Study Room Labs

www.studyroomlabs.com

Yuanda Physics

Catalogue 2019

worlddidac MEMBER GOLD

StudyRoom® Yuanda Educational Science and Technology

2019

NEW CONCEPT NEW PRODUCTS!

Mobile Science Exploration System

DDM “sensor”+“Data Display Module”

WMT “sensor”+“Wireless Transmitter Module”+“Mobile Terminal”

Contents

Contents

Contents

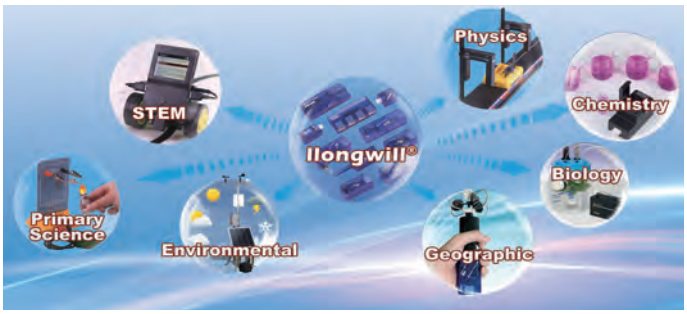
Digital Teaching Instrument

Digital Teaching International Leader

Promoting the Cognition

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

With teaching and application practices in past over a decate, great progress in subject teaching field has been achieved by StudyRoom®. Untill now, our 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.



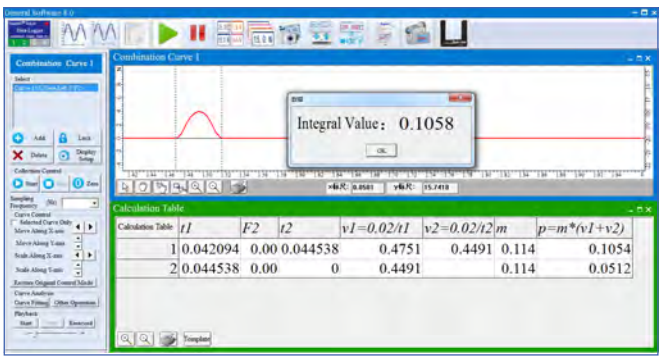
From invisible to visible, from impossible to possible

• Attentions to Micro Signals

Varieties of difficulties with micro currents measurement in experimnts can be easily solved by our micro current sensor.

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

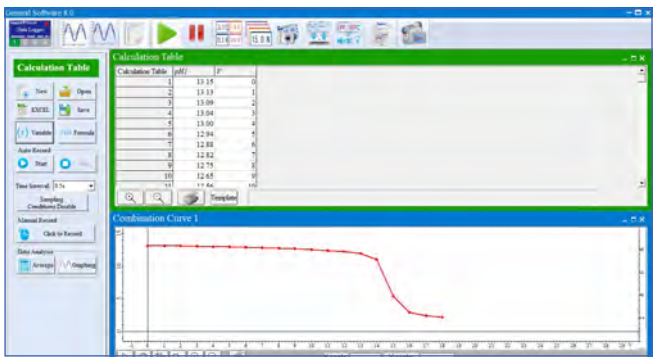
• Capturing Transient Signals



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

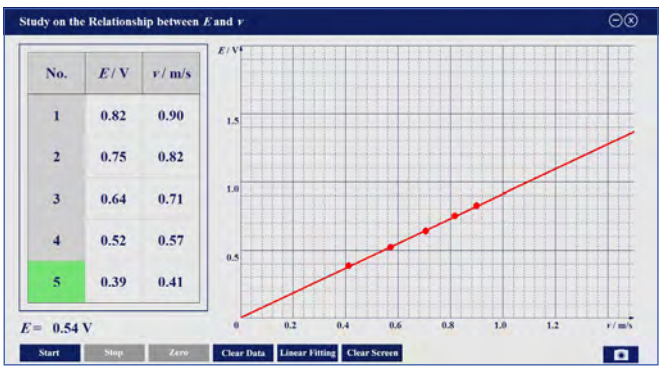
Examples: theorem of momentum, self induction phenomenon, LC vibration, Faraday's Law etc.

• Linking the Relationship between data and graph



Using our 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

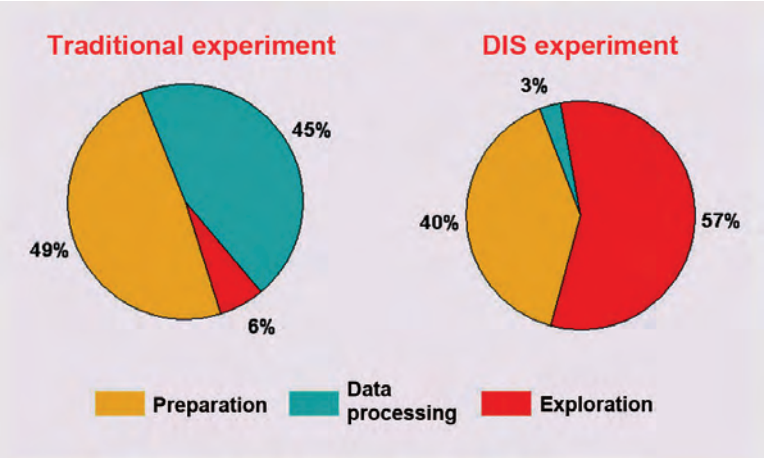


Help teachers and students overcome the difficulties in experiment operation, and help them make their dreams come true with the advantages of our products.

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

Improving Experiment Efficiency

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



We adopt 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 verfied, calculated and processed by optimized teaching software for many yeas, we have 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 strengthenation, which can caltivate 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 Equipments

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

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

information system has been developed and another more than ten types of apparatus are going to be developed and launched soon. The applicatioon 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.

Experimental Data Acquisition System

OPEN A NEW ERA OF DIGITAL EXPERIMENTAL TEACHING!

Experimental Data Acquisition System consists of data logger(P8), sensors(P7-P44), Sensor auxiliary equipment and accessories(P6),pad terminal(P5), primary school science inquiry kit(P45-P49).

Data Logger

Our Data Logger adopts modular design with a diamond appearance, which makes it easy to 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 supponts 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 model 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

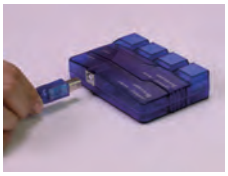
Wireless Interface

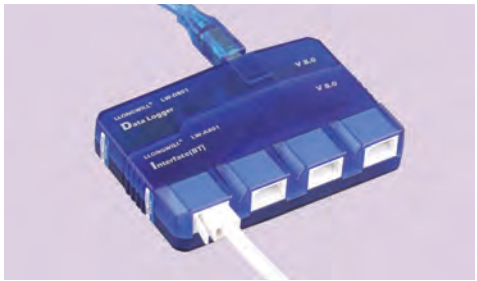
LW-A802

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

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 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

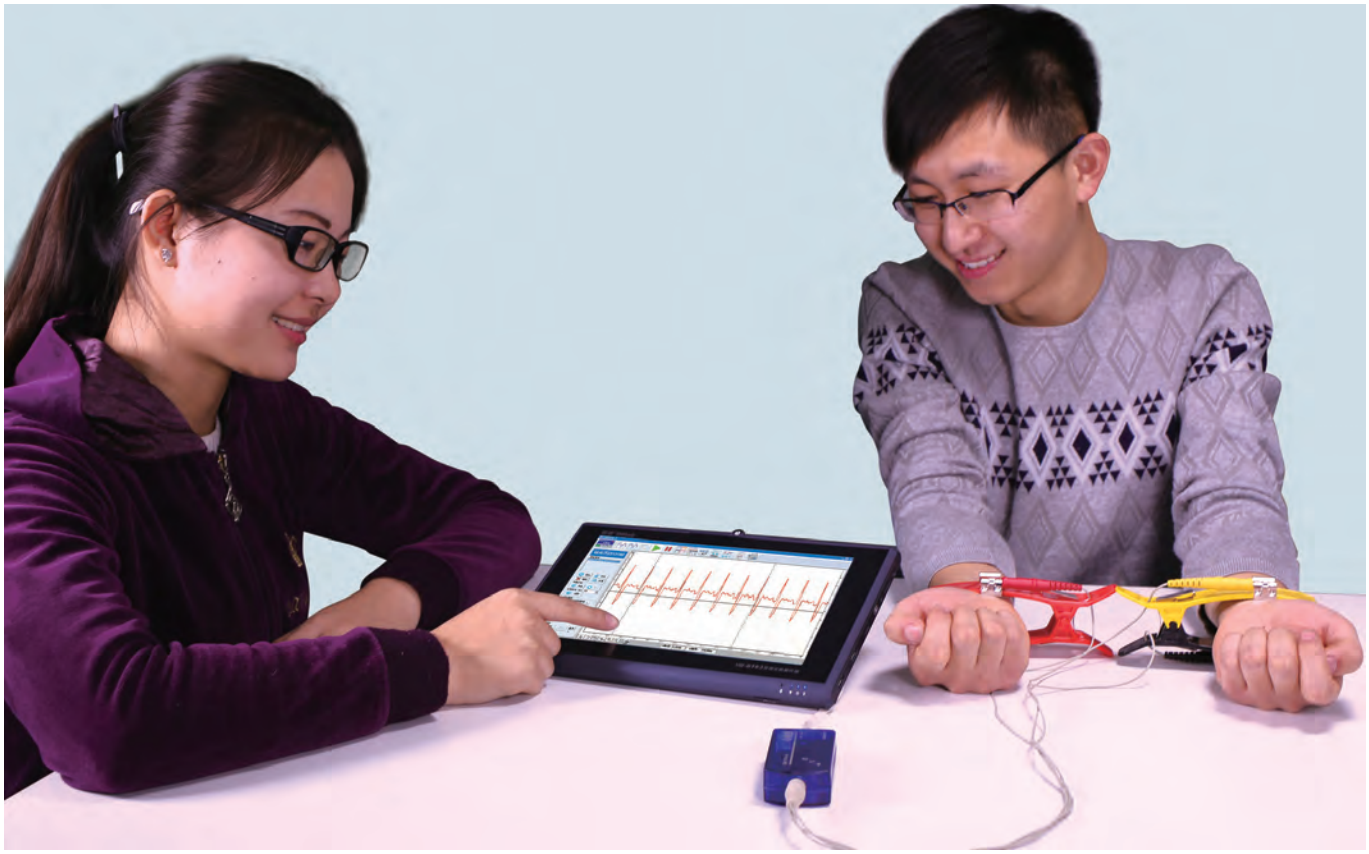
LW-D805

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 sensorsuipment with wireless function.



Study on respiration of hamster using Pad Terminal

Specifications:

High-performance tablet PC is selected as a basic platform to support parallel collection of four channels under wire and wireless conditions, especially it is easy for users to carry out outdoor experiments or dynamic experiments. LW-D803 can be connected to wired interface or wireless interface to realize communication with sensors. LW-D810 can switch from wired to wireless communication by the press button because of the built-in wireless receiving module.

1. Camera; 2. Microphone; 3. Interface; 4.Card reader; 5. Audio output port; 6. Power switch; 7. MiniVGA; 8. USB interface; 9. Wired network interface; 10.Switch of data logger; 11. pilot lamp of data logger.

Pad Terminal

LW-D803/LW-D810

- ▶ 8.9~12.1 inch touch-screen LCD
- ▶ Over 1G memory
- ▶ Selectable hard disk capacity
- ▶ Built-in WLAN card
- ▶ Supporting multiple operating systems
- ▶ Super-long battery power of 4-5 hours
- ▶ Full transplant of PC software
- ▶ Built-in data logger
- ▶ Operation of stylus
- ▶ High sampling rate

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 connected to Sensor Data Display Module

Sensor Data Transmitter

LW-A803

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

Sensor Data Transmitter B

NEW

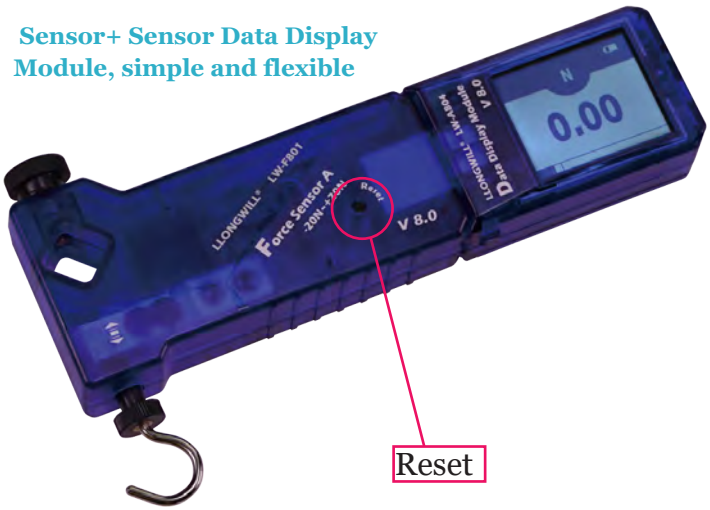
LW-A816

· 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 inputing 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 our 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 LW-A807

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

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 messurement
· 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

NEW

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

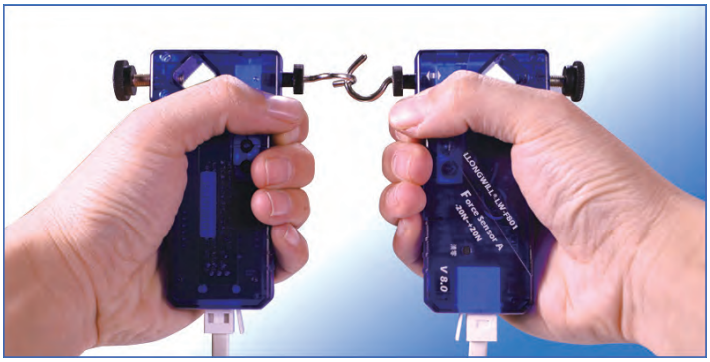
· Straight handle structure
· Pull force shows positive reading
· Press force shows negative reading

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

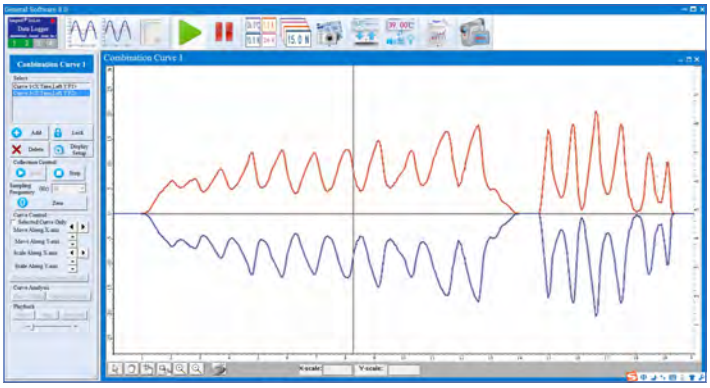
Overweight and weightlessness experiment

Typical Applications:

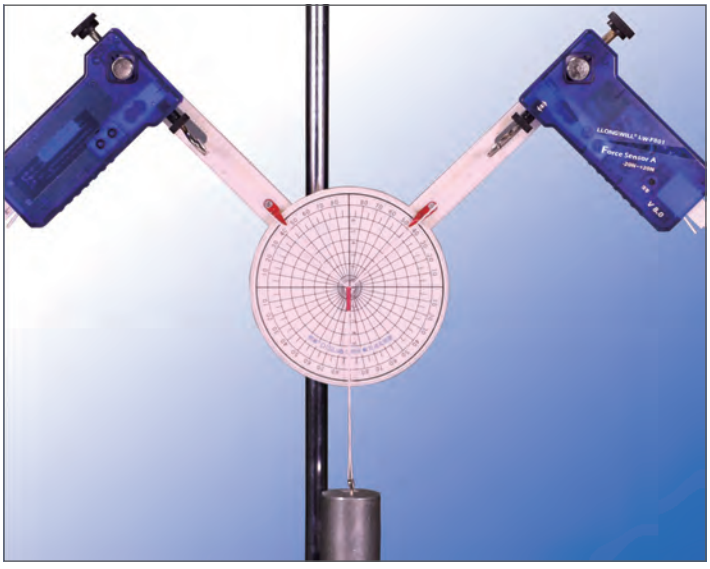
Study on fricion (study of static friction and dynamic friction); equilibrium of two forces; Hooke's law; relationship between gravity and mass; resolution and composition of force; interaction of force; Newton's third law; overweight and Weightlessness; momentum theorem (variable force); Archimedes' 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 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

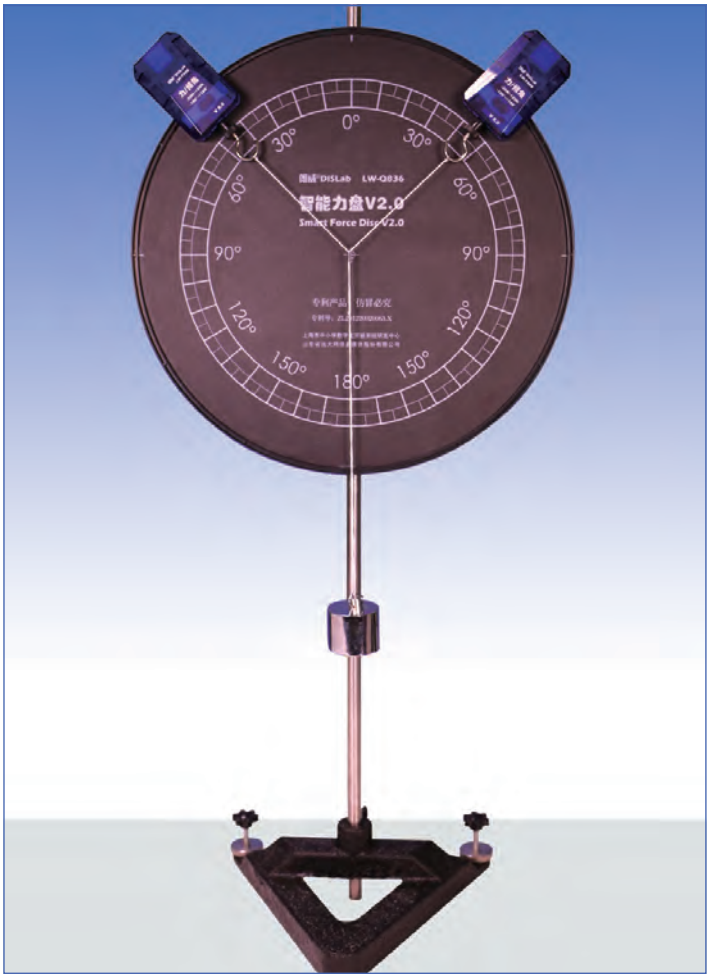
LW-F808
Range: -20N~+20N -180°~+180°
Resolution: 0.01N

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

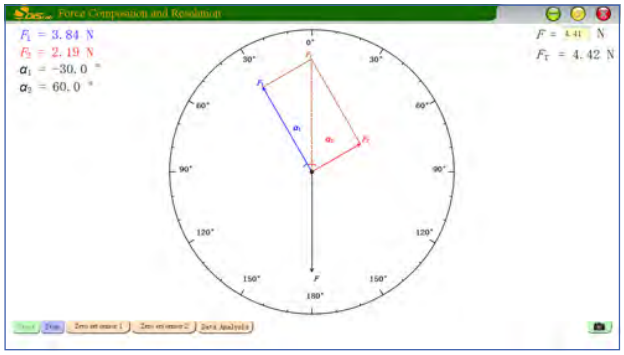
Be careful to avoid over range
Be sure to relieve the stress after use

Typical Application:

Verify the Parallelogram Law of forces



Smart Force Disc with Force & Angle Sensors

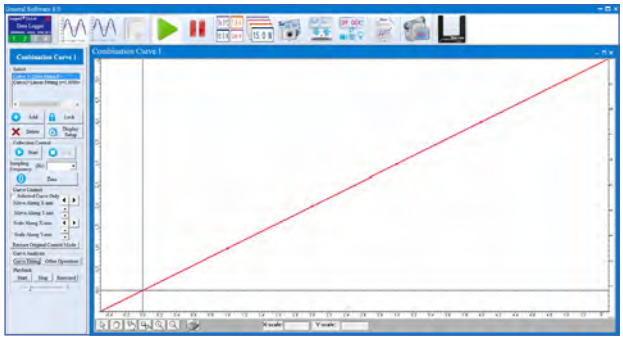


Experiment interface of force resolution using Smart Force Disc

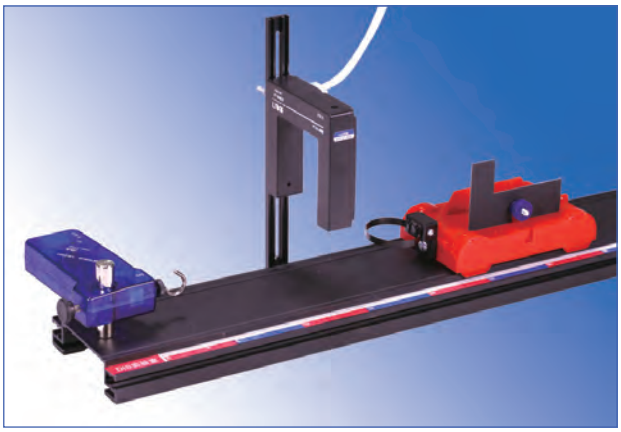
Photo Gate

LW-F851
Microsecond Precision

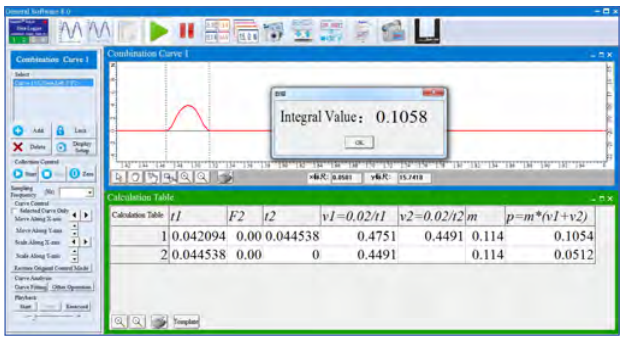
·The object's running time between any two photo gates can be measured.
· Support 4 types of time recording modes: I-type light blocking, U-type light blocking, Count, Pendulum.



