rocket flight recorder

Typical Applications:

It can realize the functions of recording, storing and viewing the flight data of the rocket model. It can record 10 kinds of data during flight: maximum altitude, maximum speed, boost time, maximum acceleration, average acceleration, time from flameout to highest point, time from the highest point to the parachute release, height of parachute release, uniform deceleration and landing time.

Rocket flight recorder software interface

llongwill® Students Health Indicators Measurement System

LW-SI801 **An excellent tool for primary school STEM teaching**

NEW

Components:

A. Storage bag
B. Data logger
C. Respiration rate sensor
D. Blood pressure/heart rate sensor
E. Cochlear wireless body temperature sensor
F. Skin resistance sensor
G. ECG sensor lead wire
H. ECG sensor electrode clip

Typical Applications:

Can measure and display 6 human physiological indicators including body temperature, blood pressure, heart rate, respiration rate, skin resistance and electrocardiogram in real time. It is mainly used to measure and compare the differences of physiological indicators of different individuals in different states .

Ilongwill®DISLab STEM

NEW TECHNOLOGY FILLS UP GAPS IN EXPERIMENTS AND SOLVES EXPERIMENTAL PROBLEMS

llongwill® Magic Circuit

LW-SI811

NEW

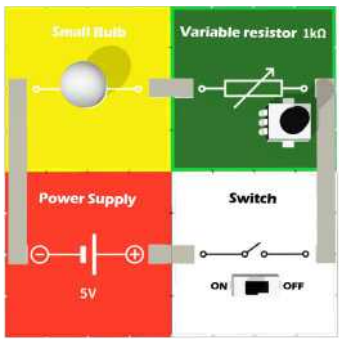
Components:

The magic circuit consists of 38 kinds of modules and accessories (include scissor, conductive tape, MicroUSB charging cable, charger).

The 38 kinds of modules are color-coded according to their roles.

Red: power module, interface module.(A in figure below)
Green: capacitance module, resistance module, variable resistance module, potentiometer module, potentiometer module, thermistor module.(B in figure below)
Yellow: LED light module, two-way LED light module, motor module, buzzer module, relay module, relay NONC switch, diode module, transistor NPN module, transistor PNP module, miniature bulb module.(C in figure below)
Blue: Voltmeter module, amperemeter module. (D in figure below)
White: Switch module, two-way switch module, tact switch module, touch switch module, wireless switch module.(E in figure below)

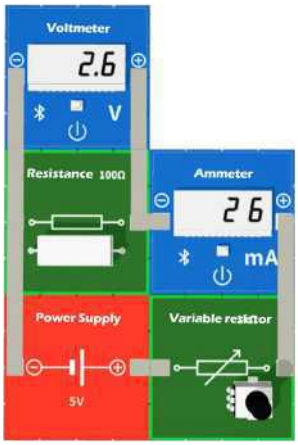
Application: Dimming circuit



Module list: Power supply×1, switch×1, miniature bulb(can be replaced with a LED light) ×1, 1kΩ variable resistance×1.

Splice each module by using conductive tape as shown in figure. Change the value of the variable resistance, then the miniature bulb turns light and dark.

Application: Ohm's law



Module list: power supply×1, 1kΩ variable resistance×1, 100Ω resistance×1, amperemeter×1, voltmeter×1

Splice each module by using conductive tape as shown in figure. The voltmeter and the amperemeter respectively measure the voltage at both ends of the resistance and the current passing through. The voltage and the current change by adjusting the variable resistance.

llongwill® Robot Modular V2.0

Utility Model Patent Application No.: 201420295246.1

LW-Q751

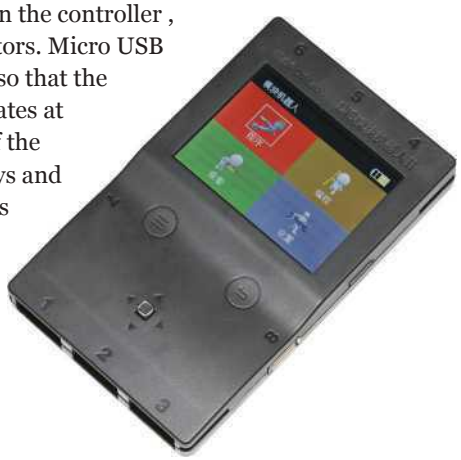
Design Ideas:

The design ideas of llongwill® Robot Modular accords with STEM education requirements. STEM education integrates with Science, Technology, Engineering, Art and Mathematics so that the focus is on that the originally splintered different objects becomes a new entirety. the integration through interdisciplinary knowledge as well as solving real-world context on hands is emphasized on STEM education. Based on practical experiences over years and on the concept of "modular combination", the robot modular is developed with three parts "sensors, actuators and controller". Moreover, this design improves and enrichs three parts in accordance with the principle of modular design. Students can independently match module, compile control program and solve practical problems according to function needs, and then their everlasting learning interests and thirst for knowledge will be motivated.

Components of llongwill® Robot Modular:

Controller (A), *Sensors* (B-H)—— tracking sensor (B), sound sensor (C), temperature sensor (D), light sensor (E), magnetic sensor (F), far-infrared sensor (G), trigger sensor (H).
Actuators (I-L)——dummy lamp (I), actuator application extension module (J), traffic light(K), electromotor(L)
Accessories (M-S)——front wheel bracket (M), rear wheel bracket (N), wheel (O), electromotor connecting wire (P), USB cable (Q), battery charger (R), Connecting wire for Bit Output Actuator (S).

Controller:



llongwill® robot modular V2.0 controller is the core component of the whole system. In the controller , there are 8 ports , which can be randomly connected with different sensors and actuators. Micro USB port which can be connected with a computer located at the left side of the controller, so that the programme download and management can be easy to conduct. The power button locates at the right side of the controller. One piece of colored LCD screen locates at the upper of the controller. Succinct UI can be convenient used to communicate with users. 2 touch keys and 1 control bar locate at the bottom of the controller. There is a battery cabin which holds rechargeable lithium batteries in the reverse side of the controller.

Acquisition of Control Program:

llongwill® robot modular V2.0 can acquire control program by following ways:
(1) Self-stored control program is kept in the "program" menu of main interface of the controller, and the control program can be selected by the control bar.
(2) Simple programming cart can be conducted with the cart after entering into the "programming" menu in the main interface of the controller.
(3) Independently design control program. Run the special software of the modular robot, the program design can be conducted by using graphical programming, Before the robot runs,the program can be downloaded into the controller through USB interface after completing the design.

Study on obstacle avoidance

Study on "OR gate"

Study on "Movement tracking vehicle"

Automatic Control Switch

LW-O803

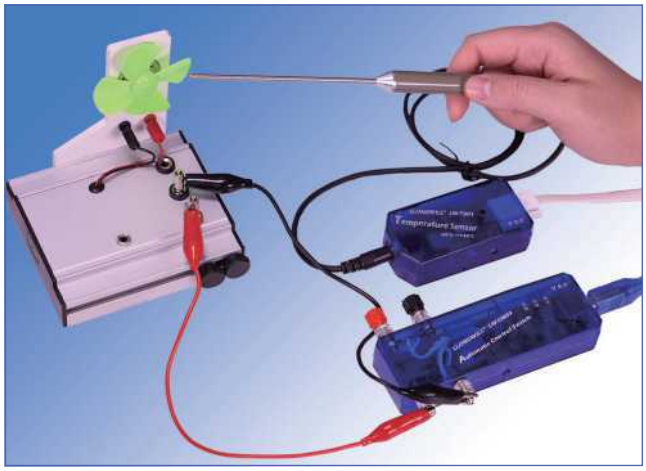
The control for external device based on sensor signals

The Design ideas of llongwill® Automatic Control Switch:

Sensors are the basis of automation; the essential of automatic control is the reaction of computer program based on the data measured by sensors.

Typical Applications:

A simple temperature control circuit (below); Sound-control circuit; Magnet-control circuit; Light-control circuit, etc.



Experiment device of simple temperature control circuit

Threshold setting interface

Automatic Control Actuator

LW-O702

Executing the instructions of the program based on sensor signals

The Design ideas of llongwill® Automatic Control Actuator:

► The basic structure of automatic control actuator is the automatic control switch plus an actuator circuit.
► Set the threshold value in the llongwill® feedback control software, then the actuator will be turned on when the sensor data reaches the threshold.

Typical Applications:

Based on “threshold feedback” program, three kinds of actions including indicator light, alarm and motor, can be executed.

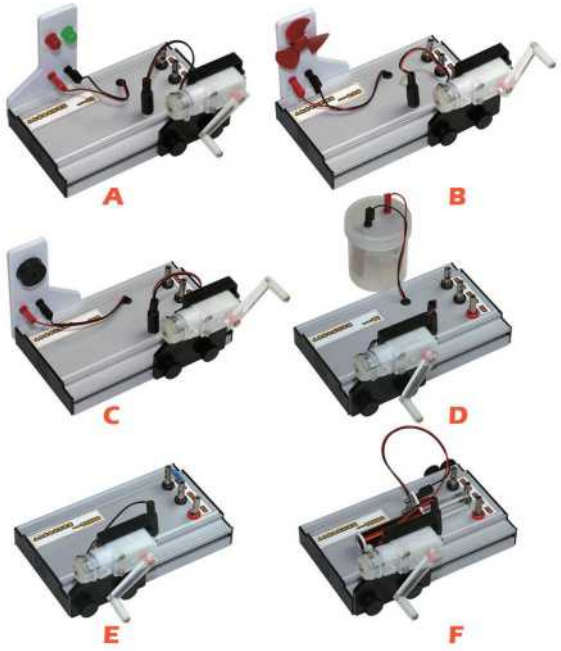
An automatic control system composed of Pad terminal, actuator and fast response temperature sensor

An automatic control system composed of Pad terminal, actuator and sound level sensor

Series of Hand Generators

LW-XQ781

The hand generator packages consist of small bulb A, fan B, buzzer C, electroplating kit D, thermal- current effect kit E, magnetic current effect kit F.

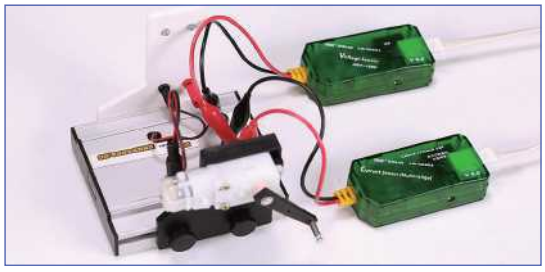


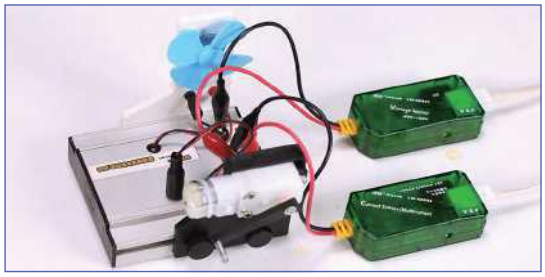
The structure of llongwill®Series of Hand Generators:

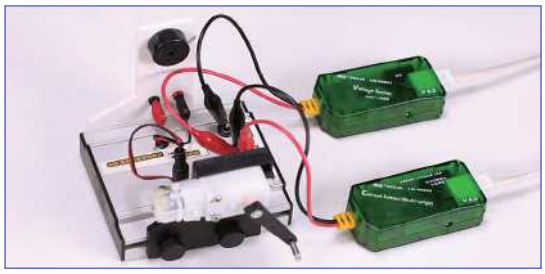
llongwill® series of hand generators are structured with base, electric generator module, and other related electric modules. Those generators can be used together with multi-range current sensor, voltage sensor, temperature sensor and magnetic induction sensor.