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



Experiment of Momentum Theorem under variable force

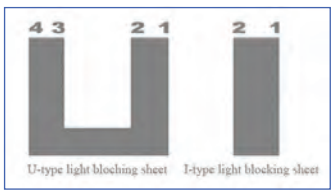


	t1	F2	t2	v1=0.02/t1	v2=0.02/t2	m	p=m*(v1+v2)
1	0.042094	0.00	0.044538	0.4751	0.4491	0.114	0.1054
2	0.044538	0.00	0	0.4491		0.114	0.0512

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 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 scholl, 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:

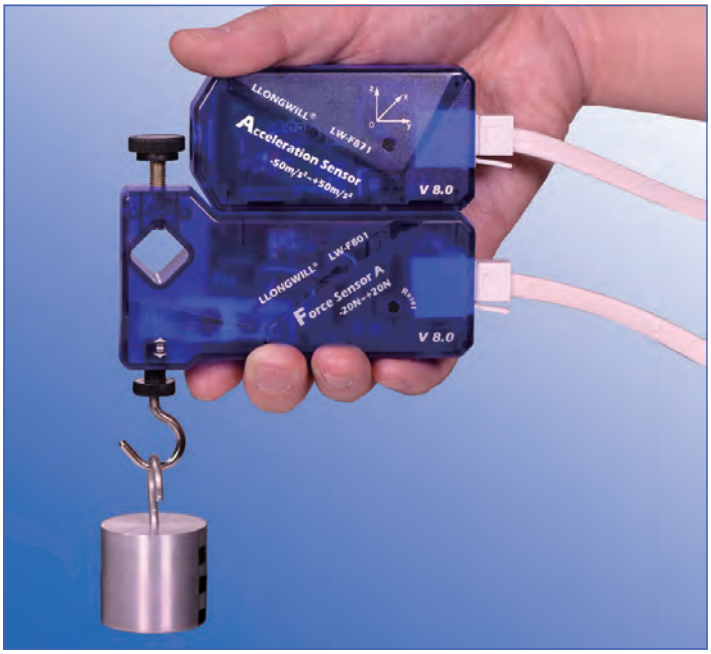
- Click "Photo gate setting" icon in the status bar; and photo gate setting window is open.
- Select the light blocking mode of the photo gate, 4 modes totally for option: "I" type, "U" type, "simple pendulum" and "timing":
- "I " type light blocking sheet is indicated with 1 and 2 from the right edge 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 dockwise, and decreases when it rotates anti-clckwise .

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.

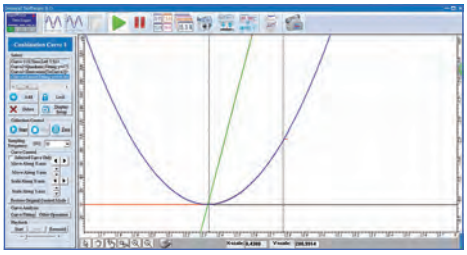
Displacement Sensor (Separated)

Design Patent No.: ZL2004 3 0030080.2
Utility Model Patent No.: ZL 2004 2 0040210.5

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

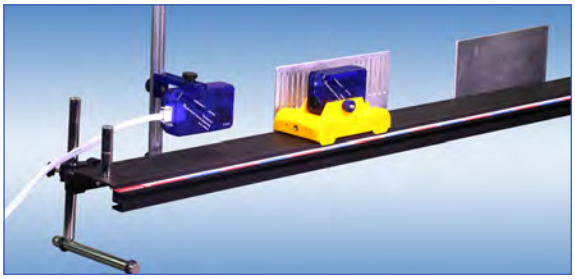
· Unique seperated design
· No measuring blind zone
· Emitter + Receiver
· Emitter: powered by lithium battery
· Receiver: connected with data logger

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)

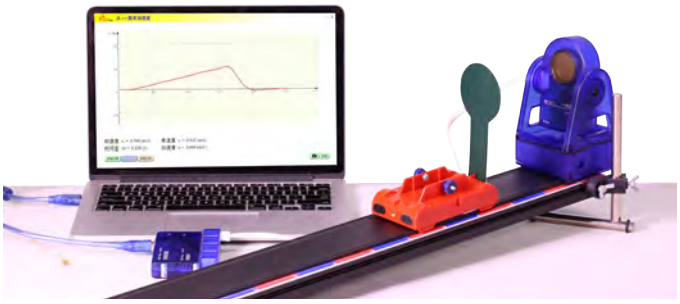
LW-F832
Range: 0.15m~6m
Resolution: 1mm

· 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!

2-D Motion System (Signal Emitter+Receiver)

Utility Model Patent No.: ZL200820173562.6
LW-F735 & LW-F736
Range: 10~150cm
Resolution: 0.1cm

· Data logger not required

Be sure to turn off the emitter after use!
Make sure the emitter's motion within the effective measuring area!

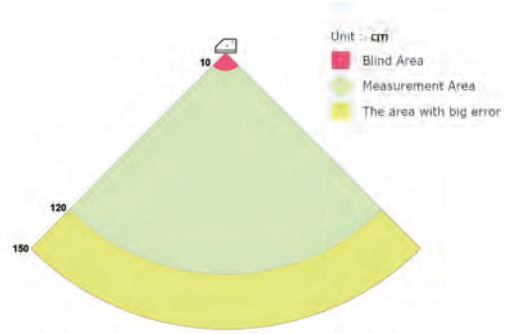
Product Composition :

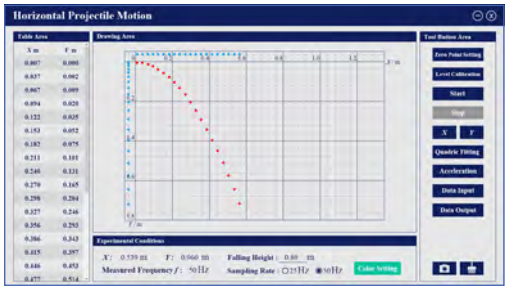
2-D motion system consists of an emitter and a receiver. The emitter with rechargeable battery is easy to roll in the tracks of 2-D motion series experiment apparatus. The ultrasonic wave and infrared ray emitted can cover 360° space around it. The receiver is a corner cut rectangular box. The corner cut edges must be kept horizontal during assembly (matched level adjusting device to adjust leveling). The red semi-transparent face of the receiver shall be towards the motion area of 2-D motion emitter.

Typical Applications:

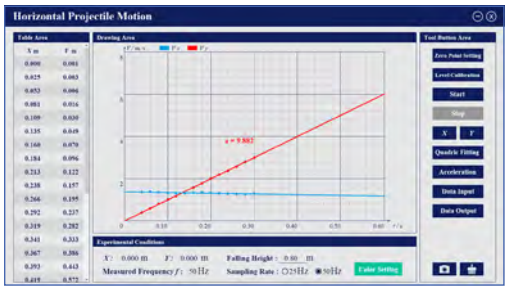
It is suitable to all the measurements of 2-D plane motion within the measurement scope of system such as horizontal projectile motion, simple pendulum motion, centrifugal motion, damping vibration, composition of motions and conservation of mechanical energy, etc.

Range:





Study on the horizontal projectile motion based on the measured data



Calculate the acceleration in the vertical direction based on the measured data

Emitter
► Unique cylindrical shape
► Used with 2-D series lab equipment (See P85~P87)
► Emits the ultrasonic and far-infrared ray signal
► Powered by rechargeable battery

Receiver
► Rectangular box with corner cut
► When mounting the receiver, make the surface of corner cut horizontal
► Communicate with computer directly by USB cable

corner cut

Signal Receiver

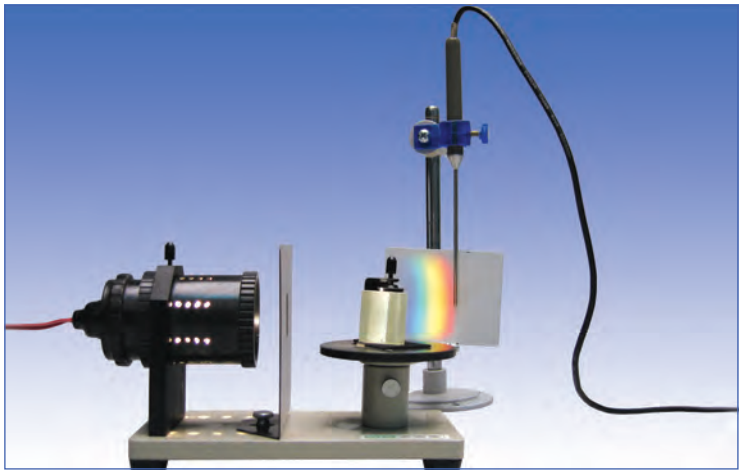
Signal Emitter

Temperature

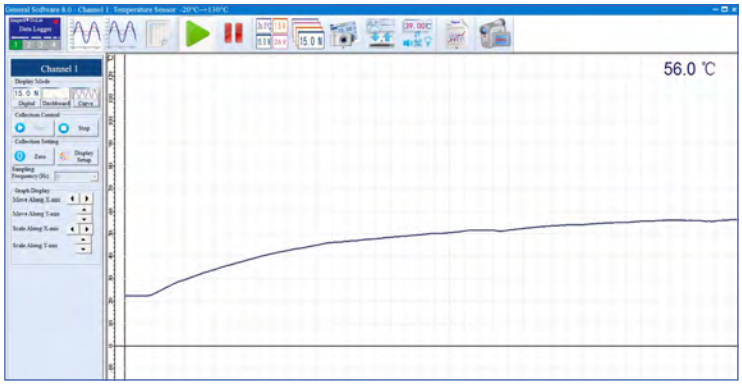
LW-T801/T803
Range: -20℃~+130℃/-50℃~+200℃
Resolution: 0.1℃

· Seperated 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 temprature measurement

Typical Applications:

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

Pressure

LW-T821/T822
Range: 0kPa ~300kPa / 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

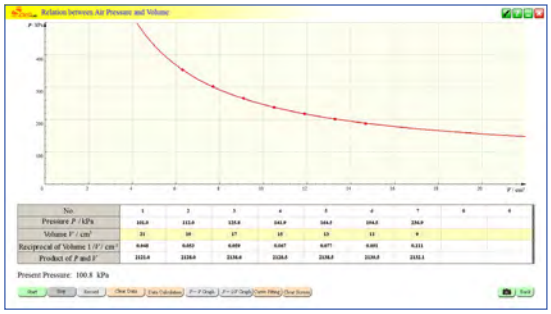
Typical Applications:

· 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 an instant temperature.
· Apparatus: 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

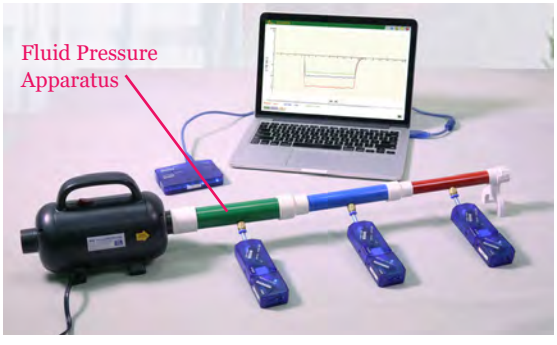
"*P-1/V*" curve

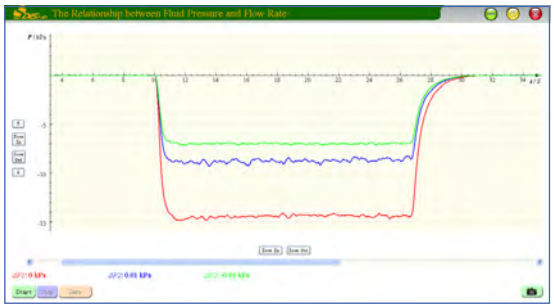
Relative Pressure

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

LW-Y801
Range: 20Hz~20kHz

· Measure and display the sound wave form and frequency.
· Support 4 sound sensors work simultaneously.

Typical Applications:

· Study on the sound frequency
· Study on the period and amplitude
· Voice print recognition

Sound Level

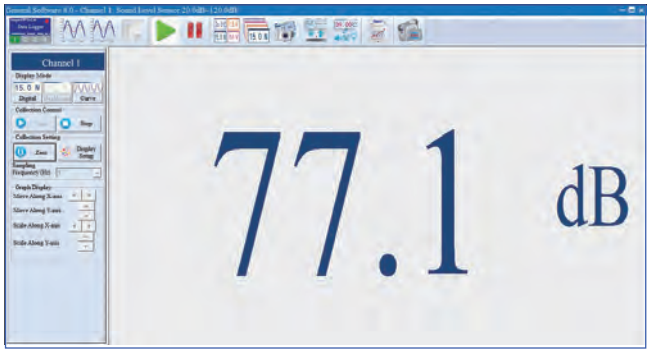
LW-Y802
Range: 20dB~120dB
Resolution: 0.1dB

·Measure and display the sound intensity.

Typical Applications:

· Study on the relationship between the loudness and amplitude.
· Noise measurement.

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).



Illumination

LW-L801
Range: 0 lux~10000 lux
Resolution: 2 lux

· Measure the luminous flux per unit area.

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

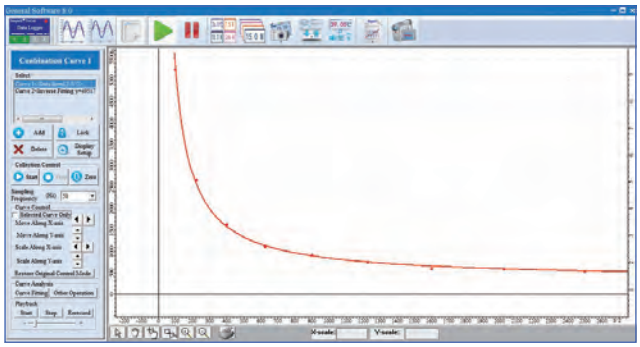
Relative Illumination Distribution

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

Typical Applications:

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

The relationship between illumination and distance



Curve of I-D (Illumination and Distance)

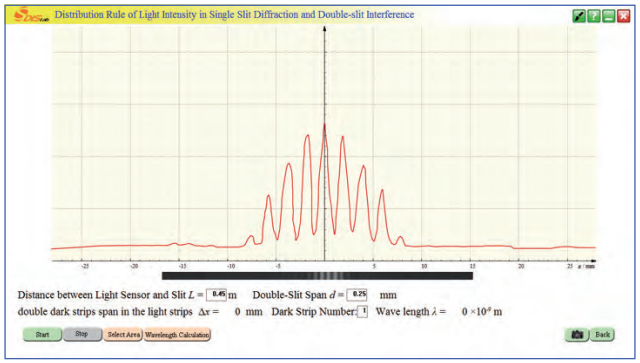
Dual-range Illumination

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

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

Typical Applications:

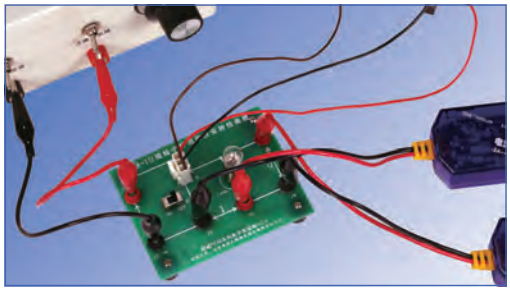
· Study the illuminance and photosynthetic efficiency
· The relationship between illuminance and distance



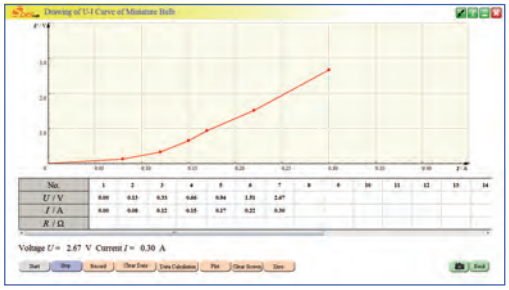
Double-slit experiment results by using Relative Illumination Distribution Sensor

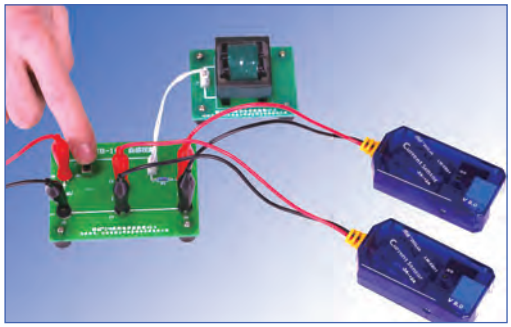
The Extensive Applications of Current and Multi-range Current Sensor working with Voltage Sensor and EXB Series Circuit Board

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

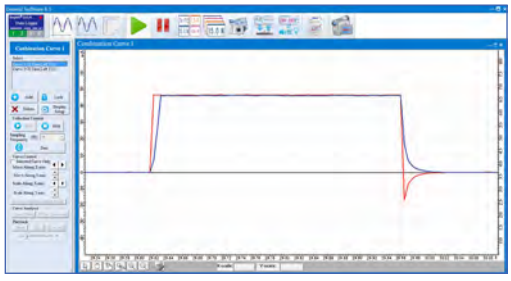


Describe *U-I* curve of a small bulb, the experiment curve as below





Self inductance, the experiment curve as below



Fruit Battery-expriment by using micro current sensor

Current

LW-E801/E802
Range: -2A~+2A/-200mA~+200mA
Resolution: 0.01A/0.1mA

· 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 moter'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.

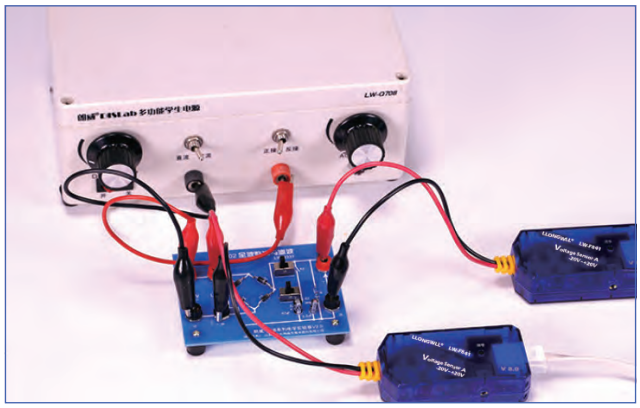
Voltage

LW-E841/E842/E843
Range: -20V~+20V
-200mV~+200mV
-600mV~+600mV
Resolution: 0.01V / 0.1mV / 0.1mV

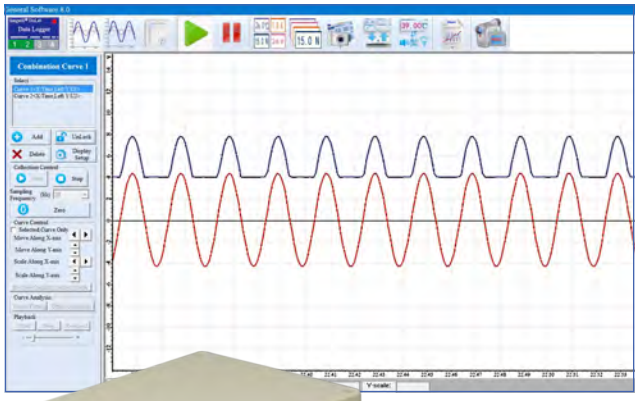
· Measure the voltage magnitude and direction between two points of the circuit
· The usage is similar to voltammeter

Typical Applications:

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



Rectifier and filter, the experiment curve as below



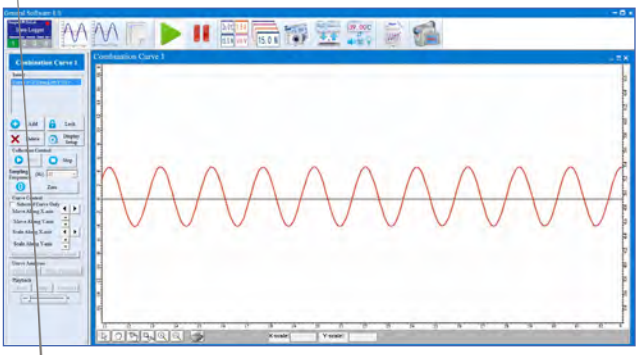
The Extensive Applications of Voltage and Multi-range Voltage Sensor working with Current Sensor and EXB Series Circuit Board

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 immage 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.

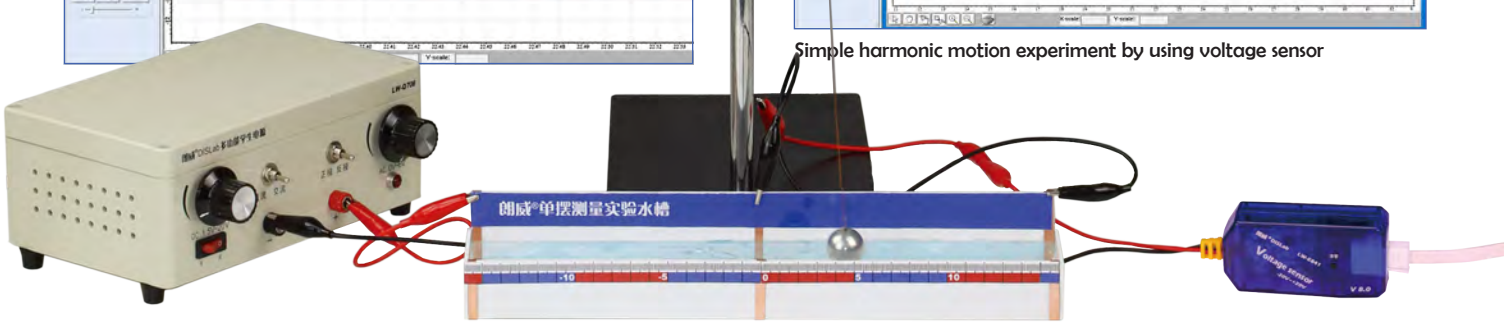
Voltage (Multi-range)

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

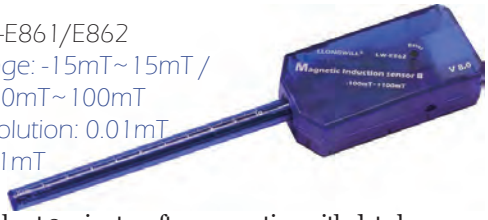


Simple harmonic motion experiment by using voltage sensor

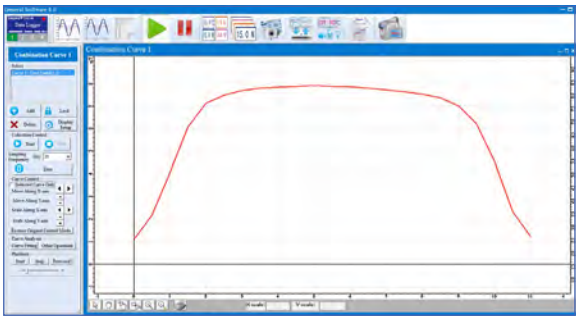


Magnetic Induction

LW-E861/E862
Range: -15mT~15mT / -100mT~100mT
Resolution: 0.01mT / 0.1mT



· Preheat 2 minutes after connecting with data logger
· Start the measurement after the reading is stable
· Keep far away from strong magnet after use
· The absolute value of the reading is the component of MII at the measuring point, parallel to the probe direction
· When the reading is positive, it means the component direction is towards the probe head, otherwise, the component direction is towards the probe tail.



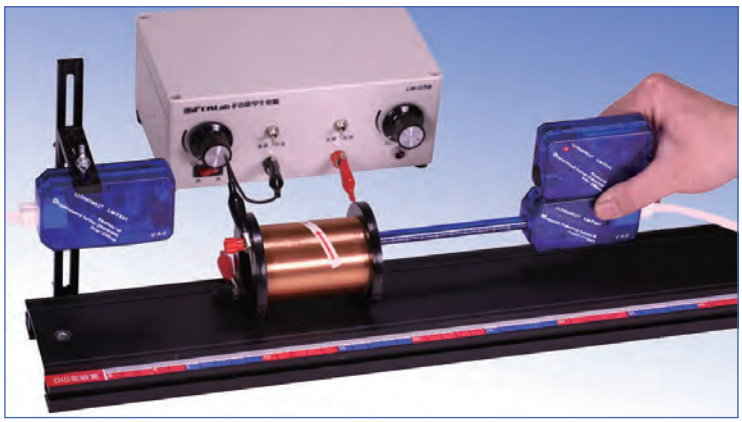
Study on the magnetic field distribution in the electrified solenoid, results as above

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

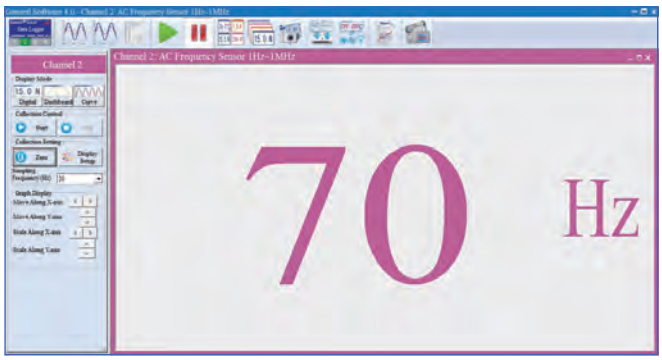
LW-E883
Range: 1Hz~1MHz

· 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 Generater 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 Electrostatic Sensor and Electrometer:

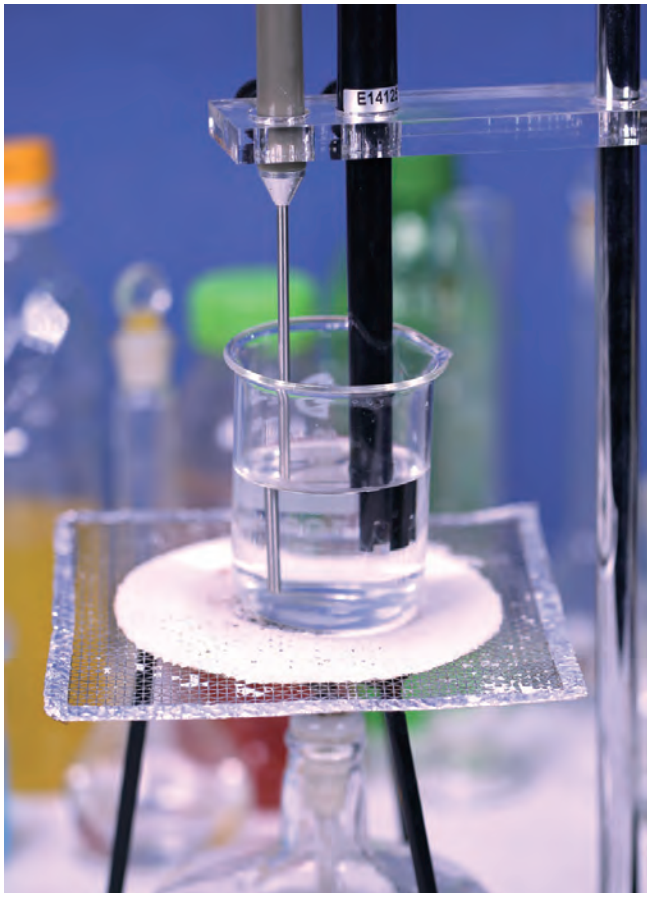
Both Electrostatic Sensor and Electrometer can be connected with computers directly (electrostatic sensor adopts wired manner while electrometer adopts wireless manner).
Please make the measured electrified object approach to the metallic ball during experiments.

General Sensors

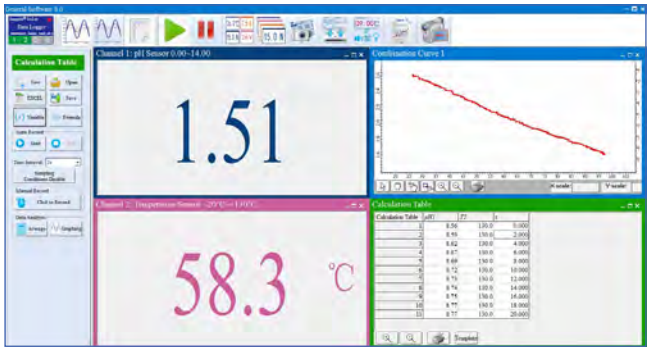
General science sensors can be used either for Physics experiments, or Chemistry experiments, and also can be used for Biology experiments, including temperature, pressure, current, voltage, micro-current, multi-range current sensor, etc. The above Physics sensors provide new experiment methods for Biology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

Temperature Sensor in Chemistry Experiment:

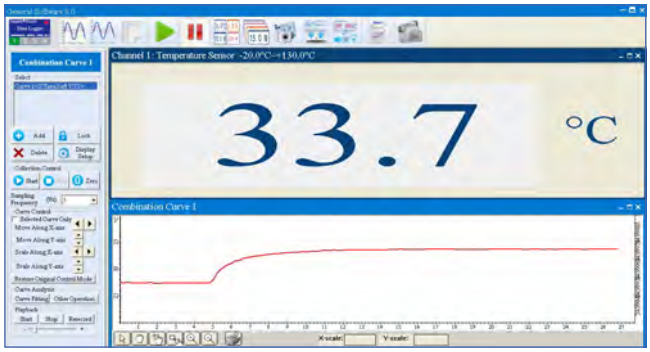
The temperature sensor can be used in experiments of Neutralization heat, heat of solution from acetic acid ionization equilibrium constant measurement, etc.



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



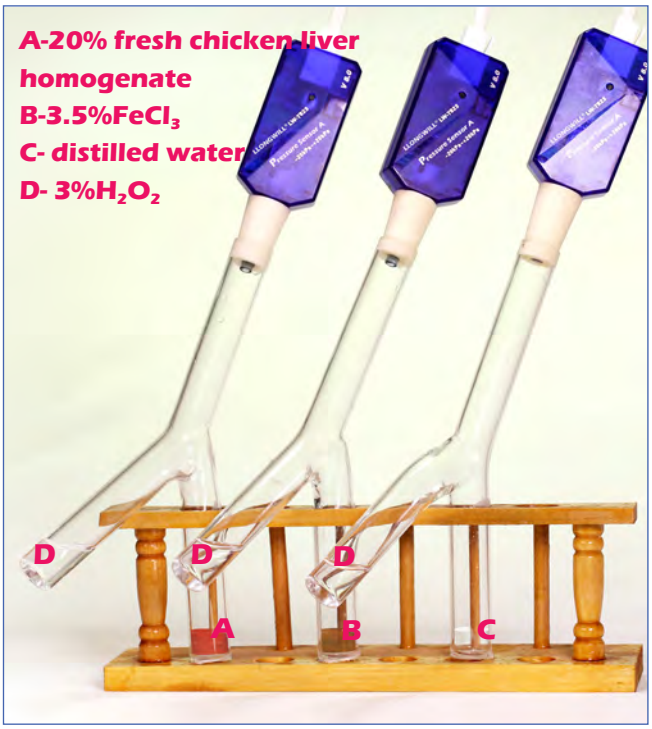
Neutralization heat experiment (NaOH + HCl) (above) and experiment results (below)



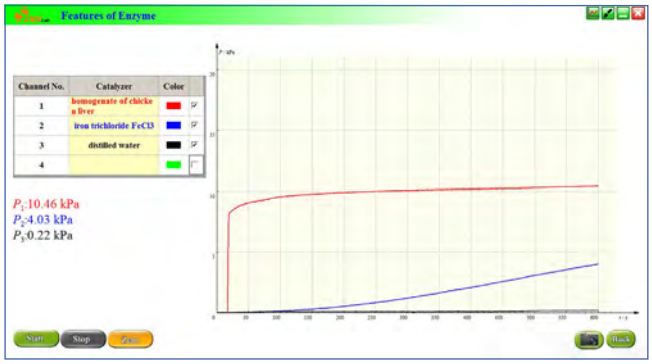
Heat of solution experiment (NaOH)

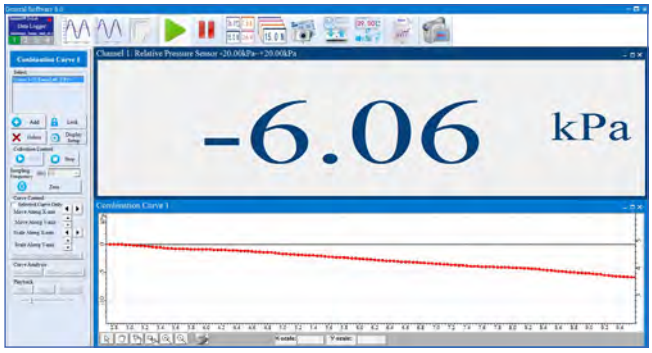
Relative Pressure Sensor in Biology and Chemistry Experiments:

· 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)

Electricity Sensors in the Application of Chemistry Experiments:

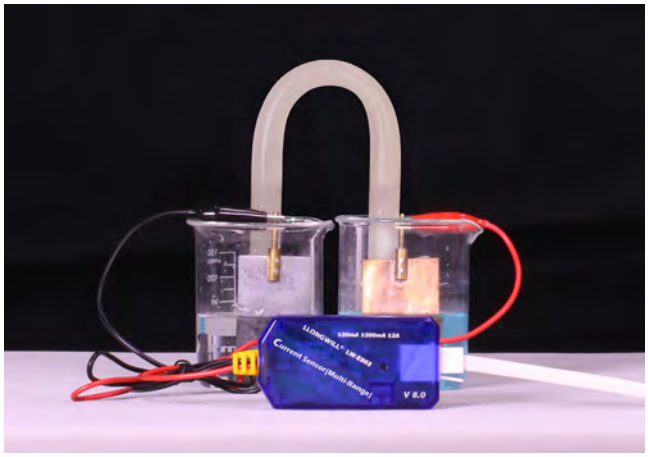
Many chemical reactions can be described as ion activities. Therefore, the electrical measurements are required to support chemical research, and thus produce an important branch of chemistry - electrochemistry. High school chemistry experiment, in part, is related to the content of electrochemistry, 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:*

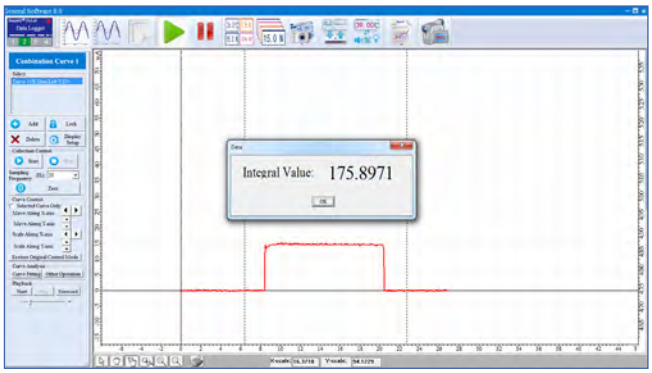
► Principles: The primary cell is a device which converts chemical energy into electric energy. In the copper-zinc primary cell, zinc atom loses two electrons, and the electrons flow from the negative electrode (zinc) to the positive electrode (copper), forming current.

► Apparatus and Reagents:

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 producesd. Potassium nitrate melting point is 334 ℃, and it will be decomposed meanwhile oxygen will be released if above 400 ℃ .

► Apparatus and Reagents:

Data logger, current sensor, 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)

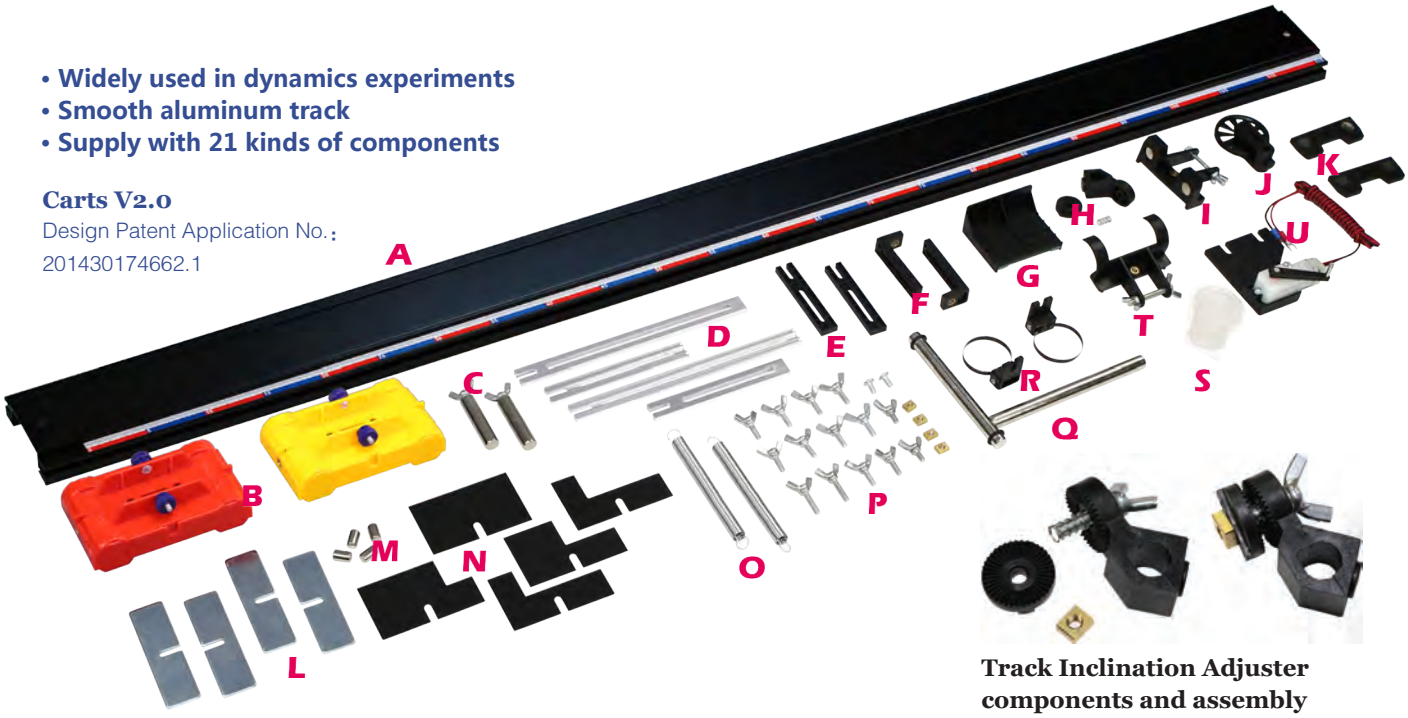
Lab Equipment

NEW TECHNOLOGY FILLS UP GAPS IN EXPERIMENTS AND SOLVES EXPERIMENTAL PROBLEMS

Our 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 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.

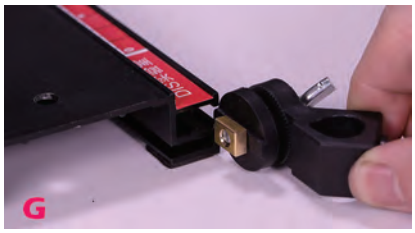
Installation and Use of track carts V2.0:

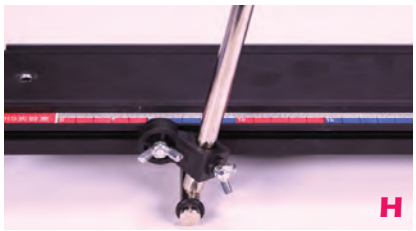
Track cart is the key equipment of mechanical track system. Refer to image below about its installation specifications.

A. The cart wheels are above the bottom bodywork of, so it is only applicable to This 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:

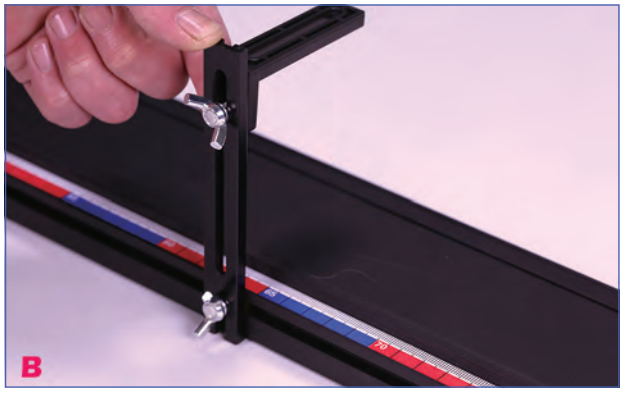
G. the first step for assemblling T-type track support is to install track inclination adjuster, and it will be longitudinally inserted into guide slot from track port through the rectangular copper nut in the frond end of butterfly bolt of regulator teeth; H. To Assemble the track inclination adjuster, 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.