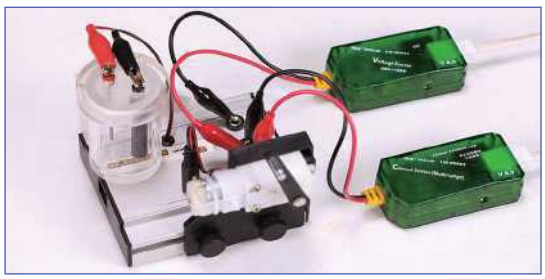
Usages of llongwill® Series of Hand Generators:

► 1.Fix the generator module to the base with a plastic cap bolt; Plug the Generator module wire into the base, and then plug the red wire and the black wire on the base into the corresponding ports on the modules individually.
► 2. Connect the multi-range current sensor and voltage sensor with corresponding terminals on the base. The probe of magnetic sensor should be placed into the central part of the solenoid magnetic effect of current device. The probe of temperature sensor should be well connected and fully touched with the resistance on the thermal-current effect.
► 3. Start the general software of llongwill® primary school science; rotate the handle of generator module clockwise or counterclockwise, then the changes of current and voltage can be observed.

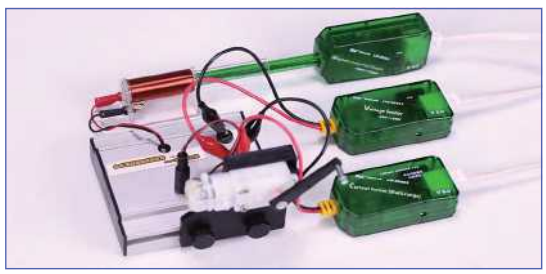

Small bulb kit


Fan kit


Buzzer kit


Electroplating kit

Thermal-current effect kit

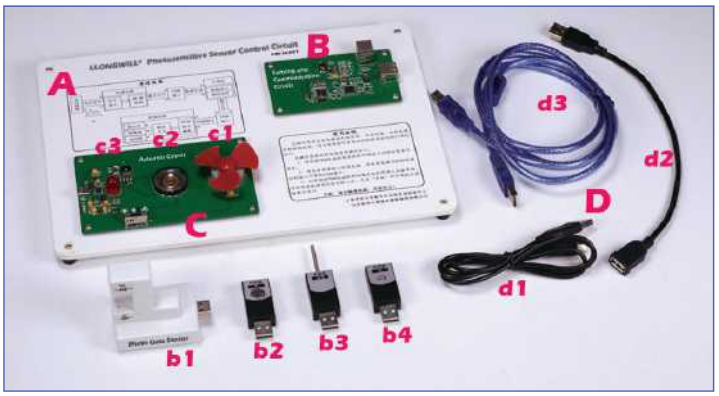

Magnetic current effect kit

llongwill® Sensor Control Circuits

The control circuits of the llongwill® sensor include the control circuit of photosensitive sensor (LW-SC001), the control circuit of acoustic sensor (LW-SC002), the control circuit of heat-sensitive sensor (LW-SC003), the control circuit of count sensor (LW-SC004), and the control circuit of timing sensor (LW-SC005).

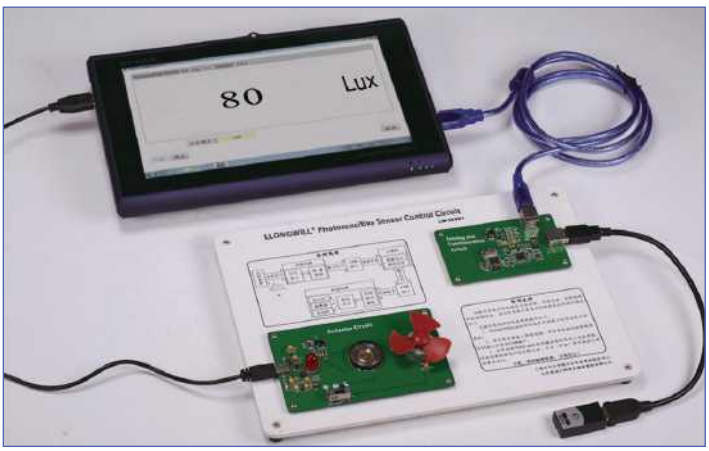
The Components of llongwill® Sensor Control Circuit:

A. Base plate; B. Sensing and communication circuit (b1. Photo gate sensor; b2. Optical sensor; b3. Temperature sensor; b4. Sound sensor); C. Actuator circuit (c1. Fan; c2. Buzzer; c3. Bulb)
D. Data cables (Including d1. Mini USB cable; d2. Sensor wire; d3. USB cable).



Experiment Example:

► Install llongwill® sensor control circuit software into the computer, following the instructions.
► Connect the sensor to the circuit by wire.
► Connect the circuit to the computer by USB cable
► Connect the actuator circuit and computer by another USB cable with one Mini USB plug.
► Start the software and set the threshold value.



Photosensitive sensor control circuit

Acoustic sensor control circuit

Thermal sensor control circuit

Counting sensor control circuit

Timing sensor control circuit

llongwill® Logical Circuits

Utility Model Patent No.:ZL200720017880.9
ZL200920027215.7

LW-6312 & LW-6338

R&D Background:

Logical circuits, also are called “digital circuits”. To enhance the ability of STEM education to solve the practical problems with multi-discipline knowledge, the visual perceptual materials must be used to present the logical circuits to make the students get a direct feel of logical circuits input and output, by which, the students' practice ability can then be promoted. That’s why llongwill® Logical Circuits got specially designed.

Components:

At present there are two versions of llongwill®Logical Circuits:V2.0A& V2.0B, corresponding serial numbers: Lw-6388, Lw-6312, of which, V2.0A is a full-functional version; V2.0B is a basic version. The common part is that both of them are modular designed, while they have difference in configuration. With the signal collector and software, a real-time communication between logical circuits and a computer is realized, by which, the abstract level signals in logical circuits can be displayed visually on the screen, so that a breakthrough on logical circuits experiment teaching comes into practice.

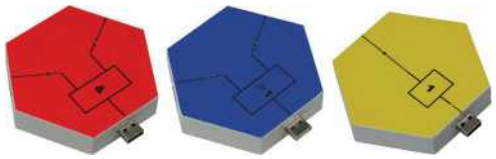
Logical Circuit V2.0 B:

Gate Circuits: AND gate OR gate NOT gate
Switches: Upper Switch, Middle Switch, Lower Switch
Sensors: Illumination Sensor Temperature Sensor
Actuators: Bulb, Buzzer
Connectors: “One Input Two Output” Connector
Accessory: Battery Box

Logical Circuit V2.0 A :
(Additional part based on V2.0B)

Sensors: Magnetic Induction Sensor, Photo Gate Sensor, Sound Sensor
Actuators: Electromotor with light blocking sheet and light blocking plate
Connectors: π-shaped Connector, Cross-shaped Connector, *Signal Collector*
Accessories: Signal cables x 6, USB cables, Software

Gate Circuits:
There are three types of gate circuits: AND gate(red), OR gate (blue), NOT gate (yellow), which are located in structrued hexagonal boxes with circuit diagram printed on the surface. Also, the pilot light is installed. When the input signal in the gate circuit module is at high level (logical state:1), the corresponding pilot light on the module surface will be ON; while the input signal is at low level (logical state:0), the pilot light is OFF. On the side of gate circuit, input port and output port can be found, both of which are standard USB ports. Different kinds of switching modules and sensor modules are available for the input port. The output port can be connected with different kinds of actuator modules.



Switches:
Consisting of the upper switch,the middle switch,and the lower switch. The switches located at a quadrilateral box with the printed circuit on the surface, shows “Close-Open” . On the side of the switch, the input interface and the output interface can be found, both of which are standard USB interfaces. For the logical state of switch module, it is positive logic, which means that the logical state will be “0” when the switch is “Open”; and “1” for “Close”.

Sensors:
The sensors are the source of logical circuits to control signals. Five types of sensors can respectively control illumination, temperature, sound, magnetic induction and motion (photo gate light-blocking). The induction rules of external signals for each sensor are as follows:(1)when the illumination sensor gets light illuminated, the resistance value decreases; when no light illuminated, the resistance value increases.(2)when the temperature sensor detected that temperature rises, the resistance value will decrease; when the temperature decreases, the resistance value will increase.(3)the sound sensor will output high electrical level when sound is detected;

and then recover to the low electrical level after a while. (4) when the magnetic induction sensor is close to the magnet, circuit will be connected, and high electrical level will be output; while away from the magnet, circuit will be disconnected, and then output low electrical level. (5)when light is blocked to photo gate sensor, resistance will increase, and low electrical level will be output; when light transmitting, the resistance will reduce, and high electrical level will be output. All these five sensors adopt quadrilateral box structure, with printed circuit diagram on the surface, and have standard USB interface configured as the output port for all kinds of switches, actuators or gate circuits. For sensors of illumination, temperature and sound, there is a sensitivity knob on the surface.

Actuators:

The actuators include a bulb, a buzzer, and an electromotor. Regarding the electromotor, it is equipped with a light blocking sheet and a light blocking plate. All these three kinds of actuators are structured with quadrilateral box , in which there are prompt words or patterns printed on the surface. A standard USB interface can be found on the side as an input port for connection of connectors, sensors or gate circuits. The actuating logic of these three types of actuators is: starts to act when high electrical level signal is received; stops when low electrical level signal is received of them,respectively.

Signal Collector:

The communication between the signal collector and a computer is realized with USB mode . In the two sides of a collector, there are six signal collecting channels A~ F. The electrical level signals can be collected and uploaded through signal cables connecting with logical circuits.

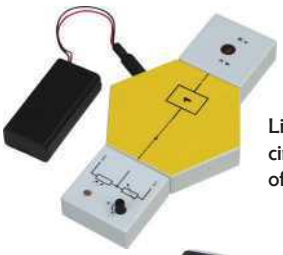
Connectors:

Connector is designed for building up complex circuits and transmitting control signals and can be connected with all kinds of sensors, actuators and gate circuits ,with a standard USB interface among them. The “one input-two output” type connector can be lined by soft cables with high flexibility, by which not only control signals can be transmitted, but also the feedback signals that power up the equipment related to the circuit; Cross-shaped connector has 1 input port and 3 output ports to allocate signal into multiple channels at the same time. It can be used for both the output and input of the gate circuit.

As to the π-shaped connector, besides the connection function, it can be plugged with 2 signal cables, which is specially designed for the experimental logic analysis of the composite gates(signal test).

Light-control circuit of flashing lamp

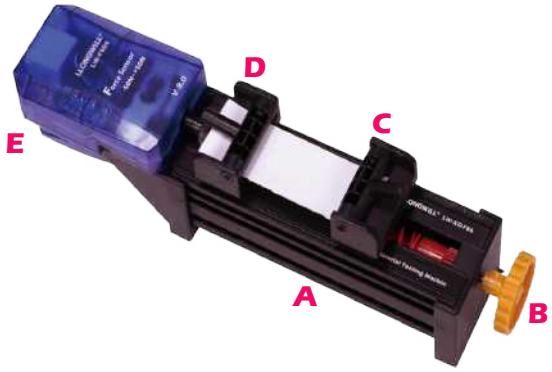
Light-control circuit of alarm light



Light-control circuit of street lamp

llongwill® Mini Material Tention Tester

LW-XQ786



Components:

llongwill® mini material tension tester is composed of A.base, B. knob, C. clamp at the end of screw, D. clamp at the end of sensor and E. force sensor.