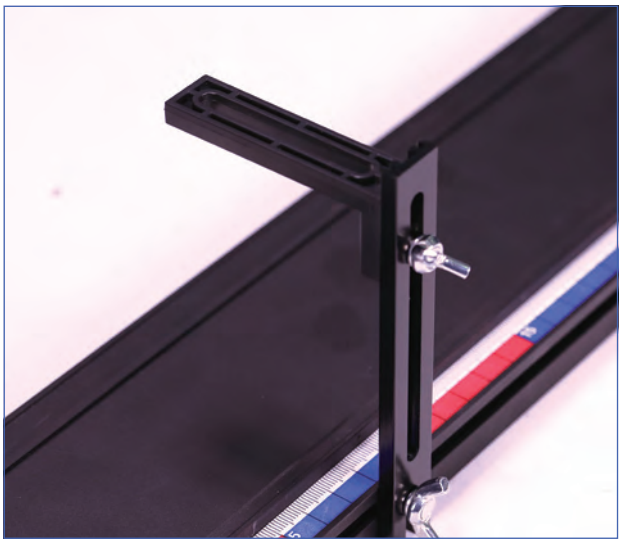




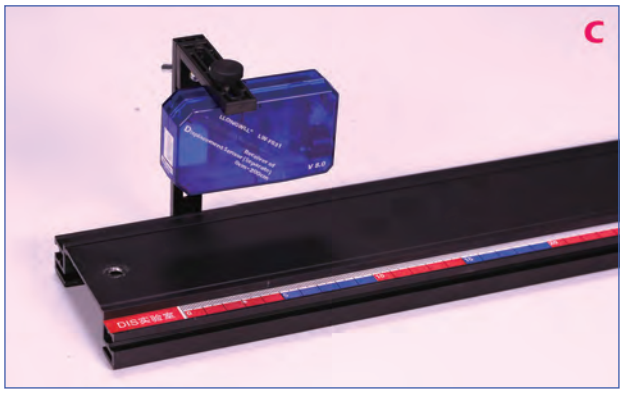
Assembly of Accessories:

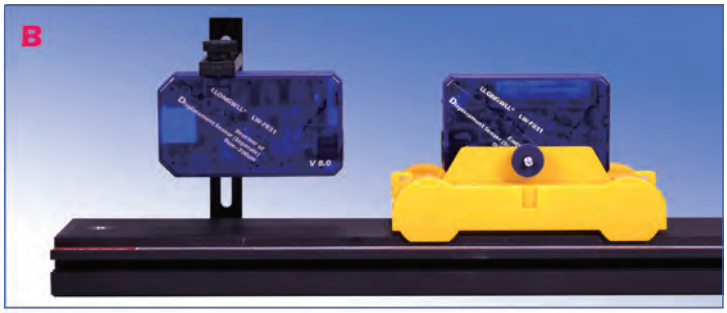
A. Mount I-type bracket on track. Many experimental facilities can be installed based on this bracket;
B. Mount L-type btacket onto I-type bracket;
C. Hoist the receiver of displacement sensor (separated); The ultrasonic export of receiver and emitter shall be aligned;

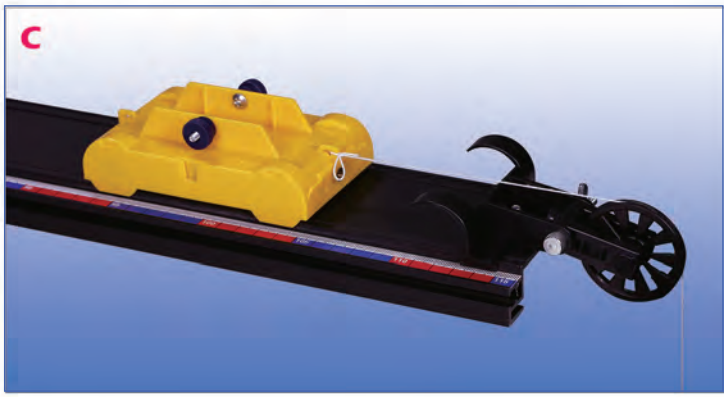


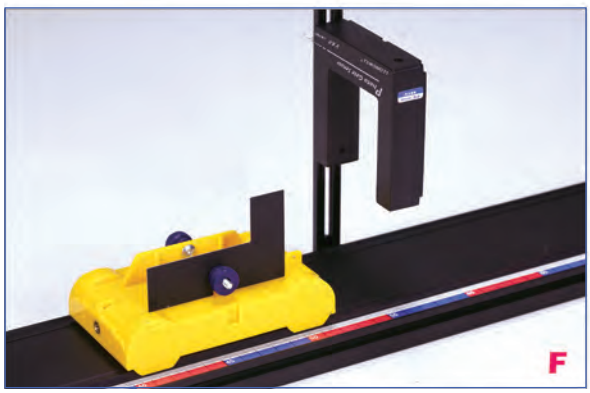


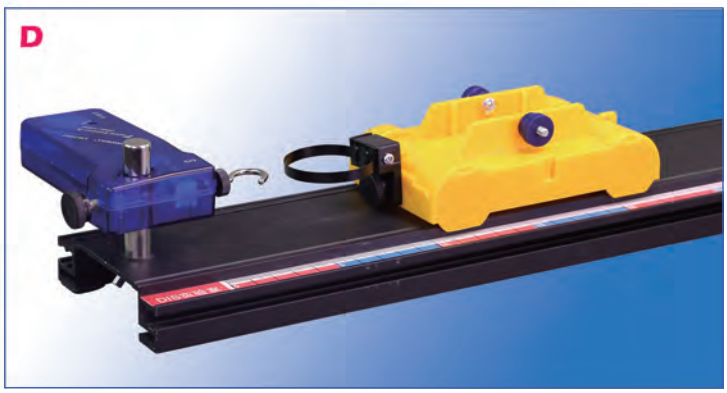
E. Mount force sensor onto fixed leg. The hook should be kept in a straight line with a spring or rope hanging from the hook;
F. Mount the photo gate sensor onto I-type bracket, and adjust the height of photo gate, ensuring the cart with light blocking sheet can go through it smoothly.





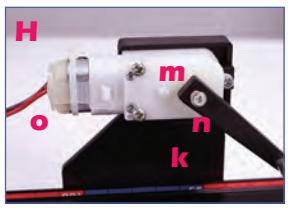


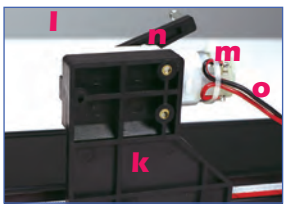


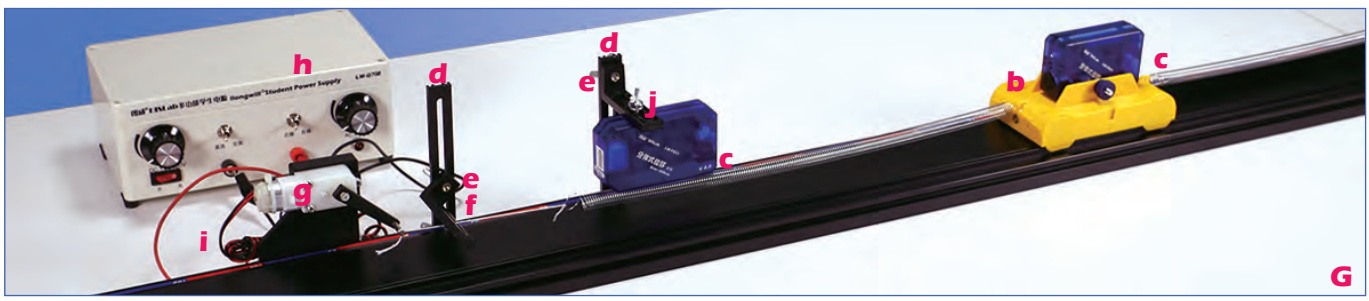


Assembly and applications:

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.







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)**

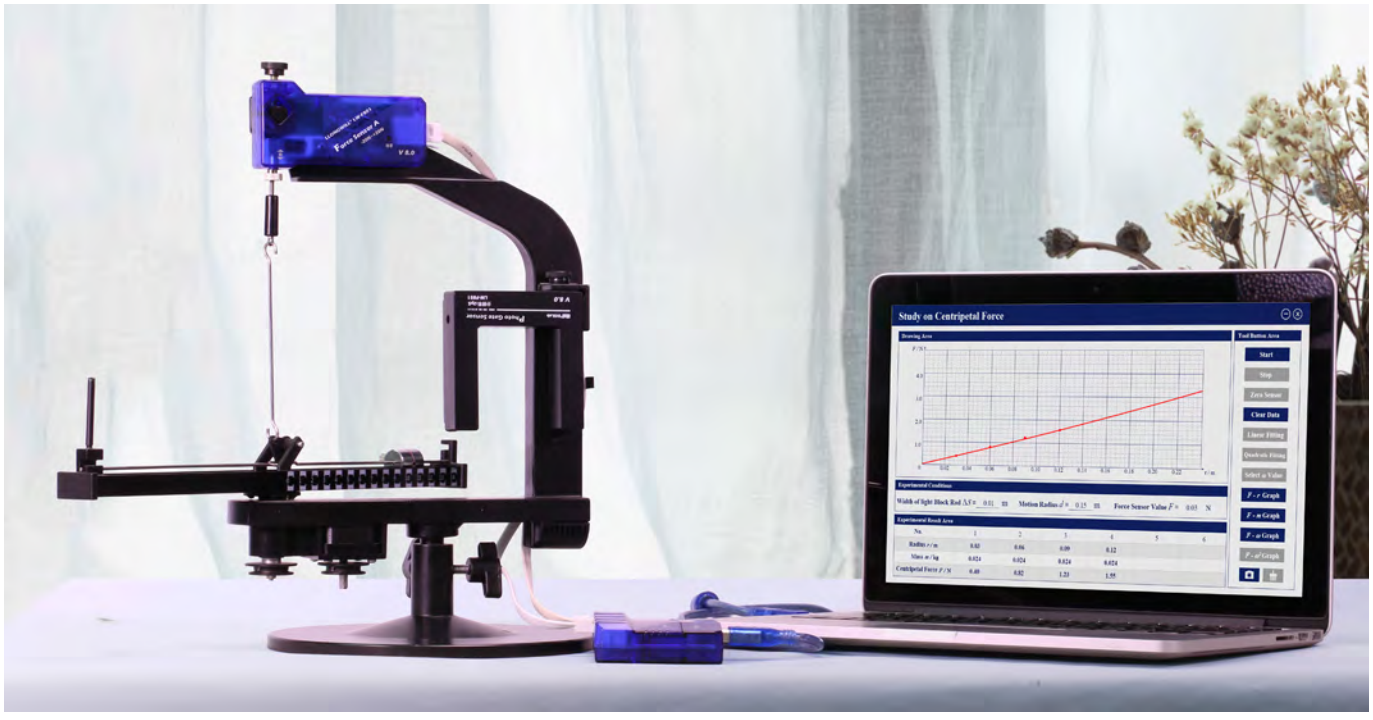
Utility Model Patent No.: ZL200720017884.7

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

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

Components of Centripetal Force Apparatus:

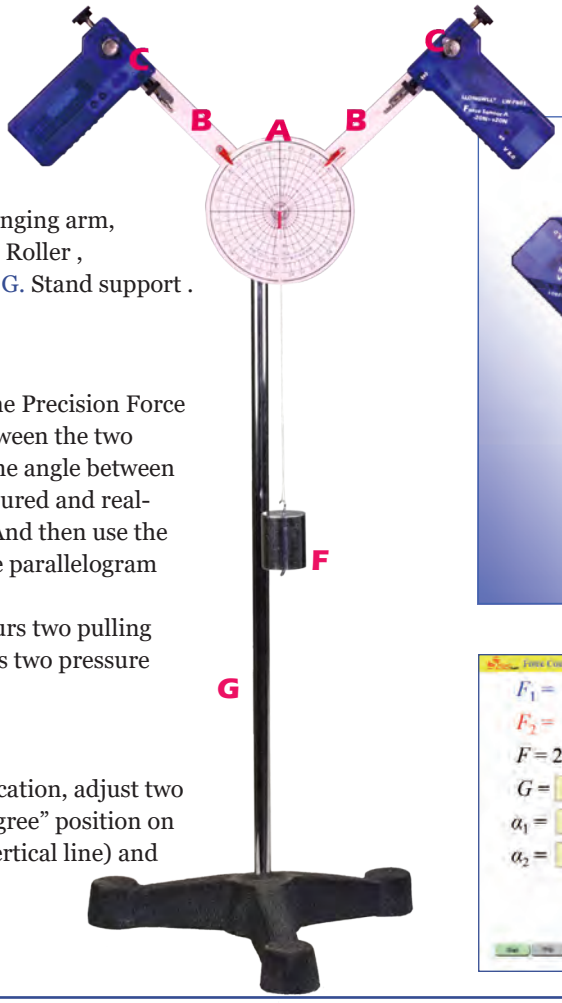
A. Main Frame, B. Base, C. Rotating Arm, D. Connecting Device (a bolt connected with the force sensor, a vertical rod and a horizontal rod), E. Weight , F. Light Blocking Rod, G. Fasten bolt: a bolt connected with the force sensor.

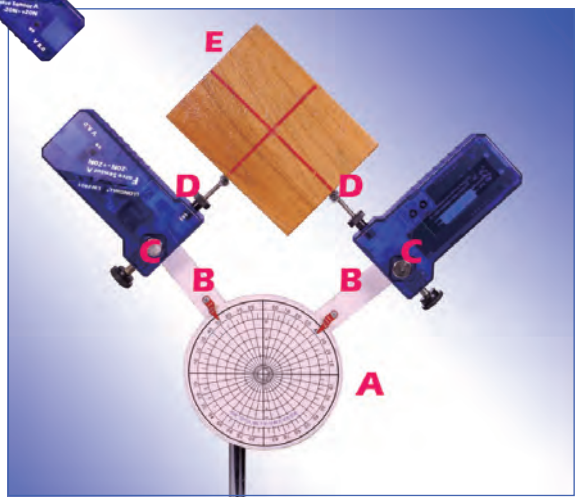


Force Resolution and Composition Apparatus

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 .

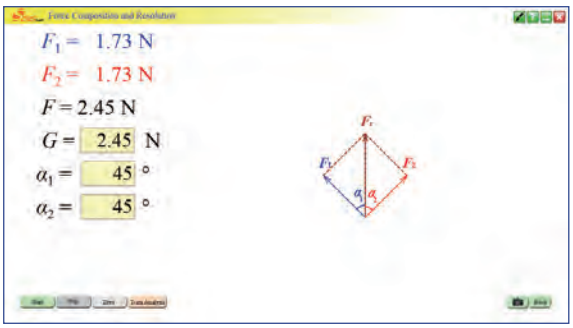
Working Principle:

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.



Smart Force Disc V2.0

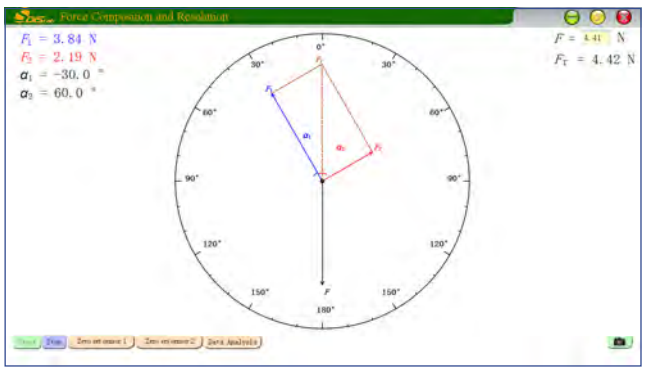
LW-Q836

Utility Model Patent No.:ZL201220020063.X

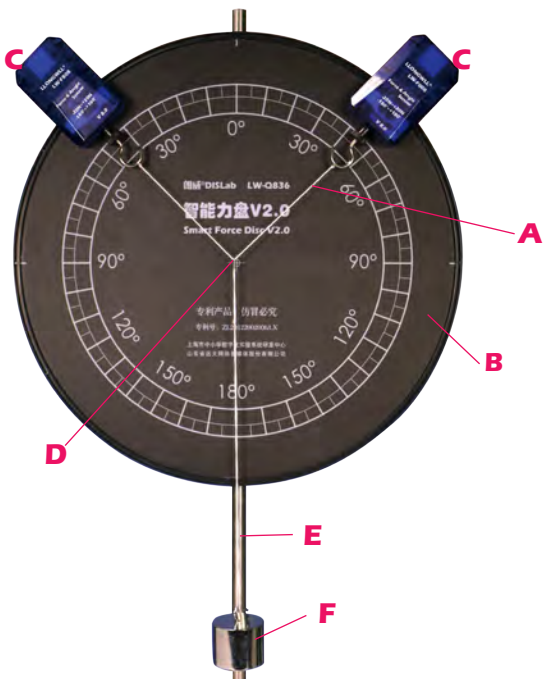
• Intelligent apparatus used with Force&Angle Sensor.
• Real time obtain the angle data automatically, instead of manual input operation

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



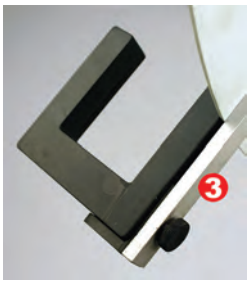
Conservation Law of Mechanical Energy Apparatus I

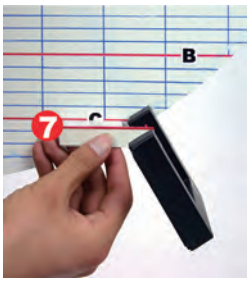
LW-5304

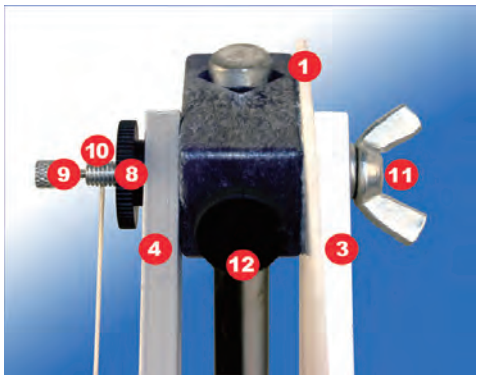
IUtility Model Patent No.: L200720017881.3

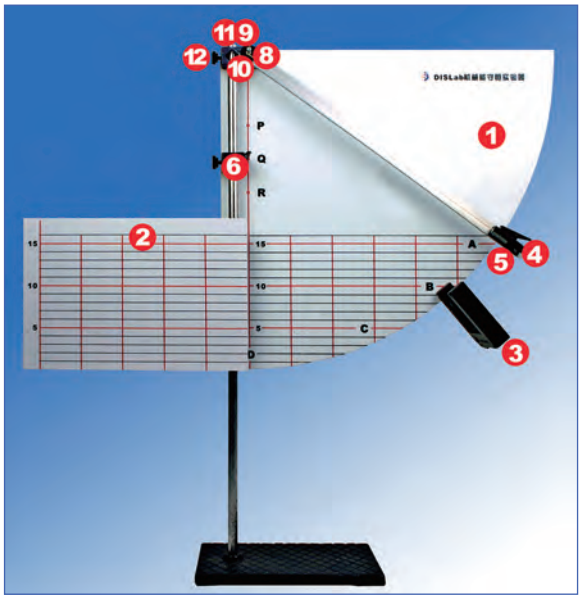
- **Verify the Conservation Law of Mechanical Energy.**
- **Using Photogate Sensor.**

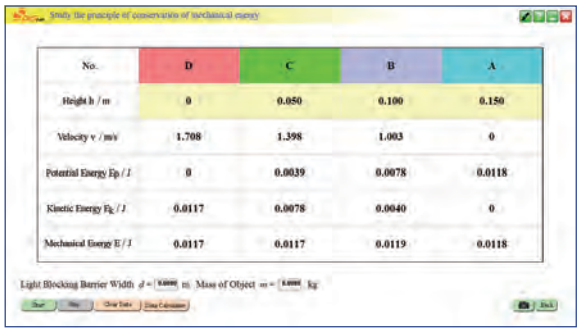
1 · Main Board
2 · Subboard
3 · Fixed Arm for Photo Gate
4 · Fixed Arm with magnetic clamp
5 · Pendulum Bob (include cord)
6 · Position Stop
7 · Planometer
8 · Central Nut
9 · Central Bolt
10 · Fixed Bolt for Pendulum String
11 · Butterfly Bolt
12 · General Bolt





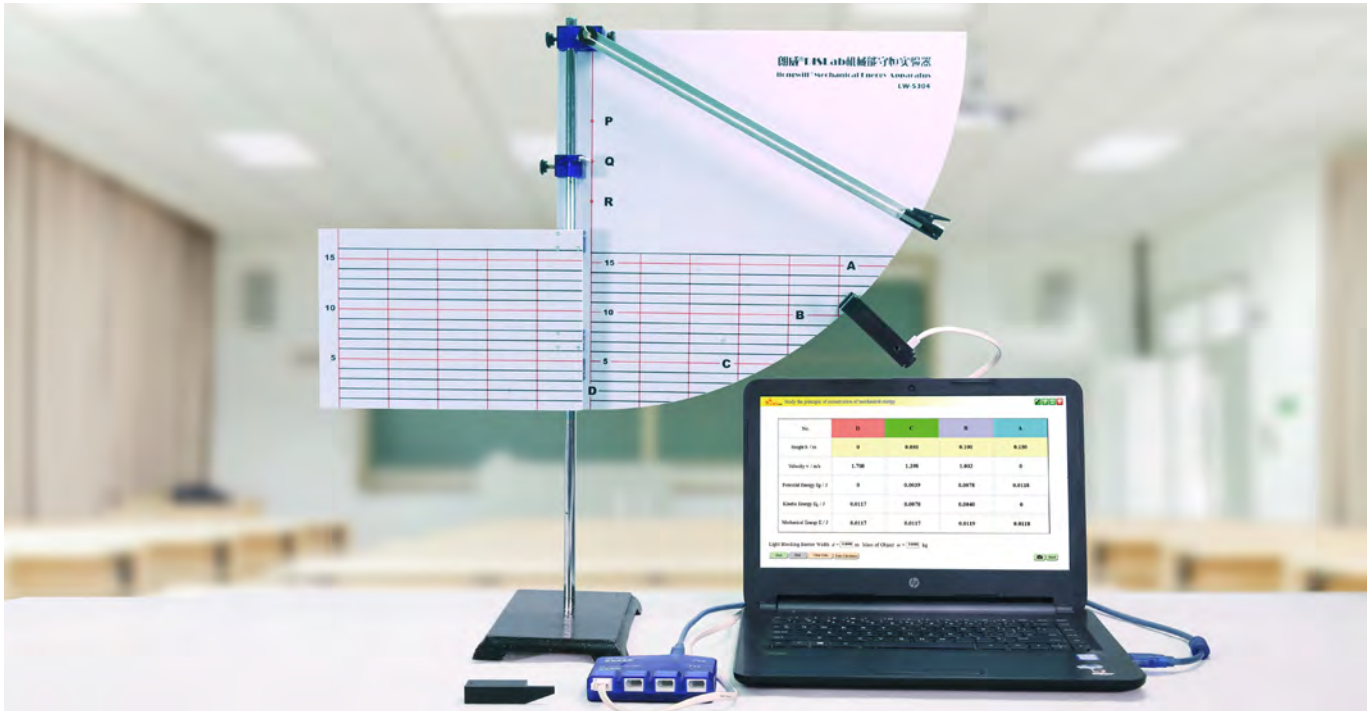






No.	D	C	B	A
Height h / m	0	0.050	0.100	0.150
Velocity v / m/s	1.708	1.398	1.003	0
Potential Energy Ep / J	0	0.0039	0.0078	0.0118
Kinetic Energy Ek / J	0.0117	0.0078	0.0040	0
Mechanical Energy E / J	0.0117	0.0117	0.0119	0.0118

Verification of the Conservation Law of Mechanical Energy



Force Resolution on Inclined Plane

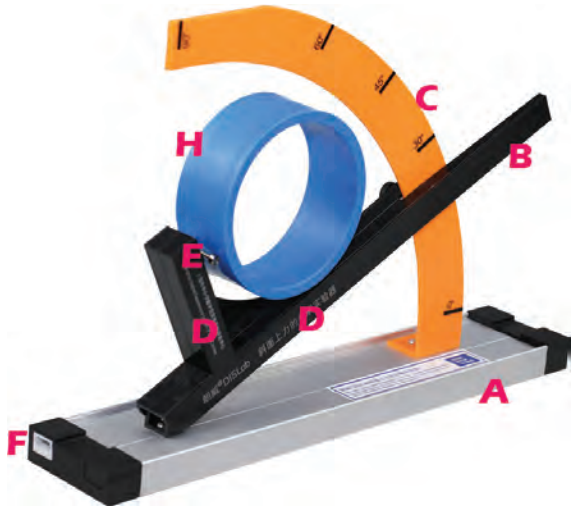
LW-Q721

Utility Model Patent No.:ZL200720017883.2

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

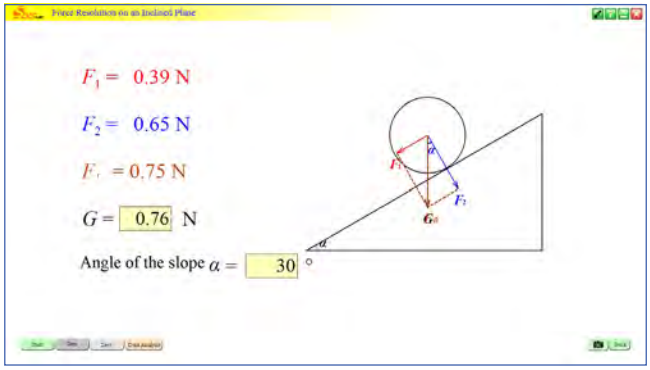
Components:

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

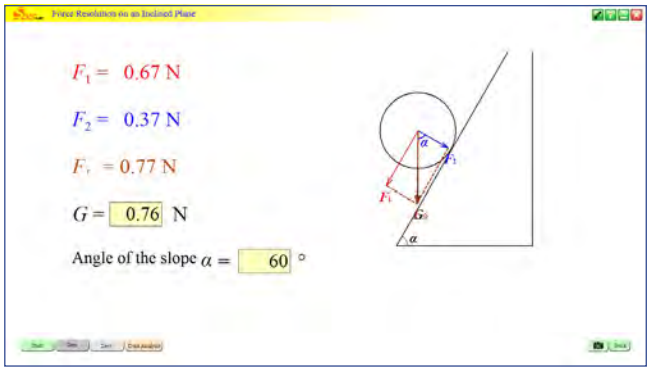


Principle and Operation:

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.

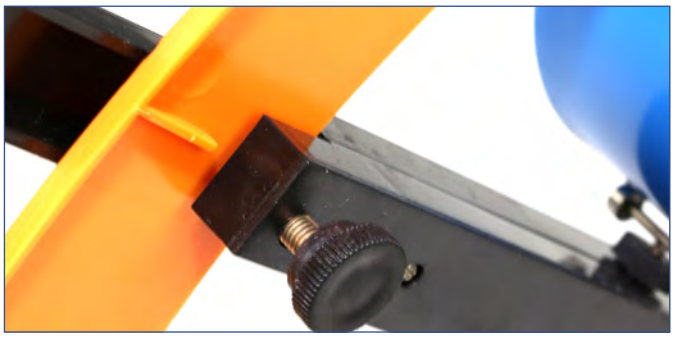


The readings of two force sensors at 30°angle

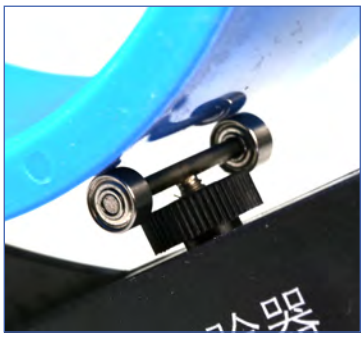


The readings of two force sensors at 60°angle

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.



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.

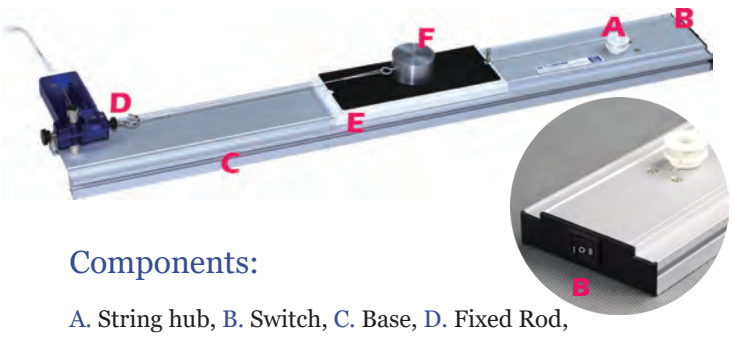


Friction Apparatus

Utility Model Patent No.:ZL200720017883.2

LW-6341

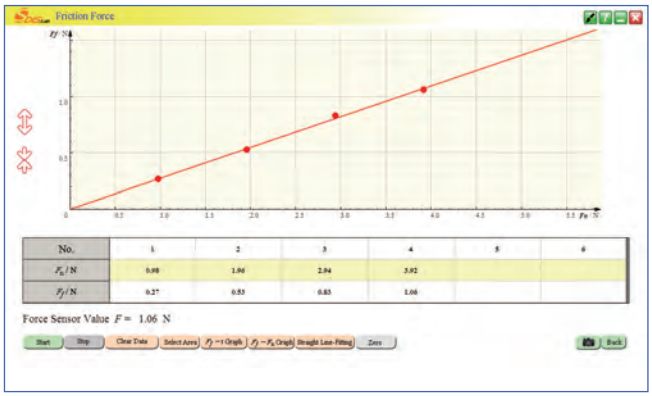
- **Study the static friction and sliding friction.**
- **Built-in traction motor**



Components:

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

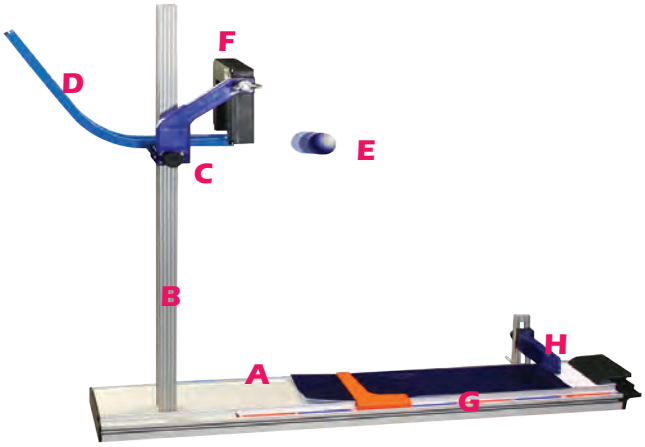
Study on the Maximum Static Friction Force



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

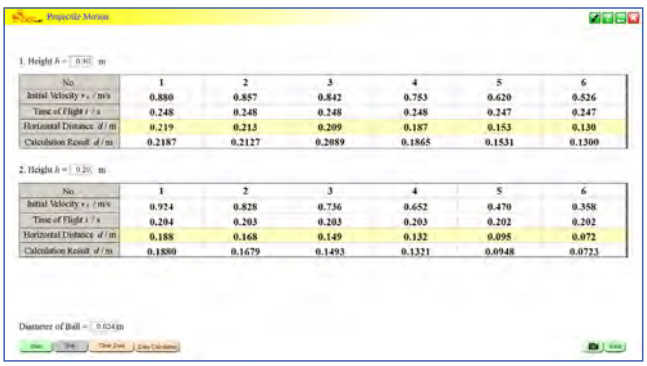
Projectile Motion Apparatus

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.



1. Height h = 0.30 m

No.	1	2	3	4	5	6
Initial Velocity v_x / m/s	0.880	0.857	0.842	0.753	0.620	0.526
Time of Flight t / s	0.248	0.248	0.248	0.248	0.247	0.247
Horizontal Distance d / m	0.219	0.213	0.209	0.187	0.153	0.130
Calculation Result d / m	0.2187	0.2127	0.2089	0.1865	0.1531	0.1300

2. Height h = 0.20 m

No.	1	2	3	4	5	6
Initial Velocity v_x / m/s	0.924	0.828	0.736	0.652	0.470	0.358
Time of Flight t / s	0.204	0.203	0.203	0.203	0.202	0.202
Horizontal Distance d / m	0.188	0.168	0.149	0.132	0.095	0.072
Calculation Result d / m	0.1880	0.1679	0.1493	0.1321	0.0948	0.0723

Diameter of Ball = 0.024 m

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.

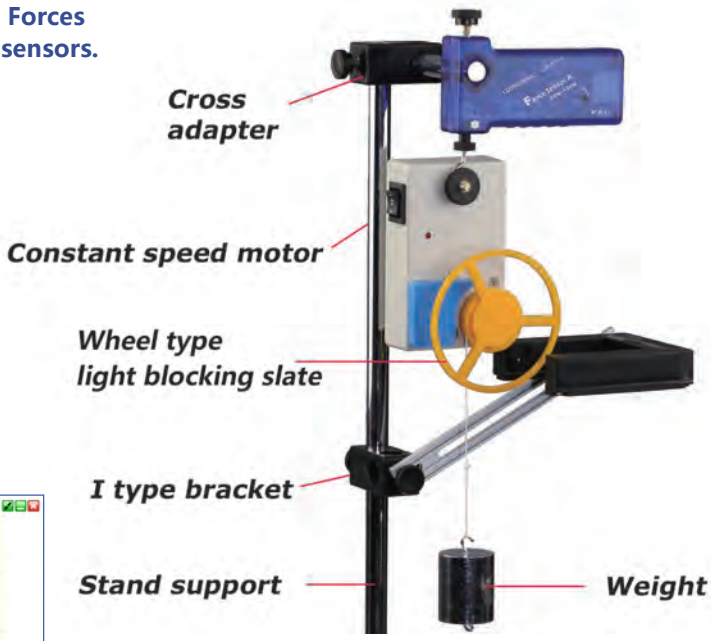
Equilibrium of Two Forces Apparatus

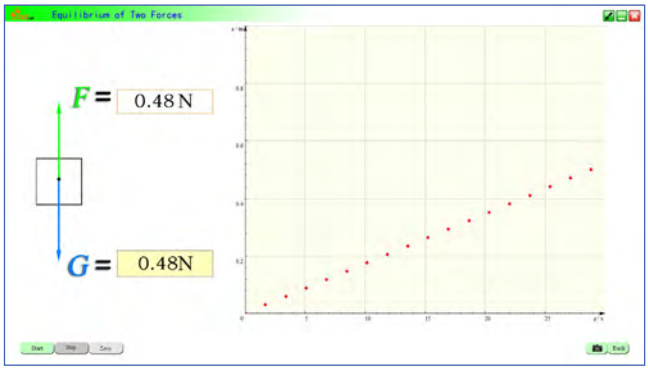
LW-Q725

- **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.





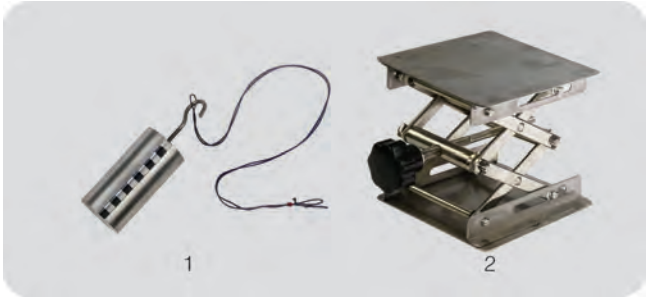
Experiment result of equilibrium of two forces

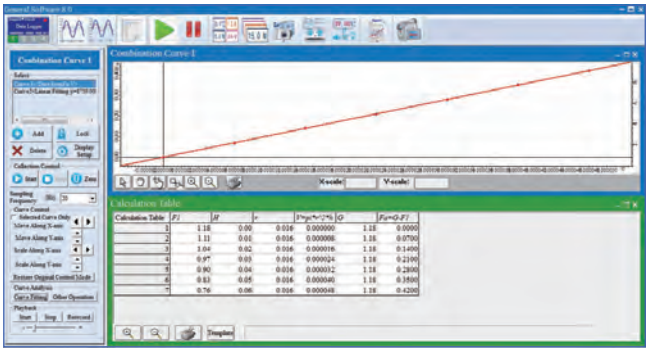
Archimedes' Law Apparatus

LW-6327

•To measure the buoyancy acted on the sinking object

Archimedes' Law apparatus is a typical physical model, consisting of an aluminum cylinder with scale, a beaker, an adapter, a leveling rod and a stepless adjustable lifting platform. The rising and falling of liquid level in container can be accurately controlled by adjusting the lifting platform. The change of Buoyancy can be measured by using the force sensor.



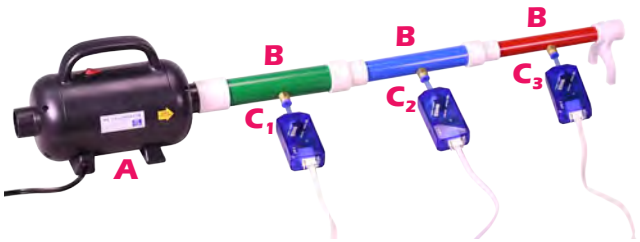


Real-time Experiment results of Archimedes' Law

Fluid Pressure Apparatus

LW-Q733

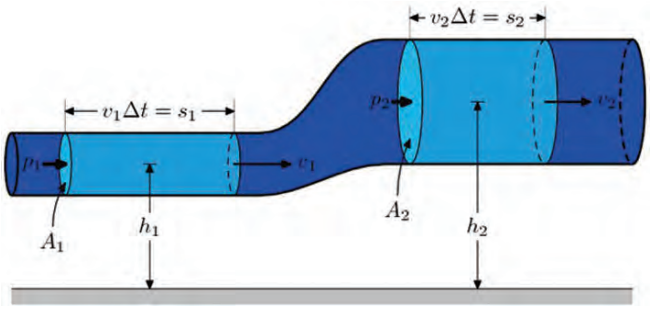
Utility Model Patent No.:201310572342.1



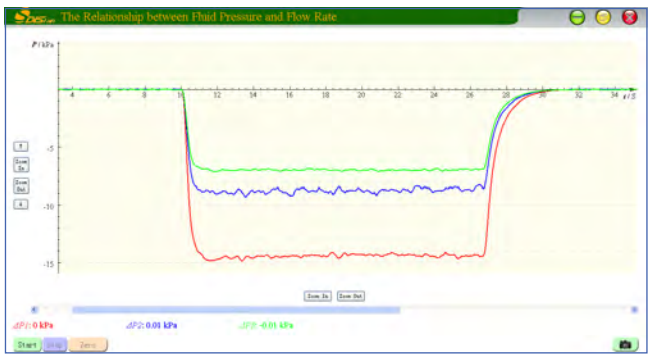
As shown in image above, this apparatus consists of A) gas pump and three-pieces of B) rigid pipes with same length and different diameters, connected in air pump and bayonets with C) locking devices, which can be used to connect with the flexible pipe of relative pressure sensors.

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.

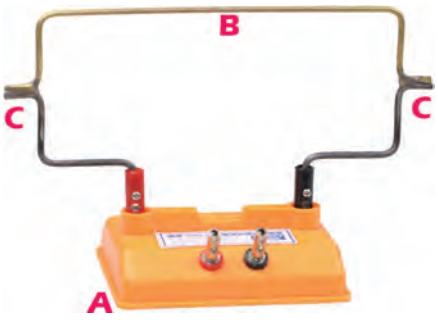


Connect these three relative pressure sensors to the apparatus; run the air pump; set up three " relative pressure-time" curves through "Combination Curve" function in the program; after the gas pump runs stablely , then the experiment result as shown in image below can be obtained. Bernoulli's principle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



Thermocurrent Apparatus

LW-6329

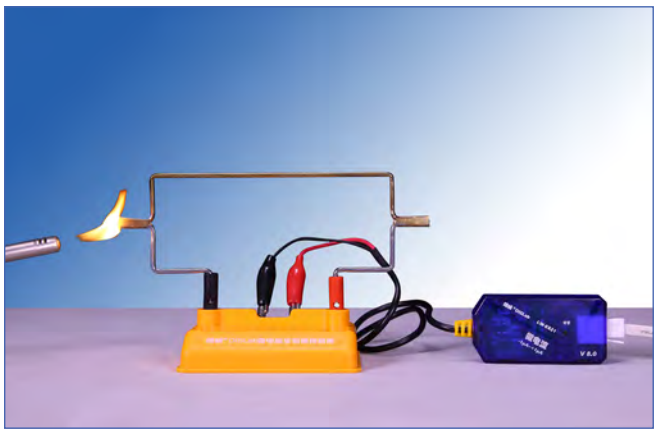


Components:

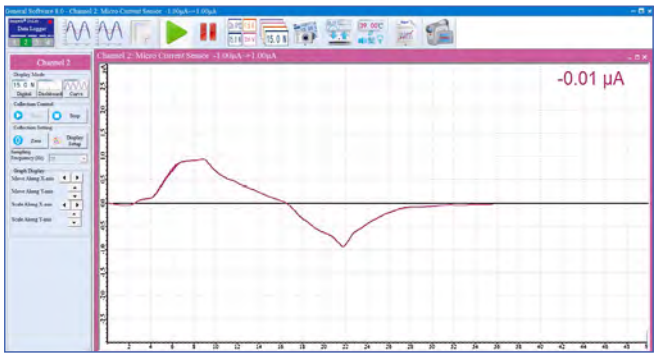
A. Base
B. Wire Frame (2 kinds of metals)
C. Metal Junctions

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

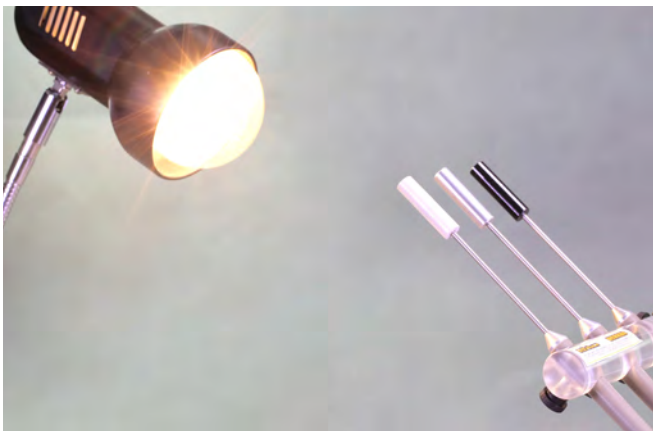
Thermal Radiation Absorption Apparatus

LW-Q723

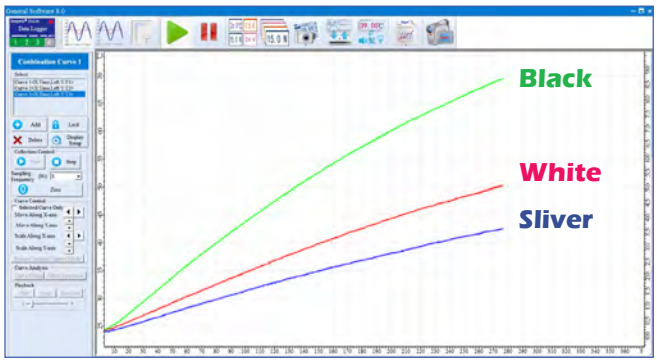
Components:

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

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:

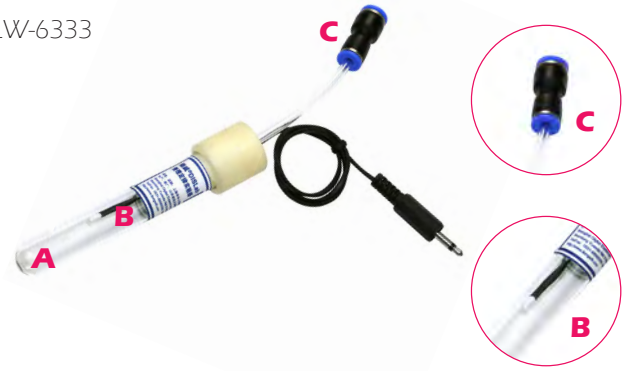
A. Base, B. Far-infrared Ceramic Unit, C. Outer Cover, D. Switch, E. Indicator, F. Power Jack, G.Fuse Tube.