Pupils study the paper's tension experiment

Experiment interface of Mini Material Tension Tester

Notes:

●Width of the materials to be tested ≤3cm, length≤4cm;
●The surface of the materials to be tested should be kept flat without any wrinkles and marks;
●Rotate the knob slowly, and keep the force sensor in its range.

llongwill® Supermodule

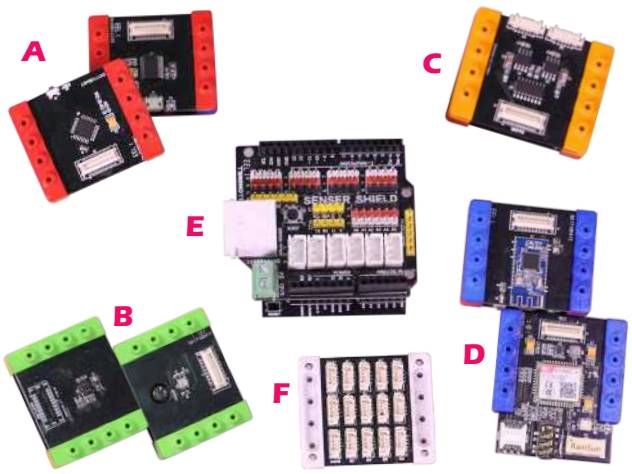
NEW

LW-Q870

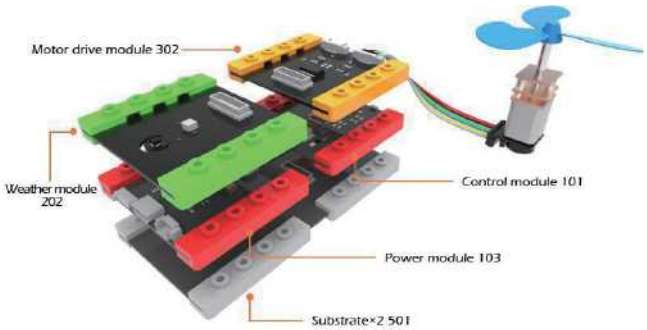
Components:

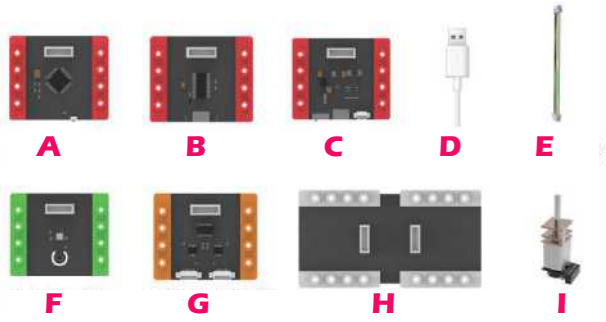
Each module is color-coded according to its role:
Red——The core module, the brain and logic core of the project (A)
Green——Input module, provides sensor data for the project (B)
Yellow——Output module, provides output sound, display, action and other functions for the project (C)
Blue——Communication module, provides wireless communication for the project, such as Bluetooth or WiFi (D)
White——Extension module, enables compatible connections with various external modules through the transfer function(E F).

► Bid farewell to complex connecting compatibility issues
► Contains more than 20 modules to distinguish functions from color
► Each module is connected by easily stacking
► With simple combination, you can DIY your own hardware



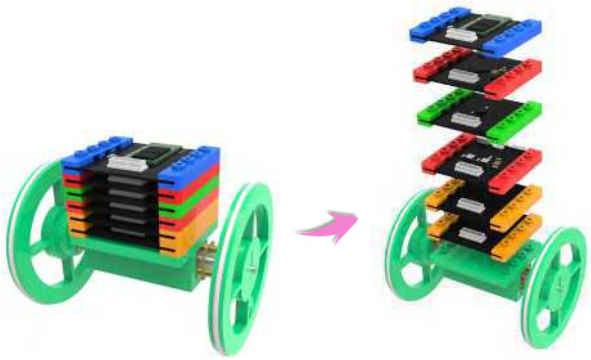
Supermodule research project——Modular Cell Phone:





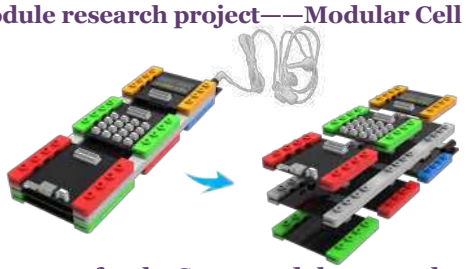
A.Control module 101
B.Download Module 202
C.Power module 103
D.USB cable
E.Motor connection cable
F.Weather module 202
G.Motor drive module 302
H.Substrate × 2 501
I. Motor

Supermodule research project——Self balancing transporter



Supermodule research project——Shared lock

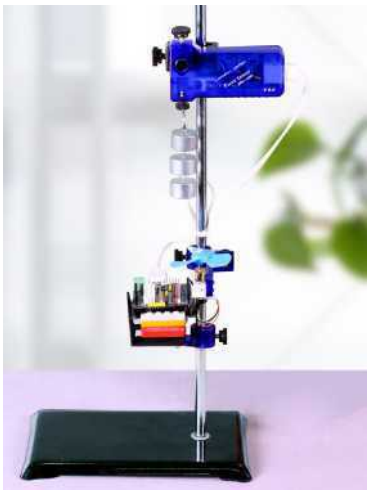
Supermodule research project——Modular Cell Phone:



Usage of sensors for the Supermodule research projects:

Force sensor controls motor speed, which can be used for load overweight display or alarm.

It contains power module 103, control module(USB) 104, motor drive module 302, Arduino compatible module 504, Arduino expanded version 505, motor, motor cable, force sensor, sensor cables, etc.

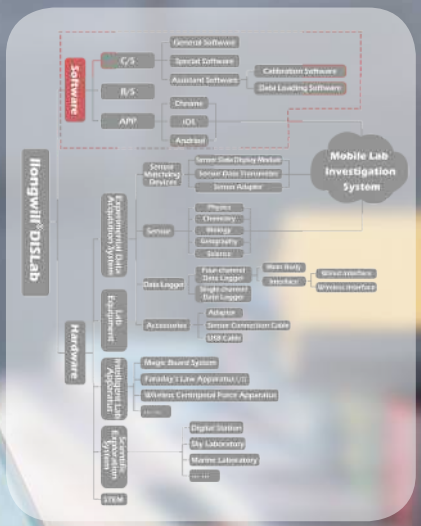


llongwill®DISLab Software

COVER WINDOWS/MAC OS/ANDROID/IOS/CHROME OS SYSTEMS
BUILD A BIG DATA SYSTEM FROM DESKTOP TO CLOUD

Support Windows/Mac OS/Android/iOS/Chrome OS, mobile/pad/computer and other platforms

iOS Android chrome



llongwill© Teaching Software

Categories of llongwill© experiment software (classified by stage and purposes):

●Primary school science softeware: “Special + General” integrated software
●secondary school science software: ◆General software; ◆ Special physics software; ◆Special chemistry software; ◆Special biology software; ◆General software; ◆Special physics softeware; ◆Special biochemistry software & chemistry software;
●Assistant software: ◆Calibration software; ◆Data loading software.
●special software for intelligent lab equipment;
●Special software for acoustics.
●Digital weather station software----General-type integrated software.

Introduction:

Software is a bridge and bond for human-computer interaction and an important part of digital laboratory system. After more than ten years of teaching application, llongwill© software system has developed into a relative perfect software group , which includes “ General Software”, “Special Software” and “Assistance Software”.These softwares are working with subjects in physics, chemistry, biology, environment science, primary science, covering the educational sections from primary school to high school.

Components of llongwill© Software (Software name + product serial number):

●V8.0 software package—LW-S801
●Wireless centripetal force apparatus software—LW-S706
●Faraday’s law apparatus I—LW-S707
●Faraday’s law apparatus II—LW-S708
●Logical circuits apparatus V2.0A software—LW-S710
●Robot Modular V2.0 software—LW-S809
●Acoustics special software package—LW-S702
●Digital photoelectric track system software package—LW-S820
●Conservation Law of Mechanical energy apparatus II software—LW-S822
●Electrostatic measurement software—LW-S823
●Photoelectric Range Finder Software Package——LW-S825
●Magic Board Software Package——LW-S826
●Marine Laboratory on USV Software——LW-S832
●Sky Laboratory on UAV Software——LW-S831
●Rocket Flight Recorder Software——LW-S833
●Primary school science software—LW-XS801
●Digital geographic field kit software—LW-S812
●Digital weather station software—LW-WS301
●Experiment Teaching and Evaluation System—LW-S831
●Teacher Information Management System—LW-S832
●Educational Equipment Information Management System—LW-S833

llongwill© V8.0 Software Package LW-S801

Loading of V8.0 Software Package:

Put llongwill© DISLab V8.0 software disc into the driver of the computer, then the computer will run automatically. First of all, it will pop-up a welcome interface and a prompt interface of installation guide. By following the installation guide, users shall choose the path, starting installation program. After the installation, a window will be poped-up which shows that the installation is successful. After clicking “Complete” in the window, a shortcut icon of llongwill© DISLab V8.0 software is generated on the desktop. Click the shortcut icon of llongwill© DISLab V8.0 software, then you would open the initial interface of the software.

Initial interface

Desktop Shortcut

Initial interface of V8.0 software package

Function Introduction of General Software:

Fully Compatible
The General Software supports all kinds of llongwill V8.0 Sensors.

Plug and Play
Automatically display the data window once connecting a sensor, and the data window is automatically closed once disconnecting a sensor.

Multiple Display Mode
Besides some specific sensors, most sensors’ display window can be shown in following three modes “Digital”,”Instrument” and “Oscillogram”. Users can select the display mode freely according to teaching request.

Data Collection in Parallel
Support 4 digital channels to collect data simultaneously and record. Especially, it supports 4 sound sensors to be connected into a data logger simultenously.

Multiple Curves Display
There is a special combination display window to show multiple curves which have logical relations in one coordinate axis.

Freely Adjustable Coordinate Axis
In the combination display window, it supports to make a custom coordinate axis and zoom or drag the coordinate axis freely.

Curve Analysis
In the combination display window, it supports some advanced mathematical analysis for further uncovering physics laws based on the experimental curves by using some functions such as curve fittings, derivation, integration and so on.

Data Calculation
The experimental data can be recorded in the calculation table and the experiment result can be calculated according to the formula via the embedded compiler in software.

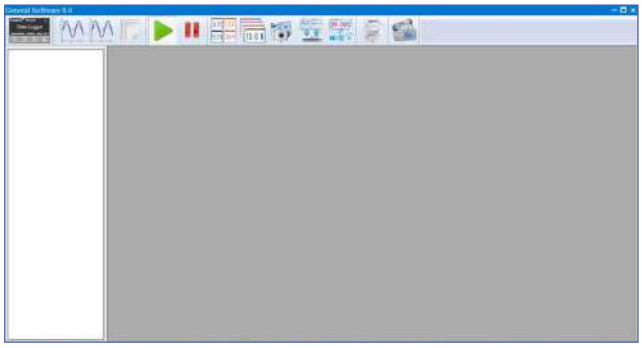
Sensoring loop control
It uses sensors as a signal source to build up an automatic control system. Based on the data measured by sensors, one can set a controlling threshold value and send an instruction signal to the actuator.

Teaching Management
It supports the interaction between teachers and students using internal network. Students can submit their experiment report to teachers via the software and teachers can give their feedback after receiving the report.

Function Introduction of V8.0 General Software:

Main interface--main interface of the general software mainly includes: title bar, main menu bar, toolbar, control panel region, window display region and status bar.

Observing the function diagram in the toolbar, the open modes of the main functions of llongwill© general software, especially for the particularly standing out the usage meaning of "computation table" and “combination curves” will be introduced and well learned.



Main interface of General Software

Special Software for V8.0 Physics:

In the principle of "less operation procedures, lower operation difficulties, focusing on experimental requirements", in special software for physics, the independent interface curing aims at each experiment process individually, so that there are the characteristics of "unique style, simple interface, one-click OK" in the software families.

Main interface of Physics (speciali) software

Special Software for V8.0 Chemistry/Biology:

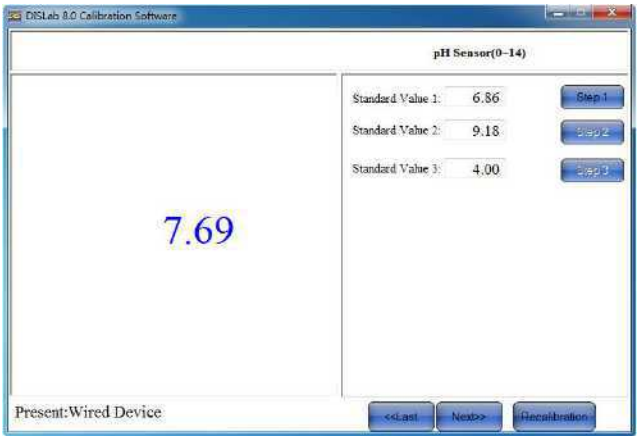
llongwill© general software can support experiments in biology/chemistry conducted with all biology/chemistry sensors. However, the distinctiveness of partial experiments in biology/chemistry is considered. Aimed at the requirements of relatively special display, process and records of a part of experiments in biology/chemistry, it is special designed, while the special software groups of chemistry and biology have been developed, in order to support and promote experiment teaching in biology/chemistry.