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

Charles' Law Apparatus

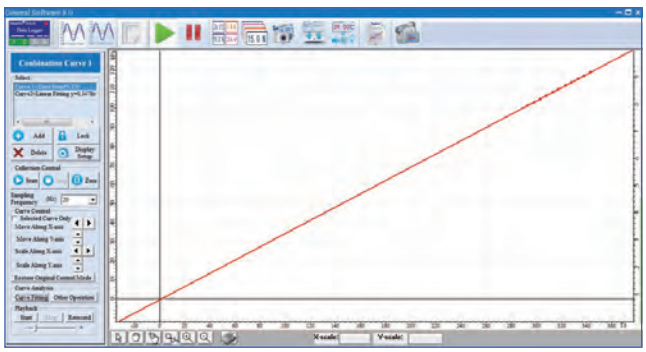
LW-6333



Components:

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

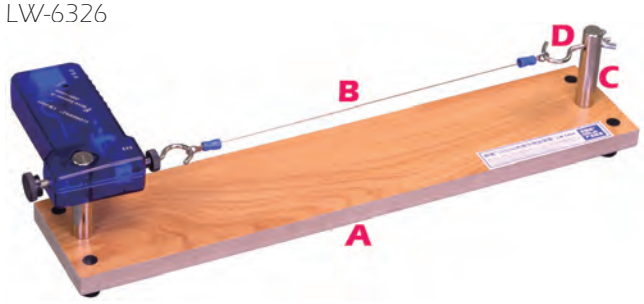
Experiment operation of Charles' Law



Curve of the relationship between Pressure and Temperature.

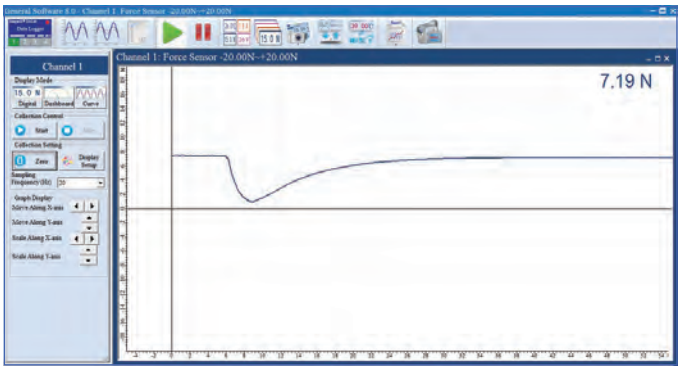
Thermal Expansion and Contraction Apparatus

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”.

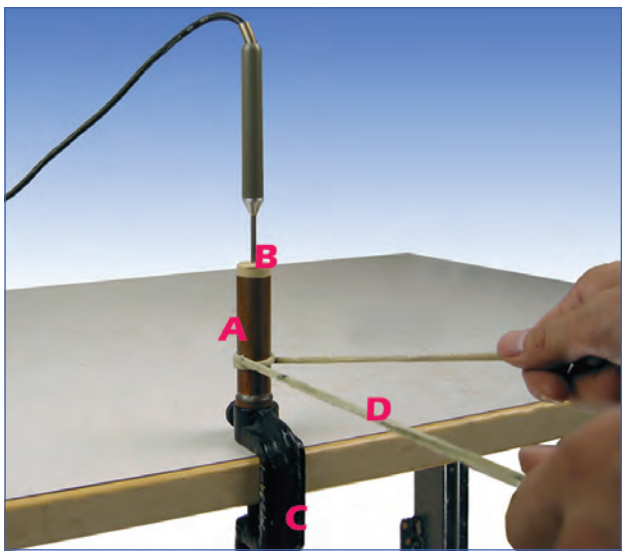
Experiment of thermal expansion and contraction of metal wire



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

Frictional Heat Apparatus

LW-6340

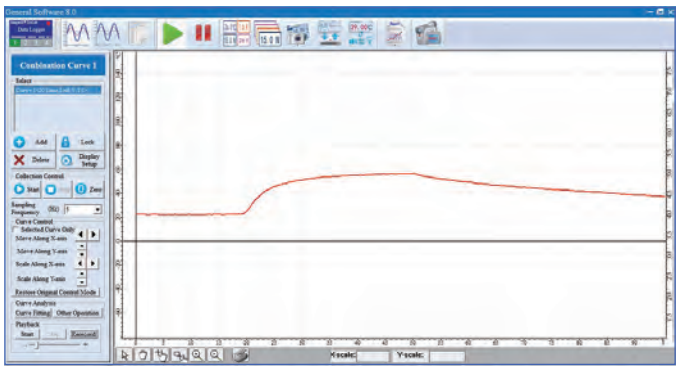


Components:

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

Working Principle:

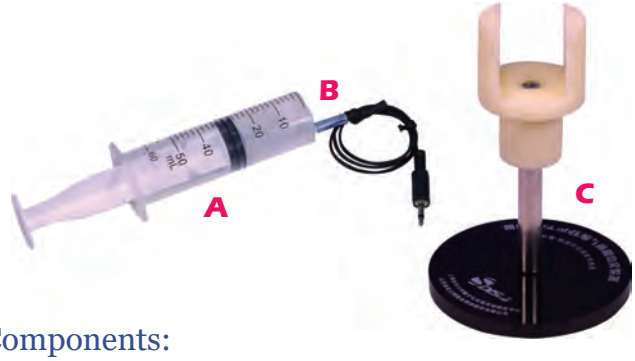
Use cord to rub the copper tube quickly, then the temperature in the copper tube will increase. With the temperature sensor, the real-time temperature change can be obtained. It demonstrates the frictional work transfer into the thermal energy.



Experiment results of frictional heat to raise the temperature

Work by Compressed Gas Apparatus

LW-6334

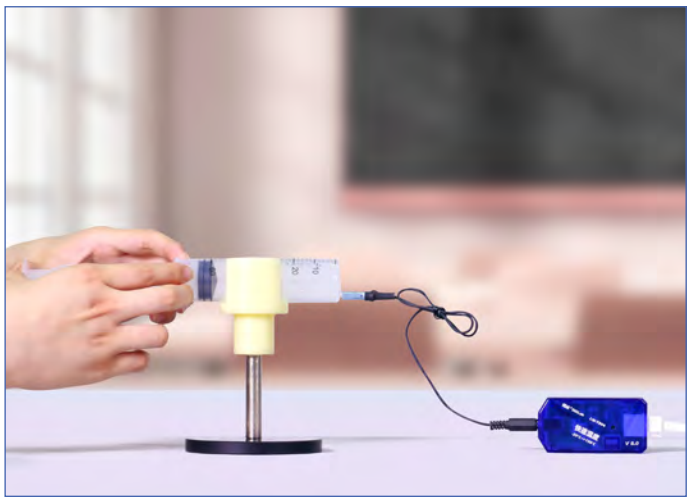


Components:

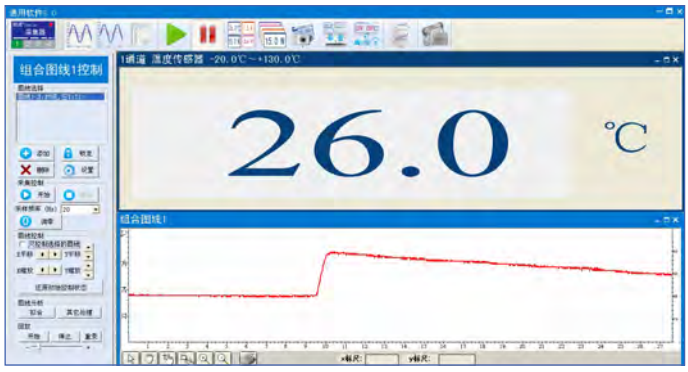
A. Large Size Syringe, B. Fast response temperature sensor probe, C. Base.

Working Principle:

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

Thermal Radiation Apparatus

LW-6330

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

Components:

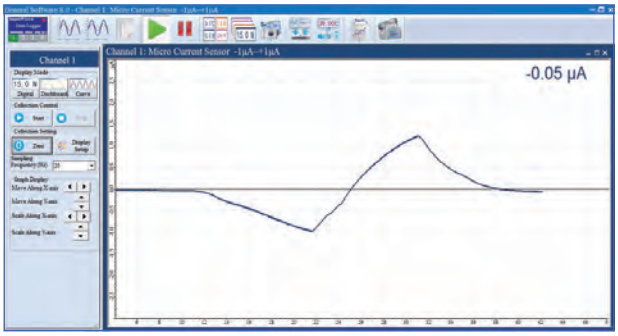
A. Thermoelectric Sensing Component
B. Specialized Experiment Board
C. Base

Working Principle:

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



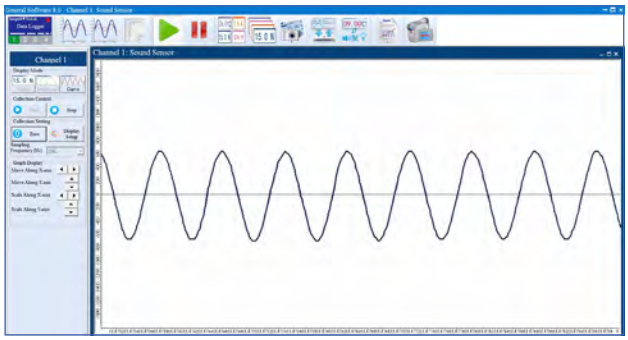
The current changes when the thermal source faces different side of thermoelectric sensing component

Audio Signal Generator V2.0

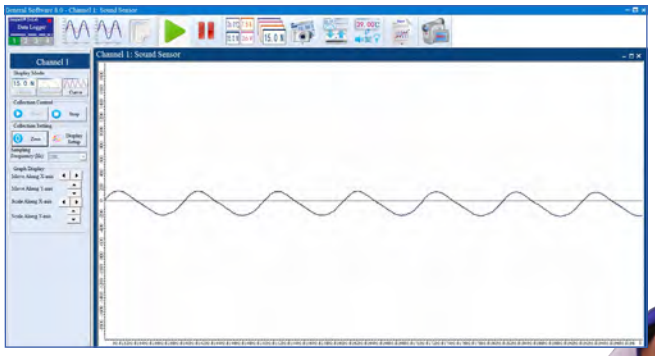
LW-Q709

- 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

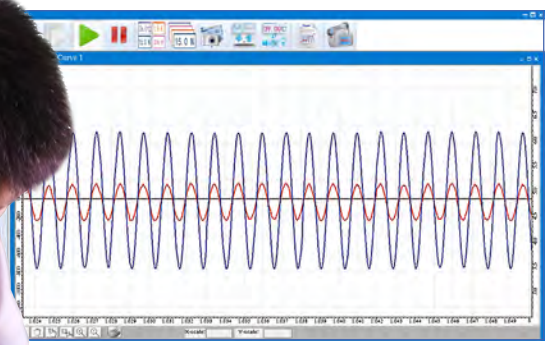
Sound waves measurement of audio signal generator



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

Optics Kit

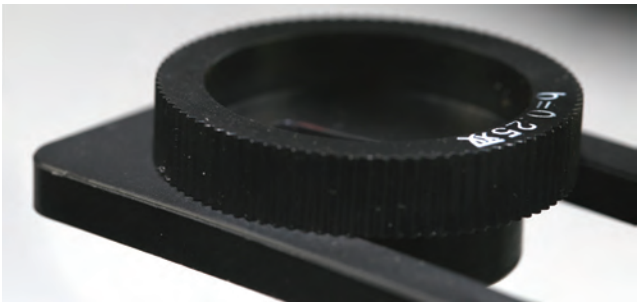
LW-5211

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

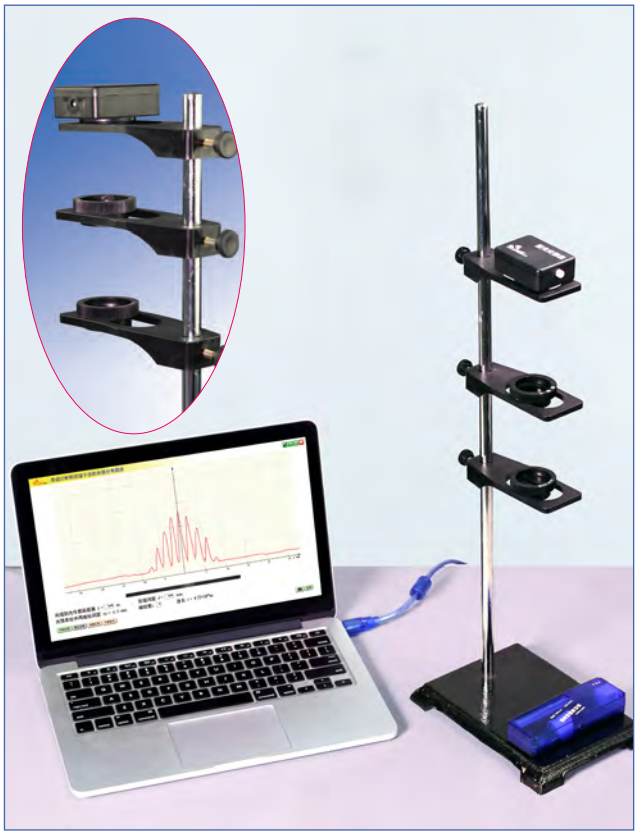
Operation Instruction:

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.

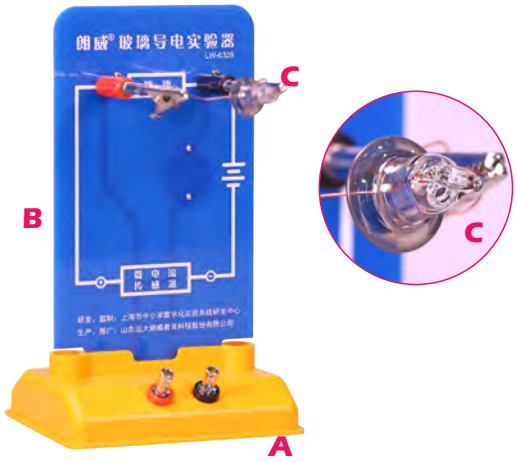


Single-slit Diffraction experiment

Electrical Conductivity for Glass Items

LW-6328

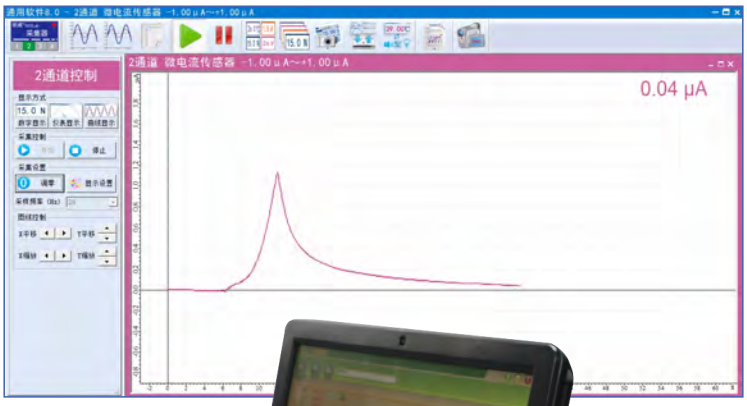
- Used to study on the glass conductivity when heated.
- Used with Micro Current Sensor.



Electrical conductivity for glass items (mobile terminal)

Components:

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



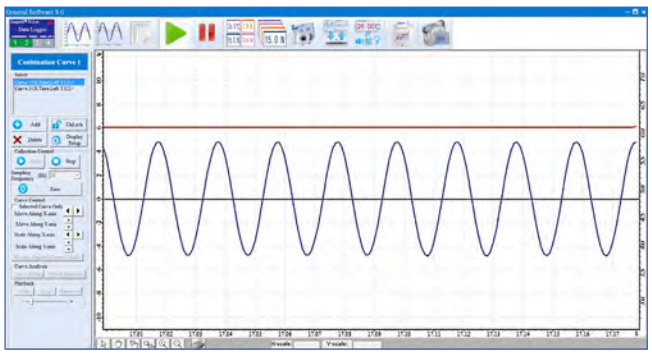
Electrical conductivity for glass items and its interface

General Power Supply V2.0

LW-Q708

Specifications

Input: AC 220V±10% 50Hz
DC Output: 1.5V~20V continuously adjustable, rated current 1A
AC Output: 0V~9V continuously adjustable, 50Hz, rated current 1A



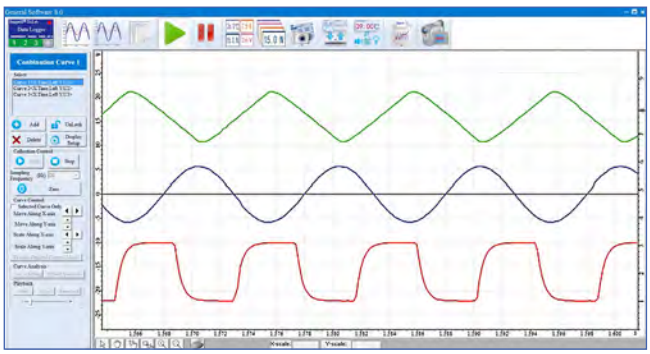
AC and DC signals output from General Power Supply

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 Frequency Signal Generator

Smart Power Supply V2.0

Utility Model Patent No.: ZL201120057646.5

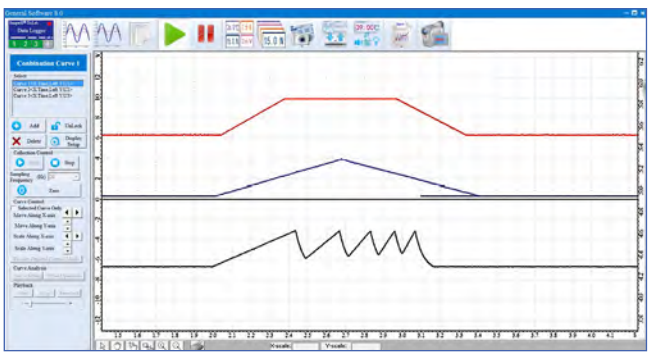
LW-Q820

Smart power supply is the key corollary equipment of 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.

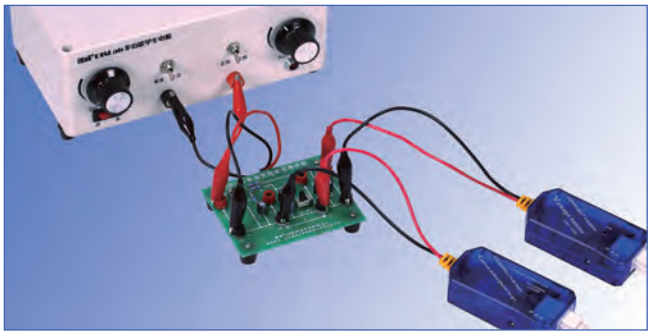


Voltage signals output from Smart Power Supply

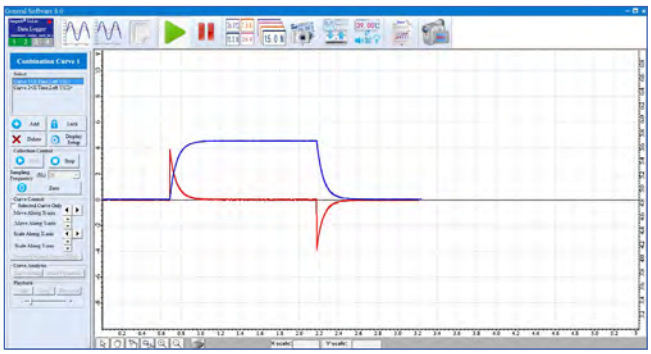
EXB Series Circuit Board V2.0

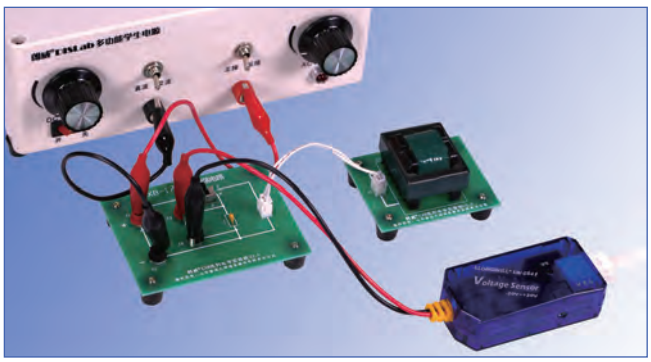
LW-6337

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

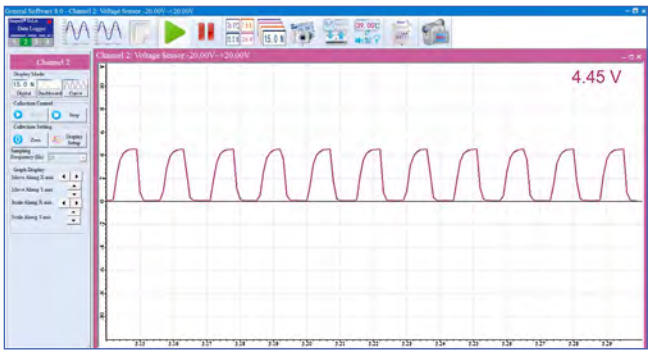


Experiment results of capacitor charge-discharge & series-parallel (below)





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



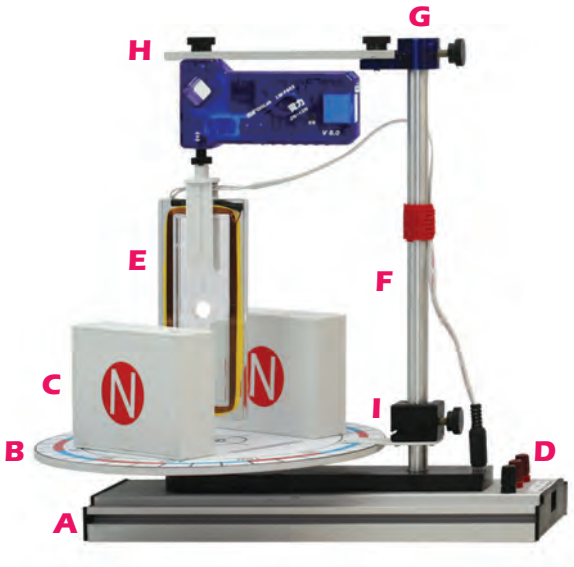
SPECIFICATION

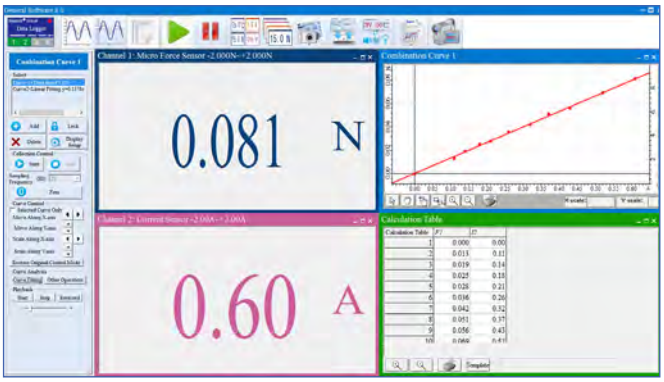
EXB-01 · Half-wave Rectification & Wave Filtering
EXB-02 · Full-wave Rectification & Wave Filtering
EXB-03 · Analysis of Complex Circuit
EXB-04 · RC & RL Phase Shift
EXB-05 · Measurement of EMF and Internal Resistance of the Battery with Voltammetry
EXB-06 · Measure EMF of the Battery with Compensation 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)

Ampere Force Apparatus V2.0

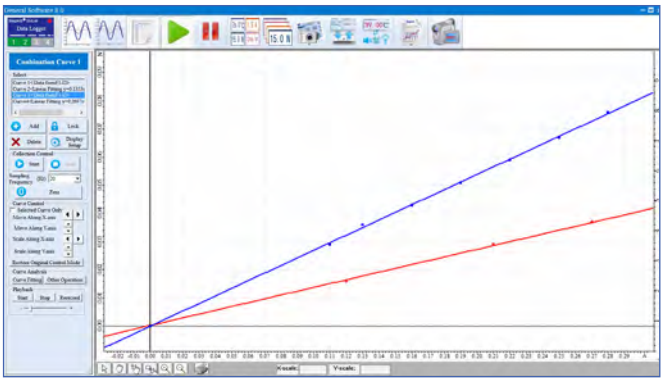
LW-Q735

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:

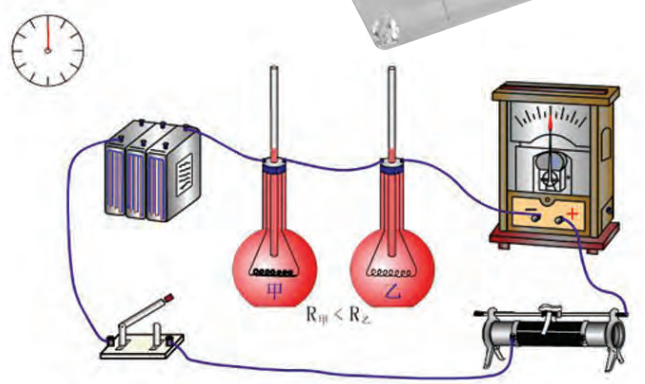
· Measurement of Ampere Force
· The effect of magnetic field on electrical wire
· Study the relationship of Ampere Force F, current flowing through the conductor I,length of conductor L,and magentic field intensity B.

Joule's Law Apparatus

LW-Q726

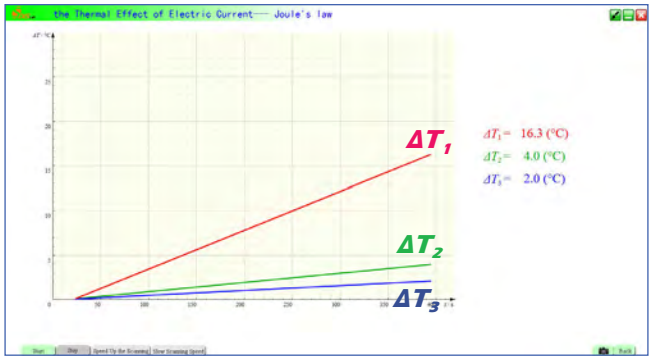
Typical Applications:

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



The classical model to verify Joule's law

Joule' law apparatus



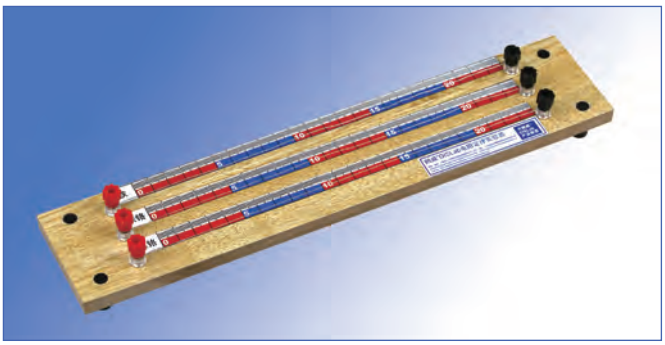
Experiment results of Joule's Law

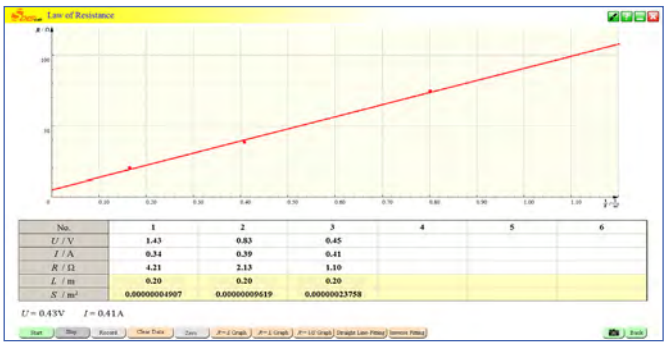
Resistance Law Apparatus

LW-6343

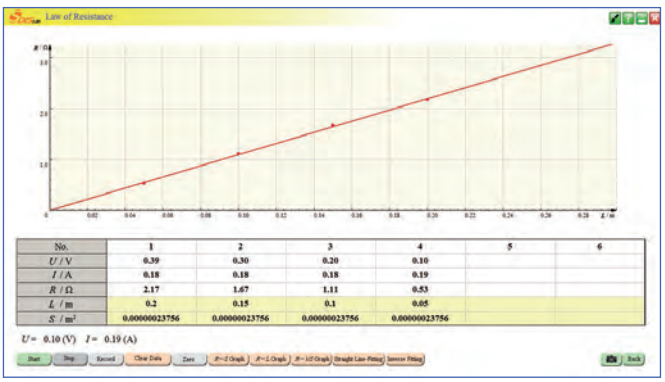
Design Concept:

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.





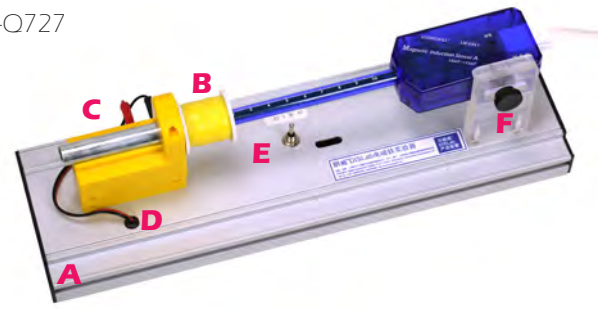
Relationship between resistance of metal wire and the reciprocal of its cross section



Graph of the resistance of a wire to its length

Electromagnet Apparatus

LW-Q727

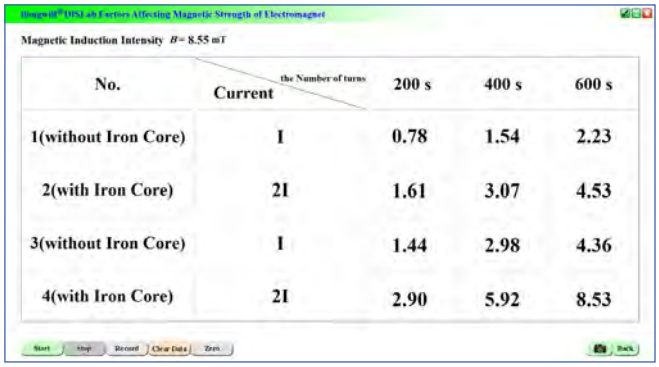


Components:

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.


Magnetic Induction Intensity B= 8.55 mT

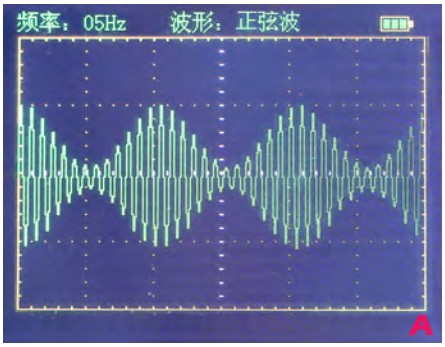
No.	Current \ the Number of turns	200 s	400 s	600 s
1(without Iron Core)	I	0.78	1.54	2.23
2(with Iron Core)	2I	1.61	3.07	4.53
3(without Iron Core)	I	1.44	2.98	4.36
4(with Iron Core)	2I	2.90	5.92	8.53

Experiment result of factors affecting the magnetic induction of a electromagnet

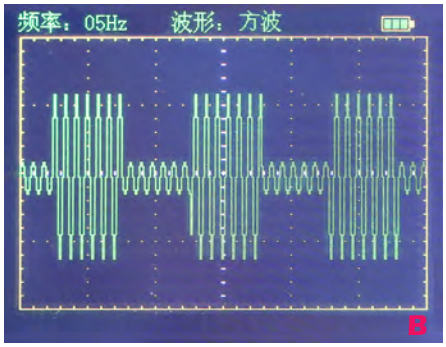
Propogation of Electromagnetic Wave Apparatus

LW-Q745 & LW-Q746

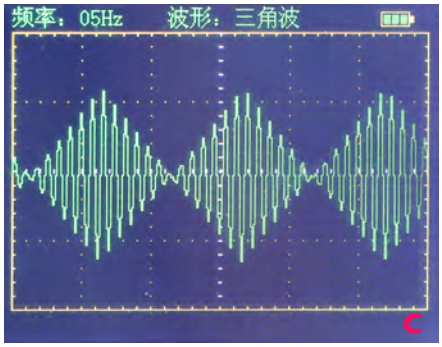
Propagation of electromagnetic wave apparatus consists of electromagnetic waves transmitting module and receiving module. The transmitting module emits the carrier frequency of 800Hz and owns the function of amplitude modulation. The modulation wave has three modes: sine wave, square wave and triangular 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).



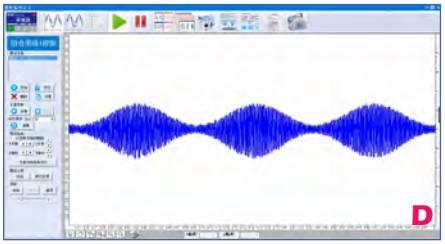
Transmitting module output signal—sine wave



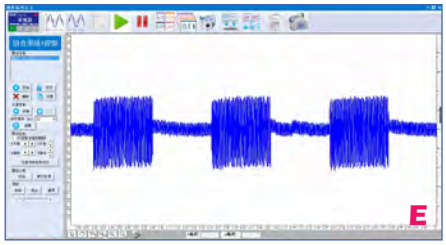
Transmitter output signal—square wave



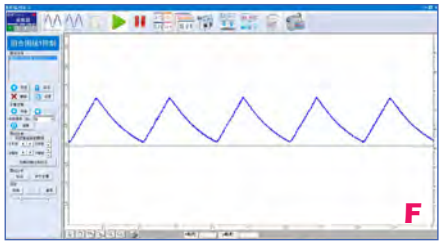
Transmitter output signal—triangular wave



Sine wave before demodulation



Experimental interface of square wave



Triangular wave after demodulation

High-sensitivity Coils

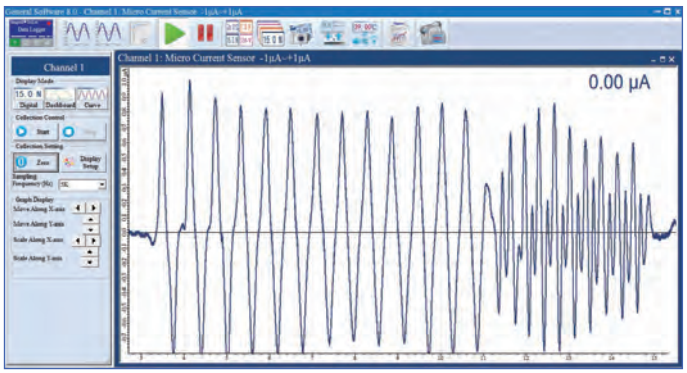
LW-Q813

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.

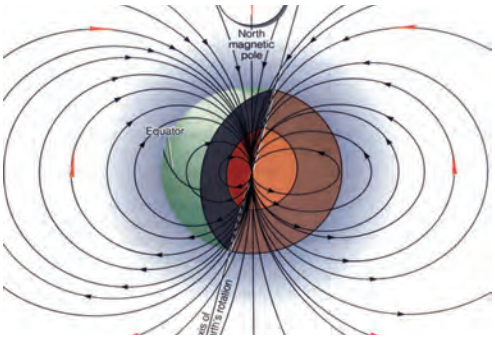
Typical Applications:

· 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

Geomagnetic Field Generator

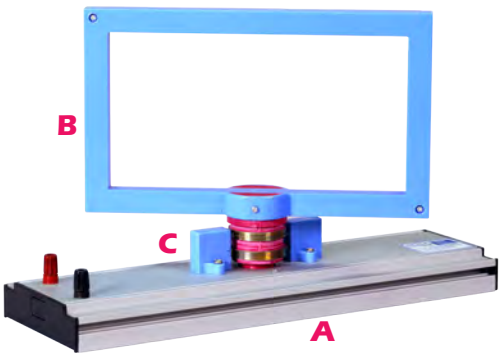
LW-6332

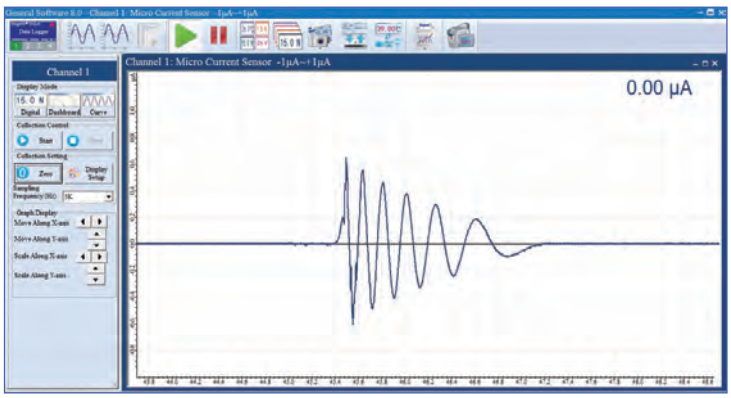
Components:

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

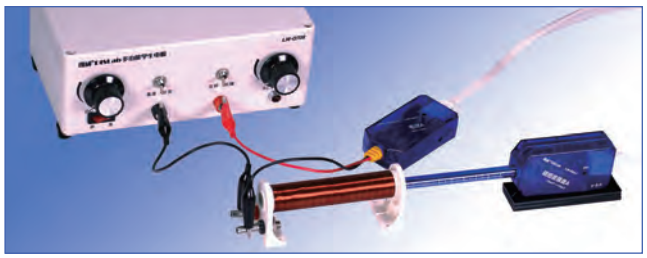
Study the geomagnetic generation

Uniform Magnetic Field Solenoid

LW-5308

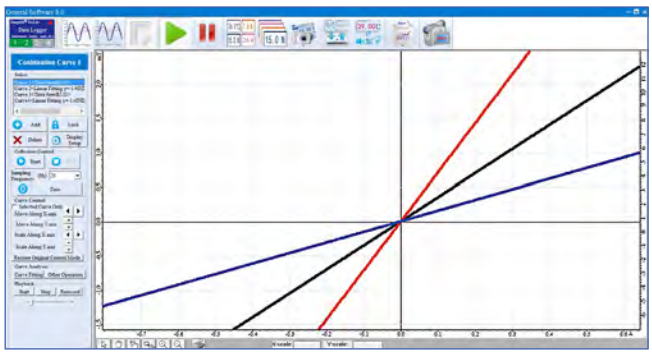
Experiment Example:

Study on the relationship between magnetic induction intensity of electric solenoid and current.



Apparatus: Data logger, general power supply, solenoid, magnetic induction sensor, wires, etc (refer to the image above).

Procedures: Connect the current sensor, solenoid and general power supply in series circuit. Then insert the probe of magnetic induction sensor into the middle of the solenoid; Click "Combination Curves", and add curve "magnetic induction intensity-current"; adjust the output of general power supply to change the current. A curve will be obtained (red); Move the probe outward, until 1 cm of the probe still in solenoid, and repeat the operation; Continue to move the probe outward, until 0.5 cm of the probe still in solenoid, and repeat the operation again, then another two curves will be obtained (blue and black).



Coordination curves of magnetic induction-current

Components:

1. The curve of "magnetic induction intensity and current" is a straight line through the coordinate origin, which indicates that there is a liner relationship between them in the solenoid;
2. The slopes of three curves are different because there are obvious difference of the magnetic induction intensity at different part of the solenoid.

Features:

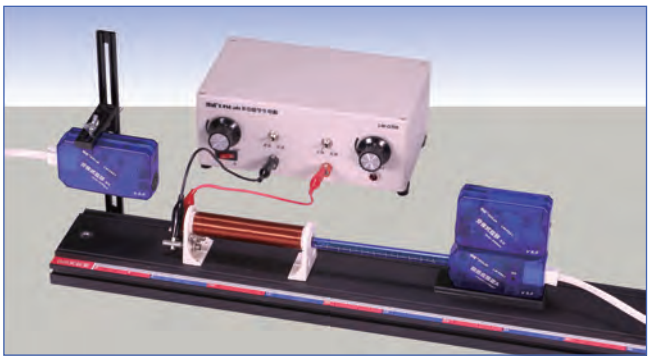
· More thinner and longer than traditional solenoid.
· Well-designed after calculating its diameter and coil turns.
· It can produce a uniform magnetic field, which covers 3/5 length area of the solenoid.

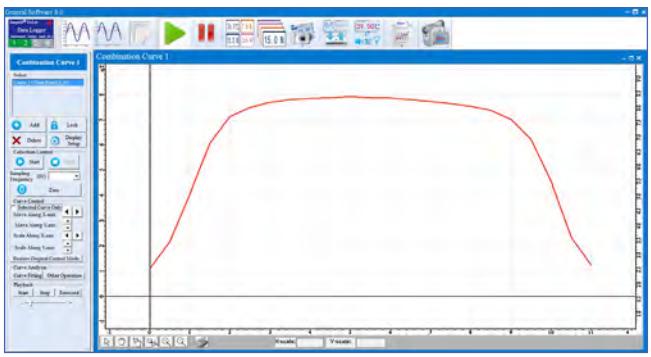
Experiment Extension of Solenoid:

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

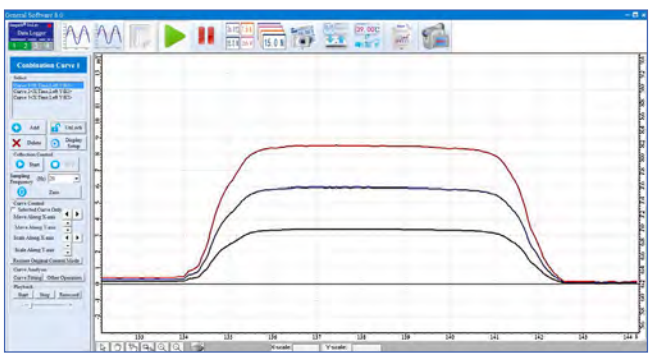
Apparatus: data logger, general power supply, solenoid, magnetic induction sensor, wires, etc (refer to the image below).

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).