Main interface of Chemistry (specialized) software

Main interface of Biology (specialized) software

V8.0 Calibration Software:

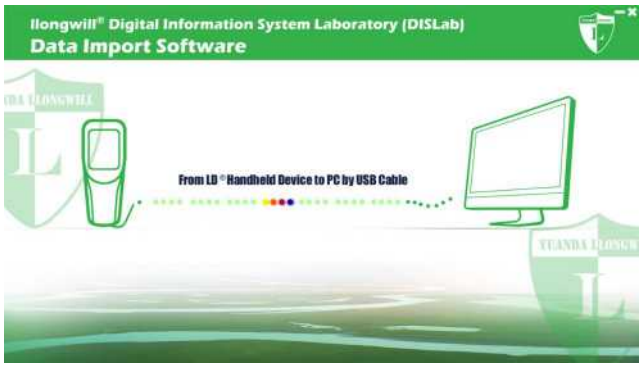
The chemistry sensors & biology sensors are different from physics sensors. The principles of many biology/chemistry sensors are chemical reaction process. Generally speaking, it is electrochemical process. In view of complexity of chemical reaction, calibration software aimed at biology/chemistry sensors has been developed individually, which is used for sensor calibration before experiment.



llongwill© calibration software can be used for those items including: pH Sensor, Oxygen Sensor (liquid), Chroma Sensor, Turbidity Sensor, ORP Sensor, Carbon Oxide Sensor, Nitrogen Dioxide Sensor, Ammonia Sensor, Methane Sensor, Hydrogen Sensor, Chlorine Sensor, Ammonium Ion Sensor, Nitrate Ion Sensor, Chloride Ion Sensor, Potassium Ion Sensor. The calibration of these sensors, should work in the standard environment. For instance , three kinds standard buffer solutions of pH value 4.00, 6.86, 9.18 respectively should be prepared in the pH Sensor calibration ; The anaerobic water, that is saturated Na_2SO_3 solution should be provided in the oxygen sensor (liquid) calibration ;

V8.0 Data loading Software:

llongwill© V8.0 system equips with independent data display module for sensors. This module has the function of storage data in addition to display real-time data of the sensor. Analyze the data loaded from this module into the computer.



llongwill©Wireless Centripetal Force Apparatus Software:

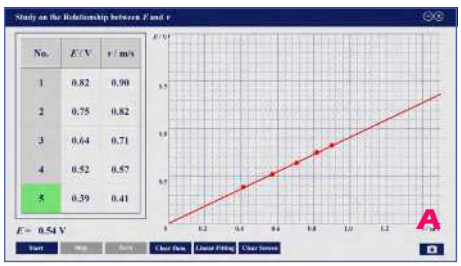
LW-S706

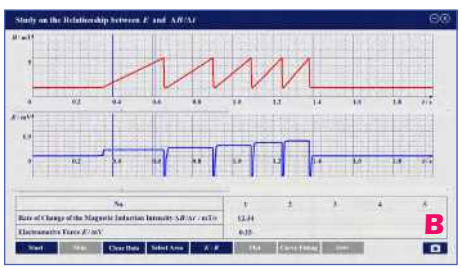
llongwill© Wireless Centripetal Force Apparatus is a new developed intelligent experimental apparatus, aimed at the expanded requirement of centripetal force experiment (details refer to P92). In view that this apparatus is an independent USB equipment which communicates wirelessly with computer directly, there is a certain distinctiveness in structure. Therefore, a relatively independent software is developed for llongwill© wireless centripetal force apparatus. The main interface of the software is the same as one in the topic of " study on factors about centripetal force" with DIS in llongwill© special software. The main interface of the software is as below:

llongwill© Faraday's Law Apparatus I. II Software:

LW-S707/S708

llongwill© Faraday's Law apparatus **I** and **II** are intelligent apparatus which communicates with computers directly by USB mode (details refer to P94 & P95), and equipped with corresponding bundled software. The experiment requirements of this series of software are specific. The setting of steps is clear, and the software can be used in the contrast of the data from many experiments. Please see graph A for the main interface of apparatus **I**, and graph B for the main interface of apparatus **II**.



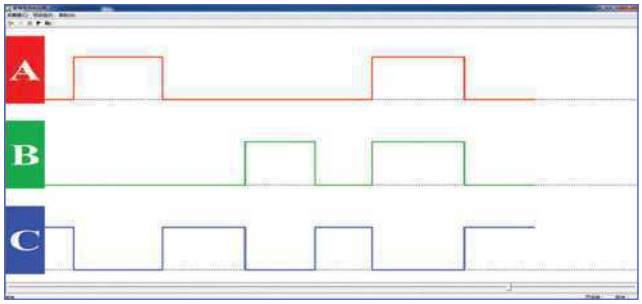


llongwill© Logical Circuits Apparatus V2.0A Software:

LW-S710

llongwill© Logical Circuits apparatus V2.0A is the upgraded version of logical circuits apparatus V1.0. After upgraded, the function with signal logger (details refer to P111) is added in the version. By the bundled special software, electric level signal figure curves corresponding to gate circuit can be shown on the computer, which is convenient for students to clearly grasp the logical relations between signals.

In the software, there are functions, such as adjustable scanning speed, variable channel modes, and adding marker lines, which can provide strong supporting for logical circuits teaching (graph below).

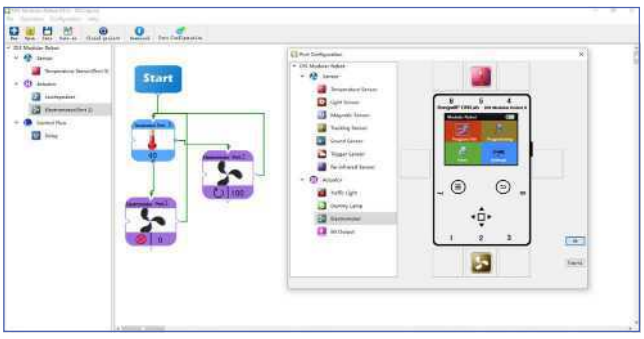


llongwill© Robot Modular V2.0 Software:

LW-S809

llongwill© Robot Modular V2.0 is a support apparatus product used for STEM education (details refer to P107). The designed idea of this apparatus aims at offering an environment for students to learn and to explore by their own, and providing helps for learning the relevant contents of automatic control in the textbooks.

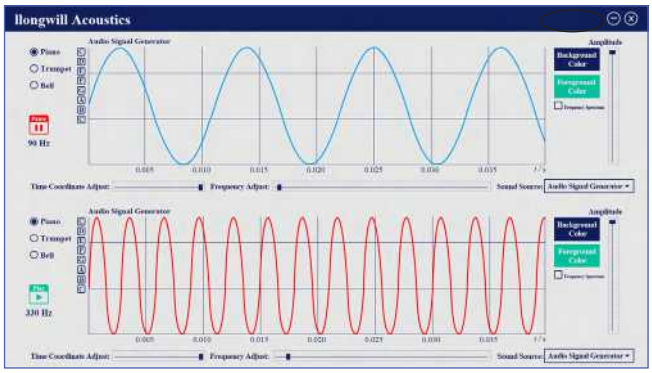
For achieving the teaching goals, the corresponding software and the matched graphical programming-styled software are developed. Once the programme being designed, the programme can be downloaded to the controller for operation by USB cables. The functions of the software include "port setting", "flowchart drawing", and "generating code". Software "Help" menu is detailed.



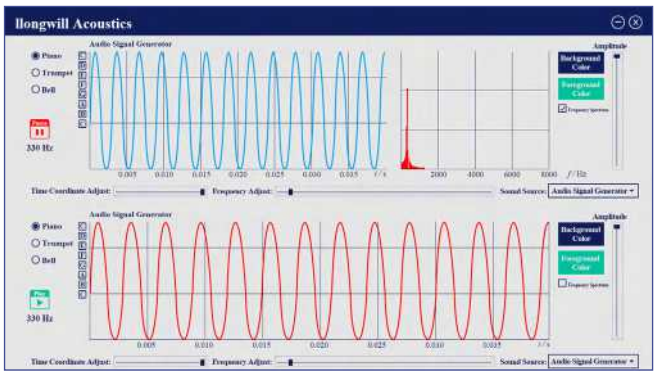
llongwill© Acoustics Software:

LW-S702

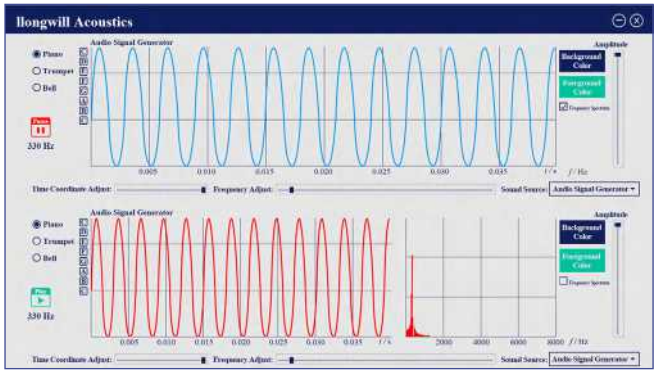
llongwill© Acoustic Software's built-in audio generator and self-extending sound gallery own the three essential elements—"loudness, tone, timbre", indicating that "the essence of loudness is amplitude" and "the essence of tone is frequency", especially with the powerful "spectrum" function (inside the red circle of image below), which shows that "the essence of tone is the overlay of multiple frequency sound waves". It is a powerful support for teaching and has obvious superiority compared with traditional experiments.



Experiment interface of relation between frequency and tone



Spectrum analysis experiment interface

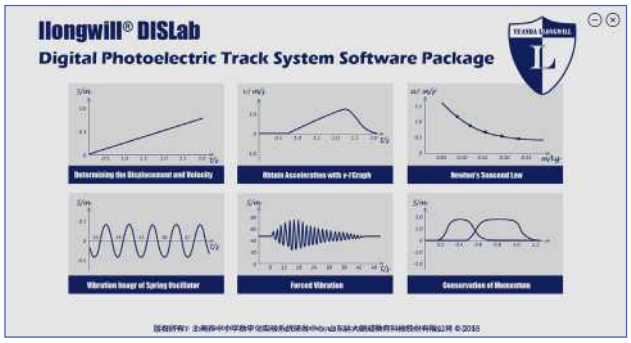


Analysis of 330hz sound spectrum of piano

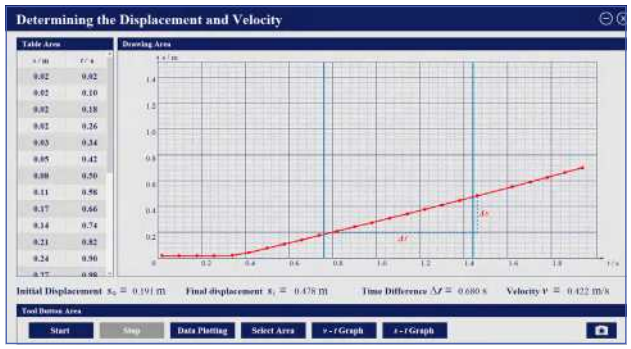
llongwill© Digital Photoelectric Track System Software Package:

LW-S820

Since the Digital Photoelectric Track System is an intelligent device which independently communicates with the computer in wireless and its special expended applications, it is mated with dedicated software. After installing the package, an independent shortcut is created, the opened main interface is shown as graph below:



Experiment interface of elastic collision and inelastic collision



Experiment interface of displacement and velocity measurement

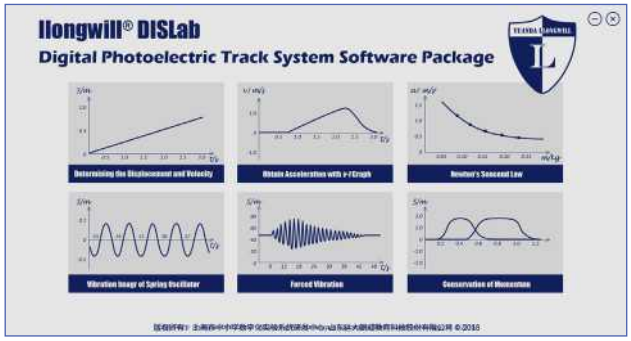
Experiment interface of acceleration calculation from *v-t* figure

llongwill© Photoelectric Range Finder System Software Package

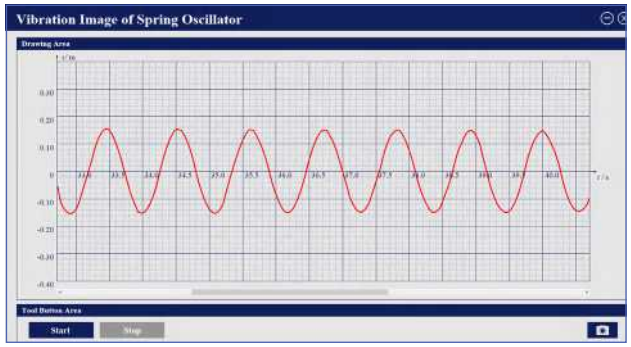
NEW

LW-S825

The cart in this system is an intelligent equipment which communicates independently with computer by wireless, and its extended application has its particularity, so the special software package is chosen to form a complete set. The main interface of the software is as follows:



Experiment interface of elastic collision and inelastic collision



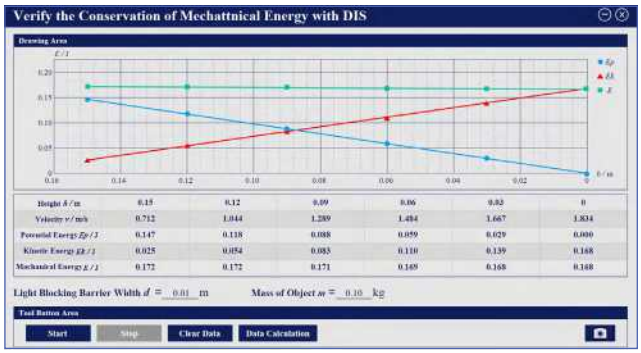
Experiment interface of vibration image of spring oscillator

Experiment interface of Newton's second law

llongwill© Conservation Law of Mechanical Energy Apparatus Ⅱ Software:

LW-S822

llongwill© Conservation Law of Mechanical Energy Apparatus Ⅱ is an intelligent experiment apparatus (details refer to P93). Since the experiment apparatus is a special intelligent device which independently communicates with the computer via USB, it is mated with the dedicated software.

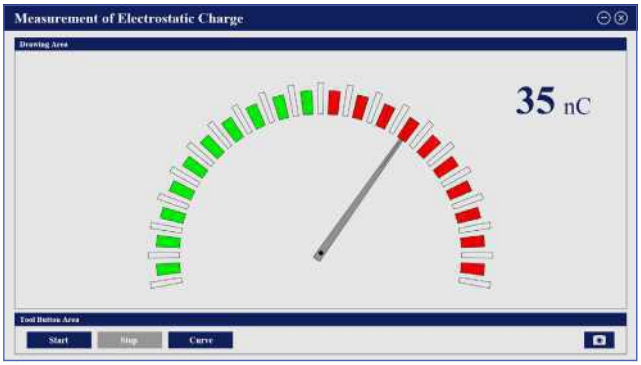


llongwill© Electrostatic Measurement Software:

LW-S823

llongwill© Electrostatic Measurement software is dedicated for llongwill© electrostatic sensor and llongwill© electrometer (details refer to P25). Since they are intelligent devices which independently communicate with the computer through wire or wireless, it is mated with the dedicated software.

Interface of electrostatic measurement special software

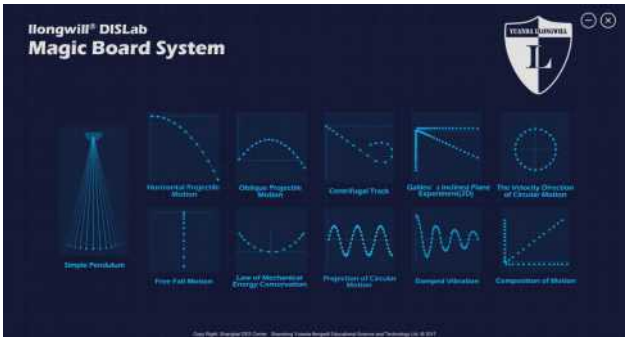


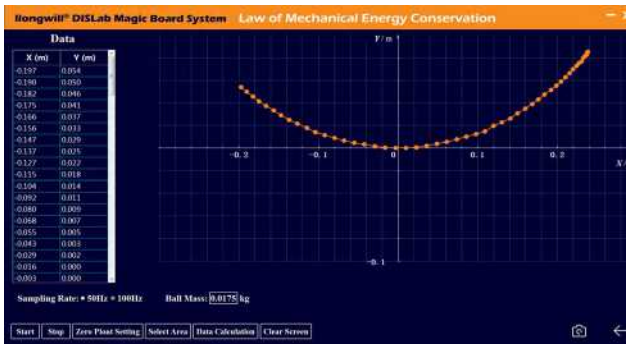
Experiment interface of charged glass rod after rubbing by silk

llongwill© Magic Board System Software Package LW-S826

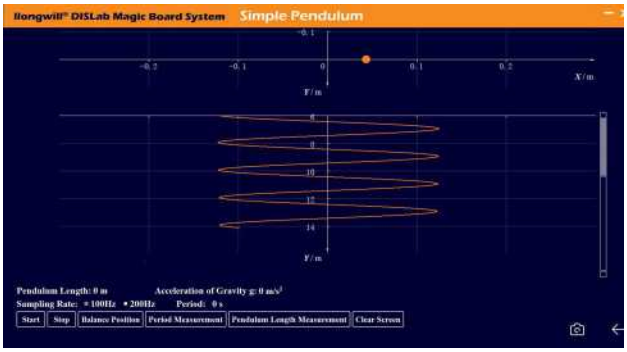
NEW

The Magic Board is an intelligent apparatus that communicates independently with the computer via USB, and its extended application has its particularity,so an independent special software is developed. The main interface of the software is as follows:





Experiment results of conservation of mechanical energy (above) and projectile trajectory and fitting curve (below)

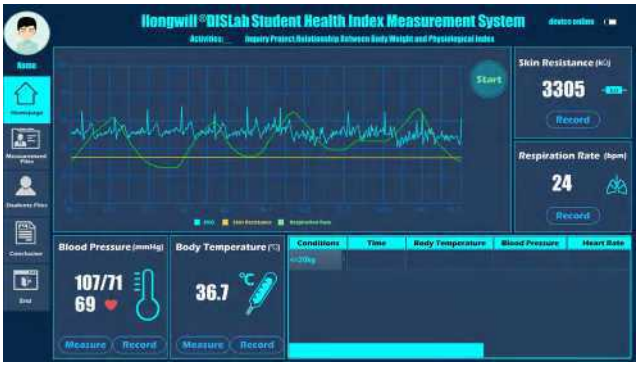


Pendulum experiment results

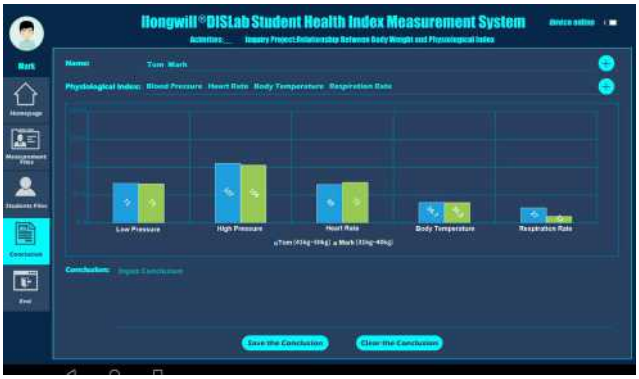
llongwill© Online Monitoring System for Water Quality of River and Lake Software LW-S835

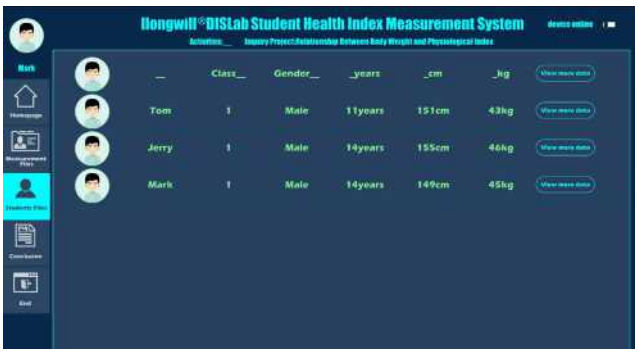
NEW

The Magic Board is an intelligent apparatus that communicates independently with the computer via USB, and its extended application has its particularity,so an independent special software is developed. The main interface of the software is as follows:



Body indicator measurement data main interface (above) and body indicator measurement system analysis data (below)



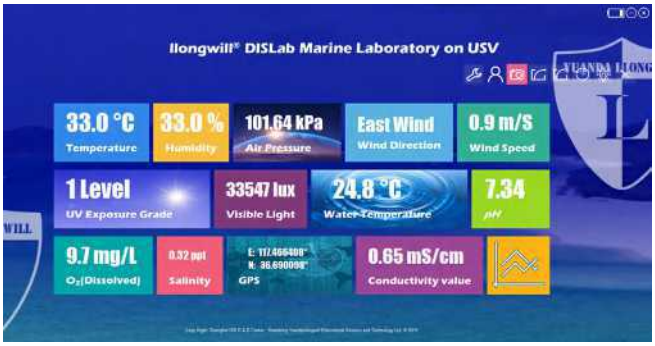


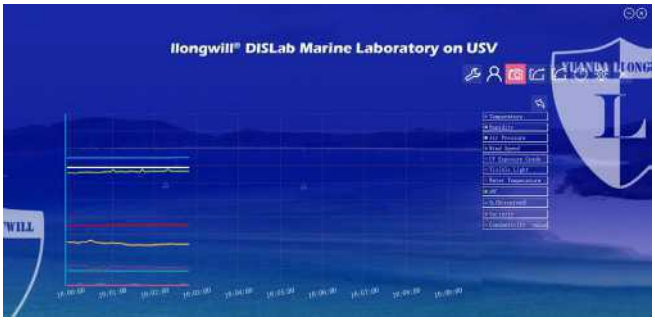
Student login interface

llongwill© Marine Laboratory on USV Software LW-S832

NEW

The software can collect and display meteorological elements, water quality elements, and GPS positioning information of the USV during operation. In addition, the software is able to view the historical graph of each element. The collected data can be save to a file, which is convenient for later analysis and study on the data.



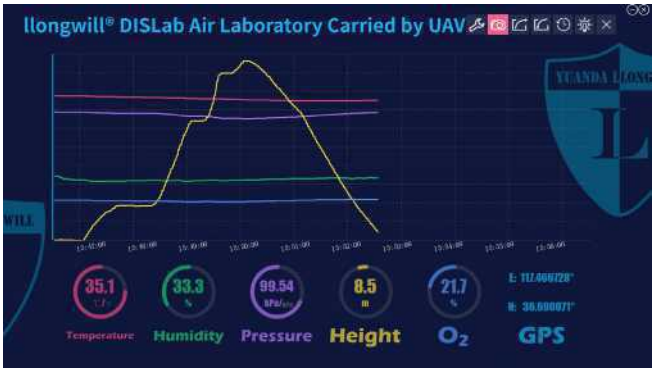


Marine Laboratory on USV Software main interface (above) and data recording interface (below)

llongwill© Sky Laboratory on UAV Software LW-S831

NEW

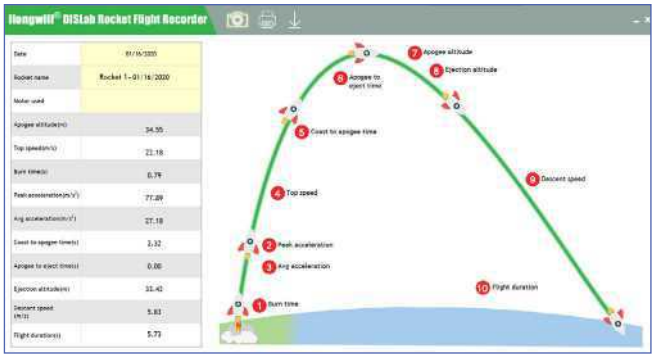
The software can collect and display air temperature, humidity, air pressure, altitude, GPS data and graphs during the drone flight. At the same time, through the different sensors mounted on the drone, the data and graphs of any elements of oxygen, carbon dioxide and PM2.5. In addition, the software is able to view the historical graph of each element. The collected data can be save to a file, which is convenient for later analysis and study on the data. Indoor/ outdoor display mode can be switched for viewing.



llongwill© Rocket Flight Recorder Software LW-S833

NEW

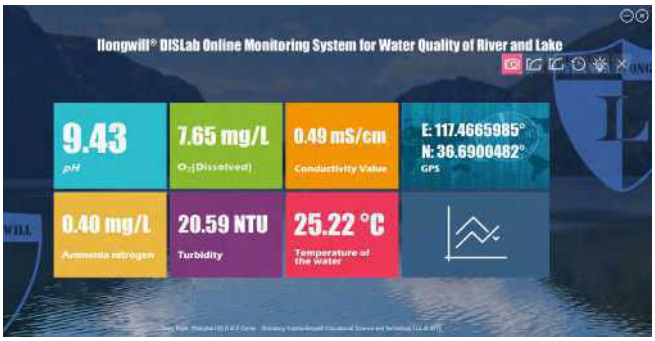
The software can collect and display 10 kinds of data during flight, including maximum altitude, maximum speed, boost time, maximum acceleration, average acceleration, etc. At the same time, flight data can be saved to a file, which is convenient for later analysis and study on the data of each node during flight.



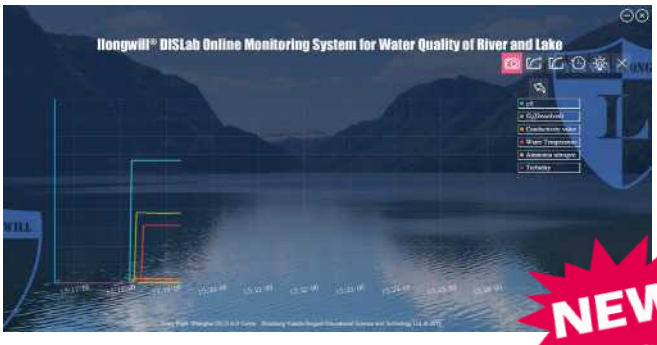
Data recording of rocket flight recorder during flight

llongwill© Online Monitoring System for Water Quality of River and Lake Software LW-S834

The software can collect and display the data and graphs of the water quality monitoring equipment during operation, including pH, dissolved oxygen, electrical conductivity, ammonia nitrogen, turbidity, water temperature, GPS, and the battery power of the equipment. In addition, the software of is able to view historical graphs of individual data. The collected data can be saved to a file, which is convenient for later analysis and study on the data. The data in the file can be imported into the software for graphic display. Indoor/ outdoor display mode can be switched for viewing.



Main interface of online monitoring system for river and lake water quality (above) and data recording interface (below)



NEW

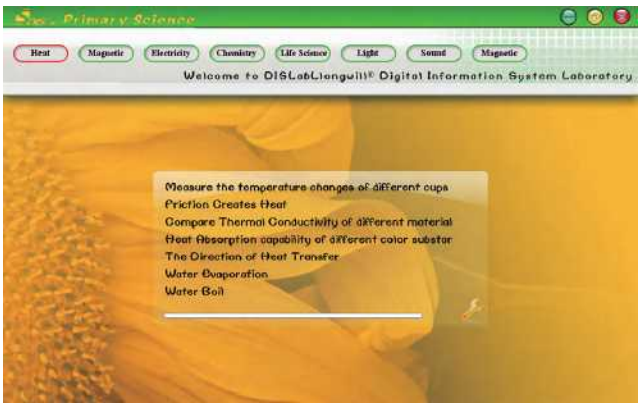
llongwill© Primary School Science Software

LW-XS801

Primary school is the critical stage for developing one's interest on science. The scientific spirit and literacy is grown together with the study of science knowledege at this stage. The teaching feature is focused on practice and taking interest as priority based on the physiological and psychological conditions. Therefore, experimental teaching plays an irreplaceable role in the primary school science teaching activities.

In the design of llongwill© primary school science software, the cognitive psychological feature of primary school students is fully considered. The software consists of two systems: special software and general software. The initial interface, is shown in the image above the whole set of software is developed in a graphical design idea and a large amount of cartoon images used to easily motive students' learning interests.

llongwill© primary school science special software is structured in menu-style and based on the primary science curriculum. The experiments which can be conducted with DIS system in the textbook is divided into 8 categories, 30 topics in total, which are respectively corresponding to the eight llongwill© learning packages of primary science.(detils refer to P45~P49). Indeed, the categories divided may be different from that of the primary school science textbooks, but it's genenrally corresponding to those textbooks.



Currently, the main functions of experimental interface of dedicated llongwill© primary school science software are displayed in the style of image and text, so that experiment topics, experiment data, window of data sheet and function button can be clearly shown, and the curving description based on experimental data, can be supported by the software.

llongwill© primary school science general software is designed as the same structure of general software as secondary schools. The main interface consists of data display area, channel overlay display area, sheet area, video area and button tools. The accessed sensor can automatically be identified, and sensor name and real-time data can be presented.

Functions description:

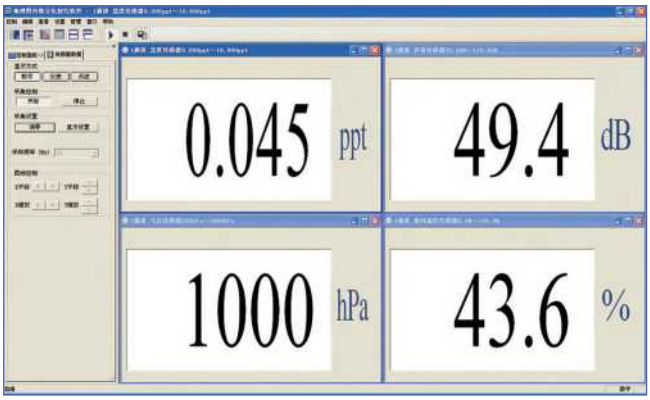
- "data display" supports 4-channel parallel display and the data in each channel can be displayed by number (default) or oscillography. The data of each channel can be displayed in the "channel overlay display area" by clicking the "+" icon, and be recalled by clicking "-" icon.
- "channel overlay display" is analogous to the "combination curve" in secondary school general software, and the data from multi-channel can be parallelly displayed in mode of oscillography at the unified time coordinate.
- In"sheet" area we can select "automatic record" or "manual record". Under "automatic record", record interval can be set according to the experimental requirement.
- "video" enables the function of recording the experimental process with the support of video recording device. Students can review the operation and the relationship between object variation and data variation based on the video recorded after the experiment, linking the phenomena observed with science principles, and deepening the knowledge of scientific laws, It is no doubt that it is more helpful in a great perfection and improvement for the primary school science teaching.

llongwill© Digital Geographic Field Kit Software Package

LW-WS812

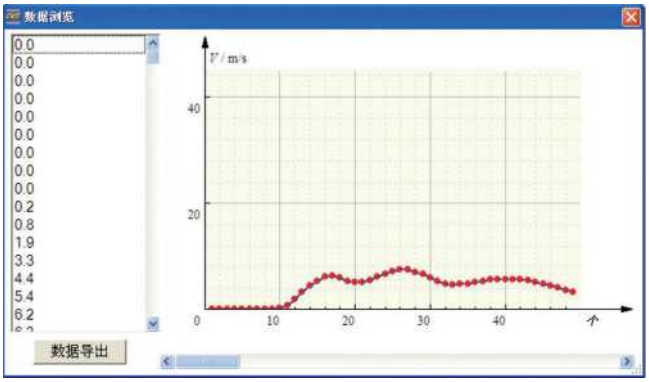
llongwill© Digital Geographic Field Kit software package is the dedicated analysis software. By clicking the software, the activities of data testing, collection and analysis can be conducted after connecting to hardware. The main interface is shown as below:

Working interface mainly consists of menu bar, toolbar, control panel and display area, functions of data display, data sheet, curve combination, data storage, etc



Data import software:

Data display module with data storage function, can be connected with the computer via the MiniUSB cable for data uploading and processing.

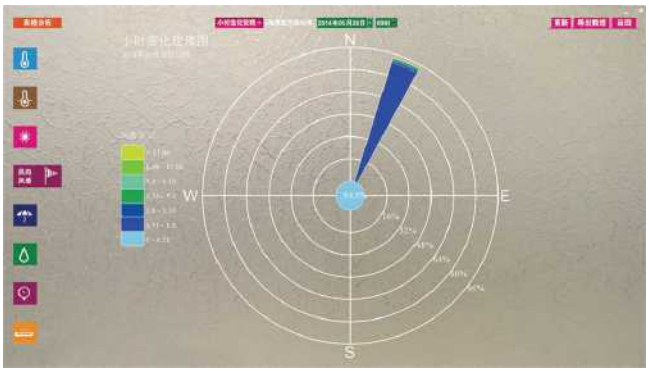


llongwill© Digital Weather Station Software

LW-WS301

llongwill© Digital Weather Station software is the subsystem of digital weather station for data display and storage, with functions of real-time data display, huge data storage and diverse data analysis. The weather station can be unattended and automatic operated for a long time. The main interface is shown as below:

The main interface is divided into two parts: the basic information display area and the display area of nine weather elements. The basic information includes current time, station location, station name, serial number, etc. The display area of nine weather elements is arranged from A~I: temperature A, evaporation B, soil temperature C, wind direction D, wind speed E, atmospheric pressure F, humidity G, solar radiation H and rainfall I. In addition, the software also has the data analysis function. The interface is shown as below:



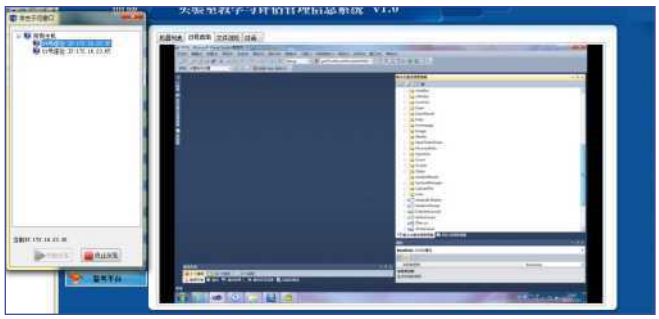
In consideration of the particularity of wind power and wind direction, click "wind power/wind direction" icon in data analysis interface, and then the "wind power/wind direction rose diagram cab be opened" .

Option setting of data analysis interface: time curve option—click pull-down menu to check variation curves by hours, days, months and years; add new curve—set start time in option setting, then click "add new curve". Click "export data" to export the historical data stored in database as Excel document .

llongwill© Experimental Teaching and Evaluation System LW-WS831

The system further combines the multimedia teaching with the laboratory teaching, mainly aimed at the experiment teaching, so that teachers can complete the teaching and evaluation tasks very conveniently. It also facilitates students' class learning, after class test and evaluation. This system includes ten functions, which are screen broadcast, student demonstration, screen monitoring, file transmission, online communication, remote command, after class test, test analysis, remote shutdown, and monitor platform. The evaluation subsystem includes user management, test library management, examination management, performance management, basic data management, system management.:

Control Interface (figure above) and remote monitoring (figure below)



llongwill© Educational Equipment Information Management System LW-WS833

Teacher information management system mainly includes the management of teachers' basic information, education background information, work experience information, professional skill qualification information, training information, reward and penalties information, award-winning information, volunteer teaching information and salary information, as well as the retired teachers information management and the substitute teachers information management; the system also provides a powerful statistical function, which allows the users to combine statistical conditions freely with all basic attributes of teachers:

Statistics Report of the Ministry of Education

llongwill© Teacher Information Management System LW-WS832

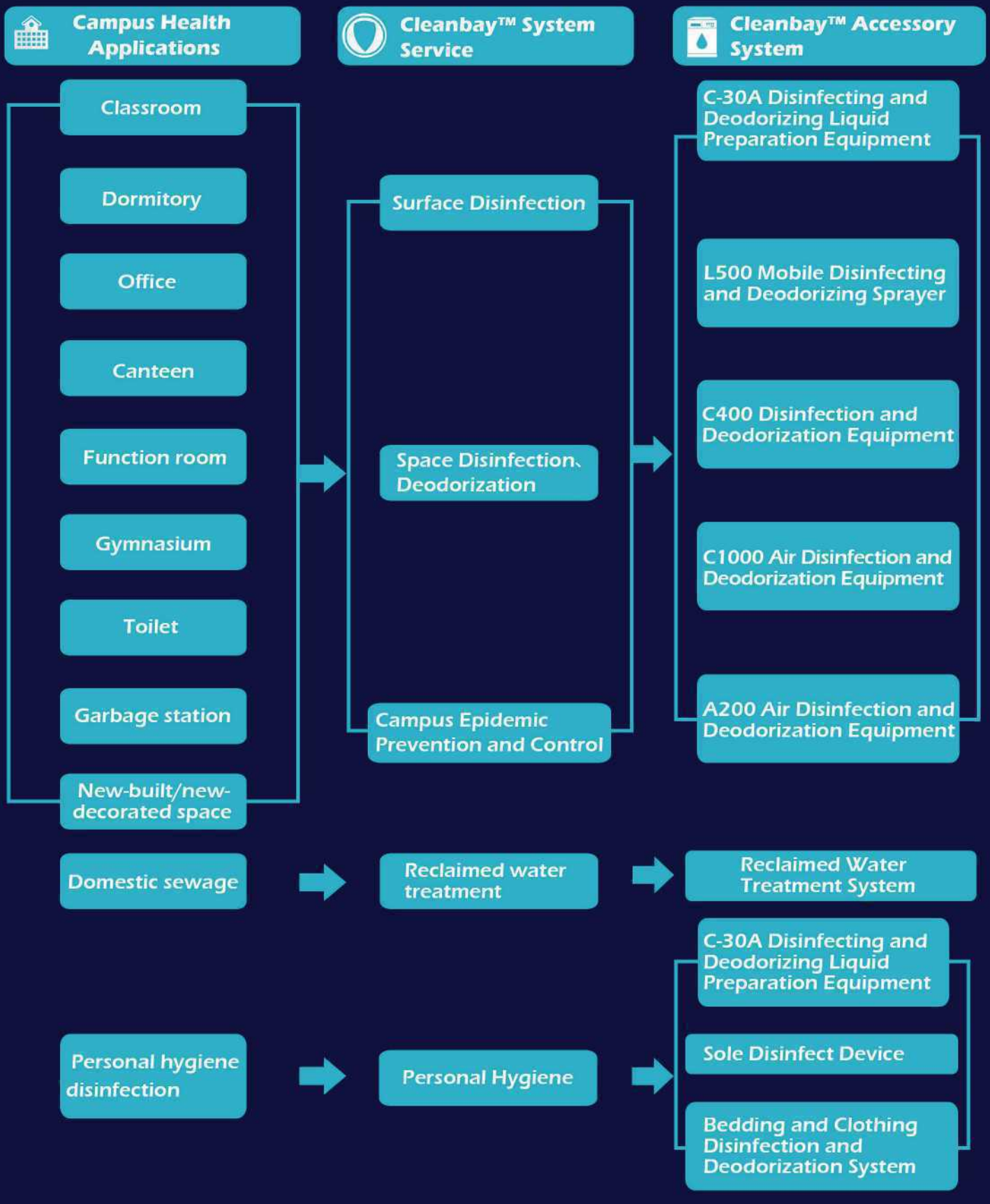
The Educational Equipment Information Management System has realized the network management platform with various functions, such as school basic information management, team construction, teaching activities management, educational technology and equipment management, statistic analysis, equipment requisition, school-running evaluation, and the Ministry of Education report. The system can implement the management and statistics of teaching instrument, basic equipment and teaching space for various disciplines such as physics, chemistry, biology, and science under different level of schools including primary school, middle school, high school, secondary school and nine-year persistent system school.

The system also provides various management functions for school's basic information, teaching space, buildings, school buses and equipment personnel:

Dynamic Statistics

Yuanda-Ilongwill——Campus Health System

Clean Our World, Change Our Life



Introduction to Cleanbay™ System Service

Cleanbay™ special disinfect deodorant is internationally recognized as the fourth-generation A1 grade green disinfection deodorant with broad-spectrum, high efficiency and safety. It is harmless to human body and poultry, and doesn't produce three reactions (carcinogenic, teratogenic, mutagenic). Through liquid spray, gas release and other ways, it can quickly and effectively oxidize and decompose volatile organic compounds, remove odor, kill bacteria and viruses, and improve environmental hygiene.

·**Surface disinfection**——block contact infection and prevent cross-contamination

·**Space disinfection and deodorization**——Isolate respiratory infections and improve environmental quality

·**Prevention and control of epidemics on campus**——protect the health of teachers and students and ensure the normal teaching order

·**Personal Hygiene**——Improve their own quality and protect physical and mental health

·**Reclaimed water treatment system**——Energy saving, turning waste into treasure

Cleanbay™ A-200 Air Disinfection and Deodorization Equipment

A-200

Popular Star Product

Cleanbay™ A-200 air disinfection and deodorization equipment is developed by using the propriety technology of CLEANBAY INC. of the United States. It is used with our company's special disinfect deodorant tablets.

Specifications:

Dimensions: 36.5*30*70(cm) Rated Voltage: AC 220V
Rated power: 100W Rated frequency: 50HZ

Application Advantages:

Intelligent control——one button start and stop, supports multiple operation modes
High purity safety——Efficient purification technology, security intelligence design
Adjustable concentration——Meet the different applications of different uses and different objects
Mobile operation——Compact shape, simple operation, easy to move, independent use

Supporting Application:

America CLEANBAY INC. special disinfect deodorant tablets.

Applicable Places:

Kindergartens, school, hotels, hospital wards, transportation hubs, conference centers, vegetable greenhouses, garbage transfer station, etc.

Authoritative data:

Staphylococcus Albus	Staphylococcus Aureus	Pseudomonas Aeruginosa
killing rate > 99.999%	killing rate > 99.999%	killing rate > 99.999%

Broad-spectrum and high-efficiency are not all of that:

Bacterial	Mycobacterium tuberculosis, Cholera, Fungus, Mold, Legionella, Bordetella pertussis, Bacillus anthracis, Typhoid bacillus, Tetanus, etc.
Virus	Hepatitis virus, Influenza virus, Bird flu virus, SARS virus, H1N1 influenza virus, Hand-foot-mouth virus, Norovirus, etc.

Cleanbay™ C-1000 Air Disinfection and Deodorization Equipment

C-1000 Invention Patent No.: ZL200610042382.X

Applicable Places:

Schools, hospitals, transportation hubs, CBD offices, large supermarkets, conference centers, new Installations, garbage transfer stations, industrial enterprises, large public places, livestock breeding and processing plants, vegetables greenhouses, etc.

Authoritative Data:

Staphylococcus Albus	Staphylococcus Aureus	Pseudomonas Aeruginosa
killing rate > 99.999%	killing rate > 99.999%	killing rate > 99.999%

Broad-spectrum and high-efficiency are not all of that:

Bacterial	Mycobacterium tuberculosis, Cholera, Fungus, Mold, Legionella, Bordetella pertussis, Bacillus anthracis, Typhoid bacillus, Tetanus, etc.
Virus	Hepatitis virus, Influenza virus, Bird flu virus, SARS virus, H1N1 influenza virus, Hand-foot-mouth virus, Norovirus, etc.

The most powerful air disinfection and deodorization product

Cleanbay™ C-1000 air disinfection and deodorization equipment produces high-purity disinfecting and deodorizing gas. It is equipped with a dedicated air distributor and intelligent control to achieve balanced and multiple release of deodorant gas. It supports full-time sterilization, mildew removal, deodorization, and formaldehyde removal in complex large space below 50,000m^3.

Specifications:

Dimensions: 52.5*47*110(cm) Rated voltage: AC220V
Rated power:200W Rated frequency:50HZ

Application Advantages:

Intelligent control——one button start and stop, supports multiple operation modes, lack of material and automatic fault notification.
Safe explosion-proof——Automatic feeding, safety explosion-proof design.
High purity and harmless——High purity preparation, multi-stage treatment, nonpolluting draining
Adjustable concentration——Meet the different applications of different uses and different objects

Cleanbay™ C-30A Disinfecting and Deodorizing Liquid Preparation Equipment C-30A

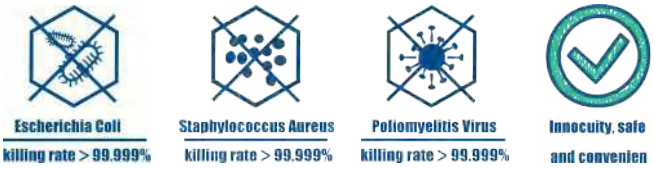
Invention Patent No.: ZL200610042382.X
Utility Model Patent No.: ZL201420481381.5
Design Patent Application No.: ZL201430305401.9

NEW

Applicable Places:

Kindergarten, schools, hospitals, transportation hubs, CBD office buildings, large supermarkets, hotels, restaurants, public toilets and other places of sterilization, deodorization and pollution control.

Authoritative Data:



Broad-spectrum and high-efficiency are not all of that:

Bacterial	Mycobacterium tuberculosis, Cholera, Fungus, Mold, Legionella, Bordetella pertussis, Bacillus anthracis, Typhoid bacillus, Tetanus, etc.
Virus	Hepatitis virus, Influenza virus, Bird flu virus, SARS virus, H1N1 influenza virus, Hand-foot-mouth virus, Norovirus, etc.

The most widely used disinfect deodorant liquid site preparation equipment

Cleanbay™ C-30A disinfecting and deodorizing liquid preparation equipment , equipped with a special water tank and intelligent control, through spray, rinse, wipe, soak and other methods to block the bacteria (fungi, mold, Escherichia coli, etc.) , Virus (hepatitis virus, many intestinal infectious disease and so on) contact transmission, at the same time remove a variety of odor.

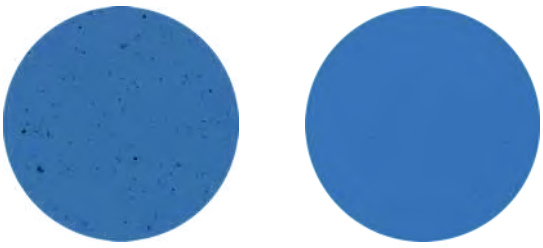
Specifications:

Dimensions: 46×33×12.5 (cm)
20L special water tank (including intelligent control)and sole disinfection device are optional

Advantage:

Wall hanging design——Compact shape, easy to install
Instantly available——Disinfectant can be obtained simply by unscrewing the tap. No need to store, no waiting
Efficient and Safe——Raw material non-toxic, safe for storage and transportation
Adjustable concentration——Meet the different applications of different uses and different objects

Sterilization effect of Cleanbay ™ disinfectant deodorant



Before After

Cleanbay™ Mobile Disinfection and Deodorization Equipment

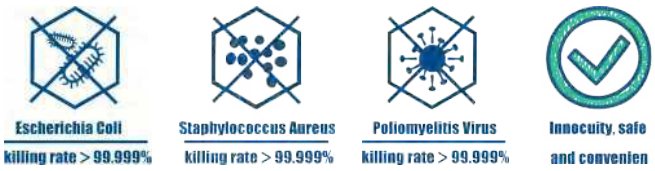
C-400

Invention Patent No.: ZL200610042382.X

Applicable places:

Kindergartens, schools, hospitals, transportation hubs, garbage transfer stations, large public toilets, poultry farms, vegetable greenhouses, etc.

Authoritative data:



Broad-spectrum and high-efficiency are not all of that:

Bacterial	Mycobacterium tuberculosis, Cholera, Fungus, Mold, Legionella, Bordetella pertussis, Bacillus anthracis, Typhoid bacillus, Tetanus, etc.
Virus	Hepatitis virus, Influenza virus, Bird flu virus, SARS virus, H1N1 influenza virus, Hand-foot-mouth virus, Norovirus, etc.

Mobile disinfecting and deodorizing on-site preparation + spraying equipment

Cleanbay™ C-400 mobile disinfection and deodorization equipment produces disinfecting and deodorizing liquid, and achieves disinfection and pollution control of space by means of spraying and sprinkling. The device comes with a water source, a power supply, a built-in raw material tank, and a reactor. It is easy to operate, and can be applied to a wide range of environmental management.

Specifications:

Dimensions: 65*46*102(cm)
Power: DC 12V Tank capacity: 40L

Application Advantages:

Instantly available——On-site preparation, direct use
Efficient and safe——making raw materials non-toxic, safe for storage and transportation
Adjustable concentration——Meet the different applications of different uses and different objects
Mobile Spray——Hand-push mobile spraying operation, wide coverage

Cleanbay™ L500 Mobile Disinfecting and Deodorizing Sprayer

L-400

Mobile disinfecting and deodorizing on-site preparation + spraying equipment

Cleanbay™ L500 mobile disinfecting and deodorizing sprayer is developed by using the propriety technology of CLEANBAY INV. of the United States. It is used with our company's special disinfect deodorant tablets.

Application Advantages:

Instantly available——On-site preparation, direct use and no need storage
Efficient and safe——making raw materials non-toxic, safe for storage and transportation
Adjustable concentration——Meet the different applications of different uses and different objects
Mobile Spray——Hand-push mobile spraying operation, wide coverage

Supporting Application:

America CLEANBAY INC. special disinfect deodorant tablets.

Applicable places:

Kindergartens, schools, hospitals, transportation hubs, garbage transfer stations, large public toilets, poultry farms, vegetable greenhouses, etc.

Cleanbay™ Disinfection service, emergency treatment of infectious diseases and public health incidents

Cleanbay™, Custom-made for schools

Customization Series 1: Cleanbay™ Reclaimed Water Treatment System-Protect the source of life

Customization series 2: Cleanbay™ Sole disinfect device-blocking external contact infection

Customization series 3: Cleanbay™ bedding and clothing disinfection and deodorization system ---Anti-mite, disinfection, deodorization and mildew

A

Acceleration Sensor	LW-F871	P14
Acoustics Software©	LW-S702	P120
AC Frequency Sensor	LW-E883	P25
Action and Reaction Apparatus	LW-Q862	P61
Air Pressure Sensor	LW-3103	P47
Alcohol Gas Sensor	LW-C842	P41
Ampere Force Apparatus V2.0	LW-Q735	P75
Archimedes' Law Apparatus	LW-6327	P65
Audio Signal Generator V2.0	LW-Q709	P70
Automatic Control Actuator	LW-Q702	P108
Automatic Control Switch	LW-Q803	P108
A-200 Air Disinfection and Deodorization Equipment	A-200	P129
AC Current Sensor	LW-E811	p23
AC Voltage Sensor	LW-E812	P23

B

Block Circuit	LW-SI816	P80

C

Campus Environment On-line Monitoring System	LW-W4000	P99
Centripetal Force Apparatus V2.0	LW-Q859	P58
CH_4 Sensor	LW-C824	P34
Charles' Law Apparatus	LW-6333	P67
Chemistry Package for Primary Science		P52
Chroma Sensor	LW-C803	P29
Cl_2 Sensor	LW-C821	P35
Cl^- Sensor	LW-C835	P33
Conductivity Sensor	LW-C802	P28
Conservation Law of Mechanical Energy Apparatus Ⅰ	LW-5304	P60
Conservation Law of Mechanical Energy Apparatus Ⅱ	LW-Q740	P93
Conservation Law of Mechanical Energy Apparatus Ⅱ Software©	LW-S822	P121
CO Sensor	LW-C826	P34
CO_2 Sensor	LW-B802/B804/B806	P38
CO_2 Sensor (Dissolved)	LW-B832	P40
Current Sensor	LW-E801	P21
Current Sensor (Multi-range)	LW-E803	P21
C-1000 Air Disinfecting System	C-1000	P130
C-30A Disinfectant Solution System	C-30A	P131
C-400 Portable System	C-400	P132

D

Data Logger	LW-D801	P8
Digital Geographic Field Kit Software©	LW- WS812	P125
Digital Photoelectric Track System	LW-Q732	P90
Digital Photoelectric Track System Software Package©	LW-S820	P120
Digital Weather Station	LW-W3000	P99
Digital Weather Station Software©	LW-WS301	P125
Dilution Vessel	LW-Q739	P82
Displacement Sensor (Integrated)	LW-F832	P16
Displacement Sensor (Separated)	LW-F831	P15
Displacement Sensor (Small-range)	LW-F833	P16
Dual-range Illumination Sensor	LW-L802	P20

E

Earthquake Simulation Platform	LW-SI817	P87
E-compass Sensor	LW-E864	P24
Educational Equipment Information Management System Software©	LW-S833	P126
EKG Sensor	LW-B851	P42
Electrical Conductivity for Glass Items	LW-6328	P72
Electricity Package for Primary Science		P51
Electromagnet Apparatus	LW-Q727	P77
Electromagnetic Induction and Lenz's Law Apparatus	LW-868	P79
Electrometer	LW-E846	P25
Electrostatic Sensor	LW-E845	P25/45
Electrostatic Measurement Software©	LW-S823	P121
Equilibrium of Two Forces Apparatus	LW-Q725	P64
EXB Series Circuit Board V2.0	LW-6337	P74
Experimental Teaching and Evaluation System Software©	LW-S831	P126

F

Faraday's Law Apparatus Ⅰ	LW-Q812	P94
Faraday's Law Apparatus Ⅱ	LW-Q828	P95
Faraday's Law Apparatus Ⅰ & Ⅱ Software©	LW-S7087/S708	P119
Far-infrared Heater	LW-5311	P67
Fast Response Temperature Sensor	LW-T804	P17
Flow Rate Sensor	LW-W3116	P47
Flow Rate & Temperature Detector	LW-Q757	P100
Fluid Pressure Apparatus	LW-Q733	P65
Force & Angle Sensor	LW-F808	P12
Force Sensor	LW-F801/F802/F804	P11
Force Resolution and Composition Apparatus	LW-5305	P59
Force Resolution on Inclined Plane	LW-Q721	P62
Friction Apparatus	LW-6341	P63
Frictional Heat Apparatus	LW-6340	P68
Functional Inclined Plane Apparatus	LW-Q864	P86

G

General Power Supply V2.0	LW-Q708	P73
Geographic Sensors		P47
Geomagnetic Field Generator	LW-6332	P78
G-M Sensor	LW-R801	P24
GPS Sensor	LW-W3115	P47

H

H_2 sensor	LW-C806	P35
Heart Rate Sensor	LW-B853	P42
Heat Package for Primary Science		P49
High-sensitivity Coils	LW-Q813	P78
High-temperature Sensor	LW-T802	P30

I

Ice-water Interconversion Apparatus	LW-Q863	P81
IRT Sensor	LW-T805	P17
Introduction to Cleanbay™ System Service		P128

J

Joule's Law Apparatus	LW-Q726	P76

L

Life Science Package for Primary Science Ⅰ & Ⅱ		P52
Light Package for Primary Science		P50
Logical Circuits	LW-6312/6338	P111
Logical Circuits Apparatus V2.0A Software©	LW-S710	P119
Low Frequency Signal Generator V2.0	LW-Q710	P73
L-500 Mobile Disinfection and Deodorizing Sprayer	L-500	P133

K

K^+ Sensor	LW-C832	P32

M

Magic Board System	LW-Q858	P96
Magic Board System Software Package	LW-S826	P122
Magic Circuit	LW-SI811	P106
Magnetic Package for Primary Science		P51
Marine Laboratory on USV	LW-SI804	P102
Marine Laboratory on USV Software ©	LW-S832	P123
Mechanics Package for Primary Science		P49
Micro Current Sensor	LW-E823	P21
Micro Force Sensor	LW-F803	P12
Mini Material Tention Tester	LW-XQ786	P113
Multifunctional Support	LW-Q731/Q743	P83
Multi-purpose Mechanical Track System V2.0	LW-Q730	P54-57
Multi-purpose Track System (Primary School)	LW-XQ783	P85

N

Neutralization Titration Apparatus	LW-6212	P82
NH_3 Sensor	LW-C823	P35
NH_4^+ Sensor	LW-C834	P32
NO_3^- Sensor	LW-C836	P33
NO_2 Sensor	LW-C822	P34

O

Online Electronic Balance	LW-F806	P81
Online Monitoring System for Water Quality of River and Lake	LW-SI803	P103
Online Monitoring System for Water Quality of River and Lake Software ©	LW-S834	P123
O_2 Sensor	LW-B801/B805	P37
O_2 Sensor (Dissolved)	LW-B831	P40
Optics Kit	LW-5211	P71
ORP Sensor	LW-C805	P41

P

Pendulum	LW-XQ780	P86
pH Sensor	LW-C801	P27
Photoelectric Range Finder (π System)	LW-Q756	P91
Photoelectric Range Finder System Software Package	LW-S825	P121
Photo Gate Sensor	LW-F851	P13
Pocket Sealing Apparatus	LW-Q716	P83
Pressure Sensor	LW-T822	P18
Primary School Science Software©	LW-XS801	P124
Projectile Motion Apparatus	LW-Q722	P64
Propogation of Electromagnetic Wave Apparatus	LW-Q745 & Q746	P77

R

Relative Humidity Sensor	LW-B807	P39
Relative Illumination Distribution Sensor	LW-L803	P20
Relative Pressure Sensor	LW-T823	P18/P44
Resistance Law Apparatus	LW-6343	P76
Respiration Sensor	LW-B852	P42
Rocket Flight Recorder	LW-SI806	P103
Rocket Flight Recorder Software©	LW-S833	P123
Robot Modular V2.0	LW-Q751	P107
Robot Modular V2.0 Software©	LW-S809	P119
Rotary Motion Sensor	LW-F881	P14

S

Salinity Sensor	LW-C815	P47
Sensor Adapter	LW-A810	P9
Sealing Apparatus	LW-Q749	P84
Sensor-control Circuit	LW-SC001~SC005	P110
Sensor Data Display Module	LW-A804/A816	P9
Sky Laboratory on UAV	LW-SI802	P101
Sky Laboratory on UAV Software ©	LW-S831	P122
Series of Hand Generators	LW-XQ781	P109
Single-channel Wired Data Logger	LW-D805	P8
Single-channel Wireless Data Logger	LW-D806	P8
Smart Force Disc V2.0	LW-Q836	P59
Smart Power Supply V2.0	LW-Q820	P73
Sensor Automatic Control Circuit Module	LW-SI822	P88
SO_2 Sensor	LW-C841	P31
Software Package (General Edition) ©	LW-S801	P117~118
Soil Moisture Sensor	LW-W3111	P47
Soil Temperature Sensor	LW-W3113	P47
Sound Level Sensor	LW-Y806	P47
Sensor Adapter	LW-A810	P9
Sound Package for Primary Science		P50
Sound/Sound Level Sensor	LW-Y806	P19
Students Health Indicators Measurement System	LW-SI801	P104
Students Health Indicators Measurement System Software©	LW-S835	P122
Super module	LW-Q870	P114
Surface Temperature Sensor	LW-W3112	P47

T

Teacher Information Management System Software©	LW-S832	P126
Telephone Apparatus	LW-Q874	P88
Temperature Sensor	LW-T803	P17/43
Thermal Expansion and Contraction Apparatus	LW-6326	P68
Thermal Radiation Absorption Apparatus	LW-Q723	P66
Thermal Radiation Apparatus	LW-6330	P69
Thermocurrent Apparatus	LW-6329	P66
Turbidity Sensor	LW-C804	P29

U

Uniform Magnetic Field Solenoid	LW-5308	P79

V

Voltage Sensor	LW-E841	P22
Voltage Sensor (Multi-range)	LW-E844	P22

W

Wind Speed Sensors	LW-W3106	P47
Wireless Centripetal Force Apparatus	LW-Q711	P92
Wireless Centripetal Force Apparatus Software©	LW-S706	P119
Wired Interface	LW- A801	P8
Wireless Interface	LW- A802	P8
WireLess Transmitter	LW-A803	P9
Wireless Transmitter B	LW-A816	P9
Work by Compressed Gas Apparatus	LW-6334	P69

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