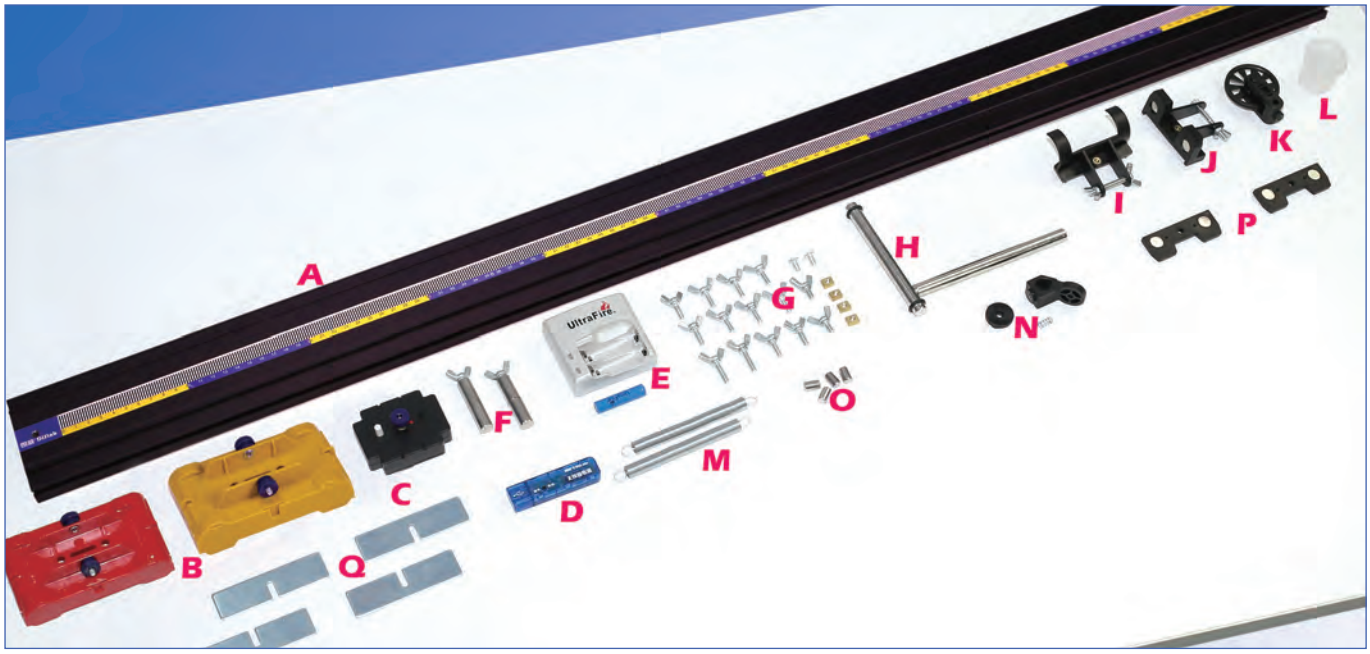
Intelligent Lab Apparatus

NEW TECHNOLOGY FILLS UP GAPS IN EXPERIMENTS AND SOLVES EXPERIMENTAL PROBLEMS

Digital Photoelectric Track System

LW-Q732
Range: 0 ~110cm

Utility Model Patent No.: ZL201220075995.4



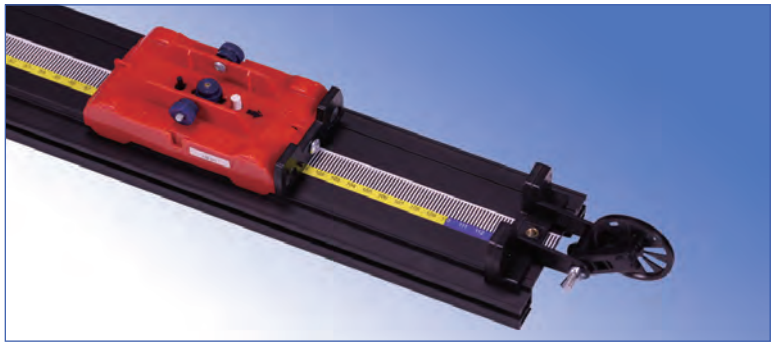
The Digital Photoelectric Track System is composed of 18 kinds of components as below

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.

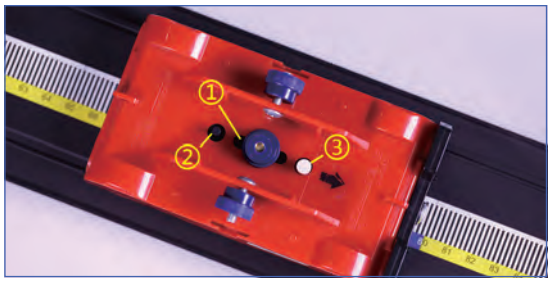
System Composition of Digital Photoelectric Track:

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.

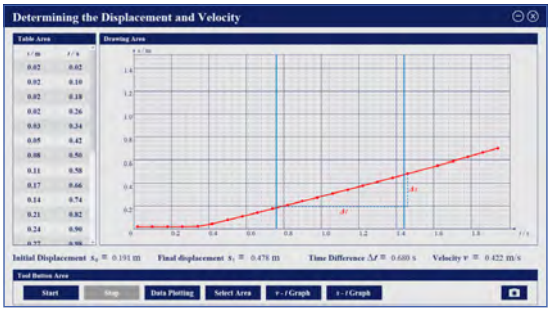


Measure the displacement and velocity by using our digital photoelectric track

Assemble the scanner into the cart



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



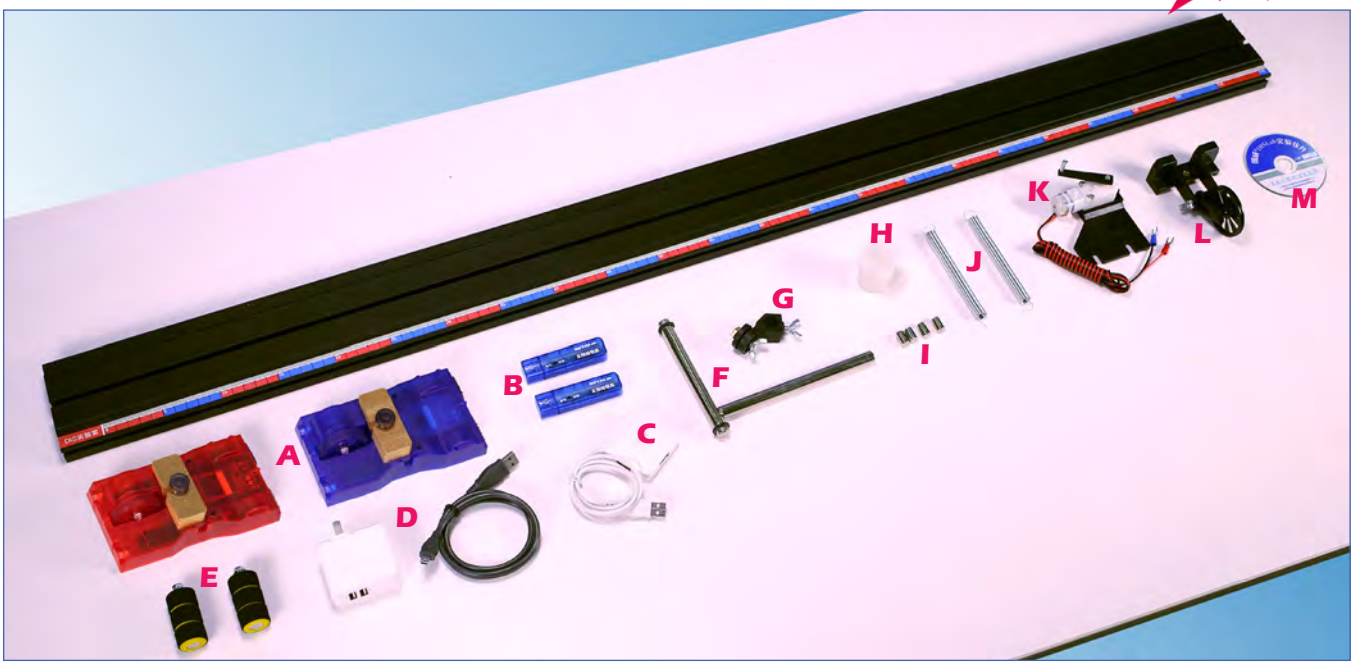
The experiment results of measurring the displacement and velocity by using our digital photoelectric track

Photoelectric Range Finder (π System)

NEW

LW-Q756

Invention Patent No.: ZL201210413579.5



Components:

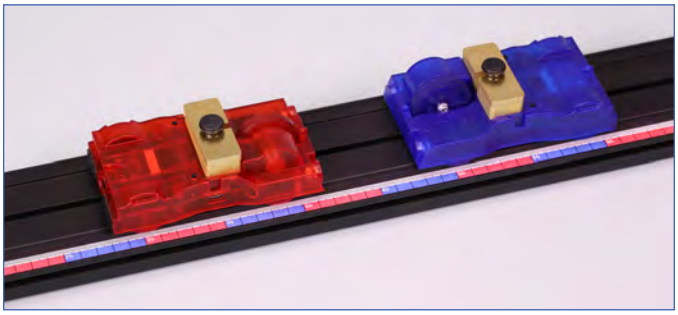
Photoelectric range finder(π System) includes: A. Photoelectric Range Finder device(including 1 red cart, 1 blue cart, 2 lithium batteries, two 100g weights, two 200g weights and two M5×30 plastic cap bolts), B. Wireless Receiver, C. USB Hub, D. Charger, Track Accessories (including E. Bumper, F. T-type 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:

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

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

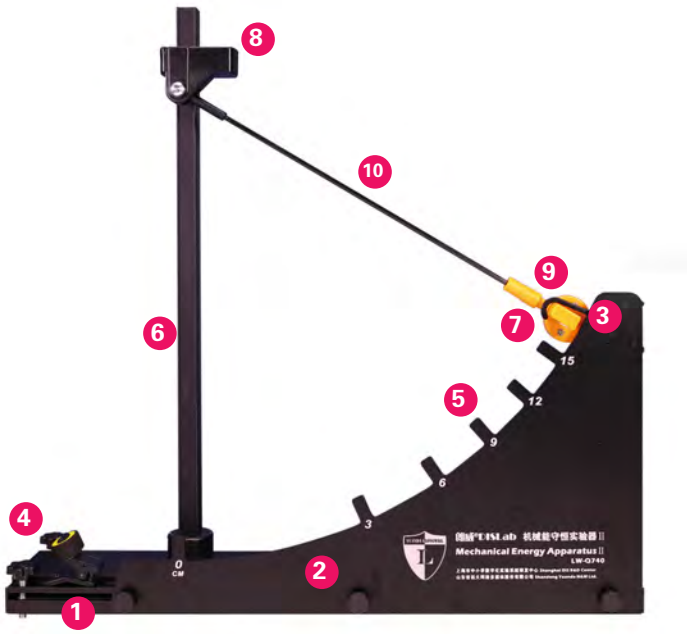
Experiment results of the relationship between the centripetal force *F* and angular velocity *ω*

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

Conservation Law of Mechanical Energy Apparatus Ⅱ

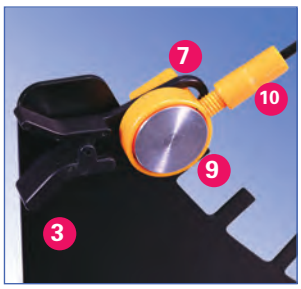
LW-Q740 Invention Patent Application No.:201410233893.4

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



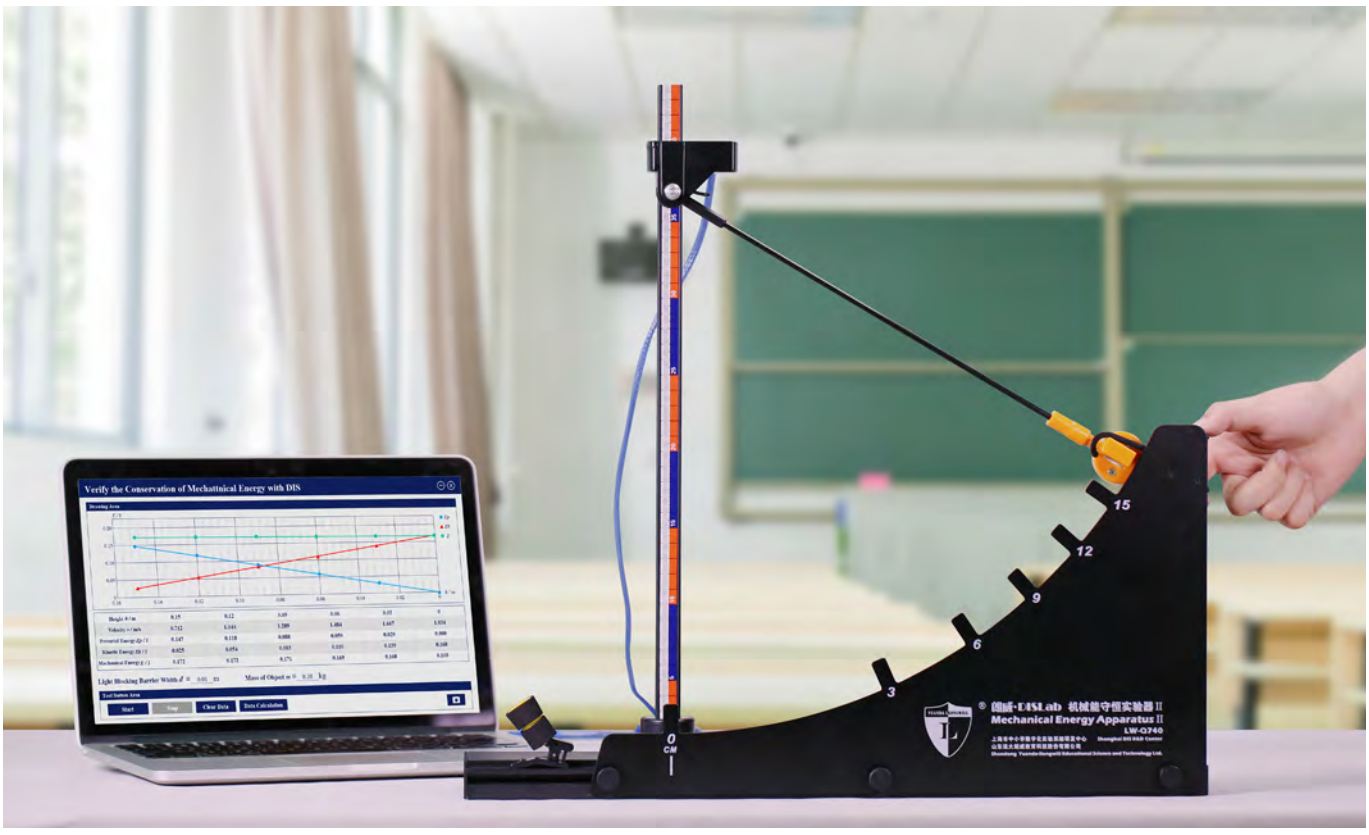
Components:

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.



2-D Projectile Motion Device

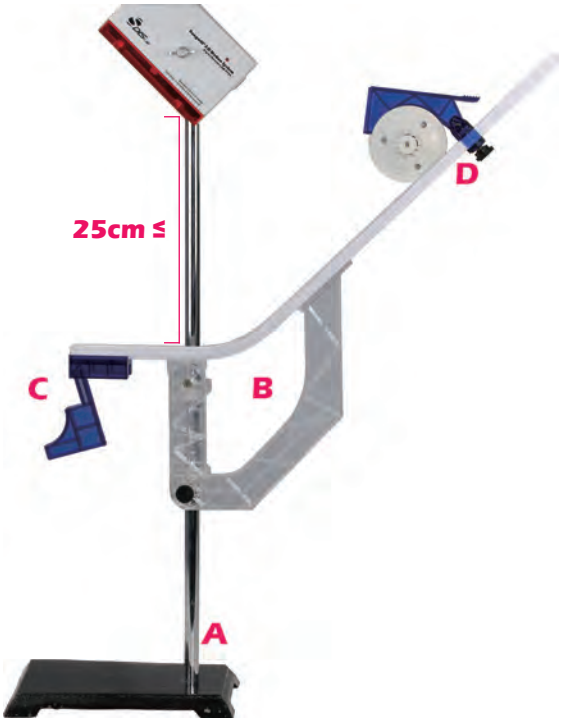
LW-Q701

Assembly:

Mount the 2-D motion receiver onto the stand support (image A), at least 25 cm higher than the fixed point of the projectile track (image C). Adjust the corner cut of the receiver to horizontal level (image B); make sure the receiver in the same plane with the infrared emission port of the emitter, ensuring the signal transmission smooth.

Operation:

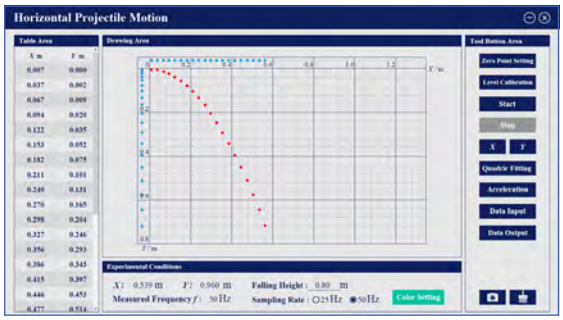
Zero setting is one important step before 2-D projectile motion experiment. Switch on the 2-D motion emitter, as shown in image D; place it at the edge of the projectile track and keep it closed to zero setting unit. Then click program zero setting and clockwise - horizontally move the emitter back about 3~6 cm on the projectile track; click horizontal alignment and complete the zero setting. Operation steps as shown in image E.



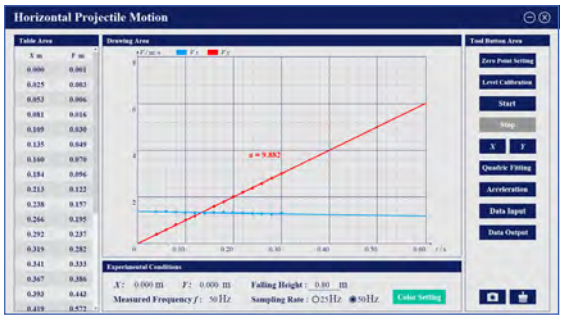
2-D Motion System, which is composed of 2-D Projectile Motion Device and 2-D Motion Sensors, is the representative of lab equipment supporting 2-D motion series.

Components:

A. Stand Support, B. Projectile Track, C. Zero Setting Device, D. Releasing Device.



To describe the track of horizontal projectile motion based on the measured data



Calculate the acceleration in vertical direction of the horizontal projectile motion; compare it with the local gravity acceleration value.

2-D Motion Resolution and Composition Apparatus

LW-Q705

Components:

A. Stand support, B. Horizontal beam, C. Traction motor and switch, D. Horizontal movement slot, E. Limit frame in vertical direction, F. Horizontal bracket of receiver, G. 2-D motion receiver, H. emitter, pulling strings and fasteners, etc.

2-D Simple Pendulum

LW-Q702

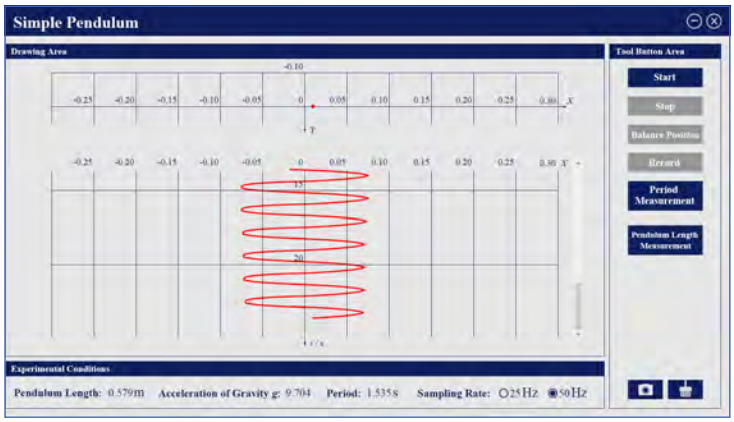
- **Describing the motion trajectory of simple pendulum in 2-D plane.**
- **Used with 2-D Motion Emitter and 2-D Motion Receiver.**

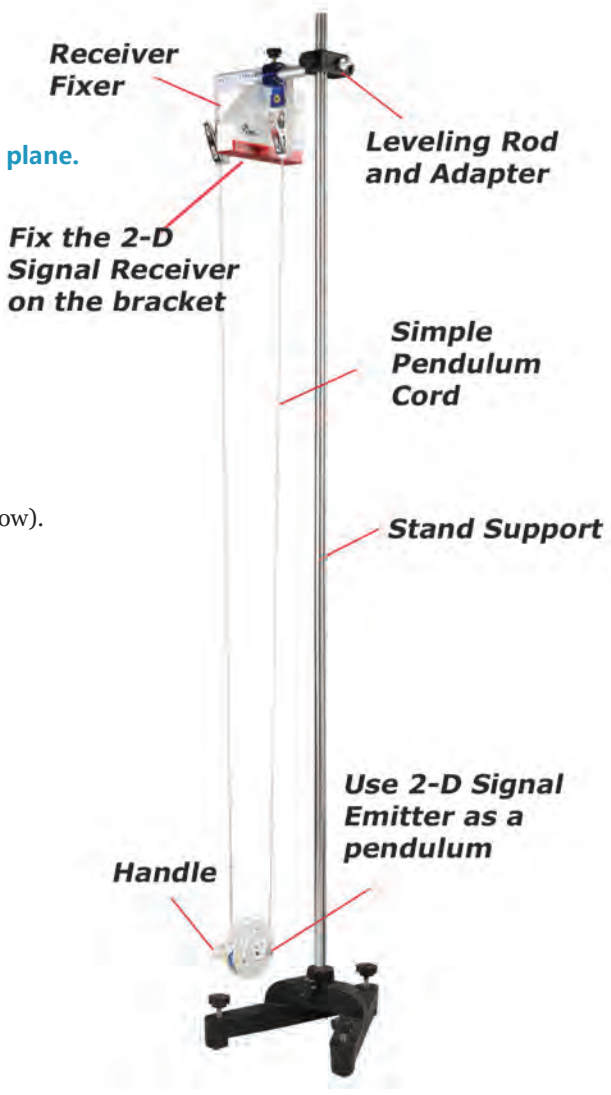
The Background:

The movement of simple pendulum is also a 2-D motion. Its trajectory can be described by the 2-D motion system.

Typical Applications:

· Measure the gravity acceleration by the simple pendulum period.
· Describe the motion trajectory of simple pendulum in 2-D plane (below).

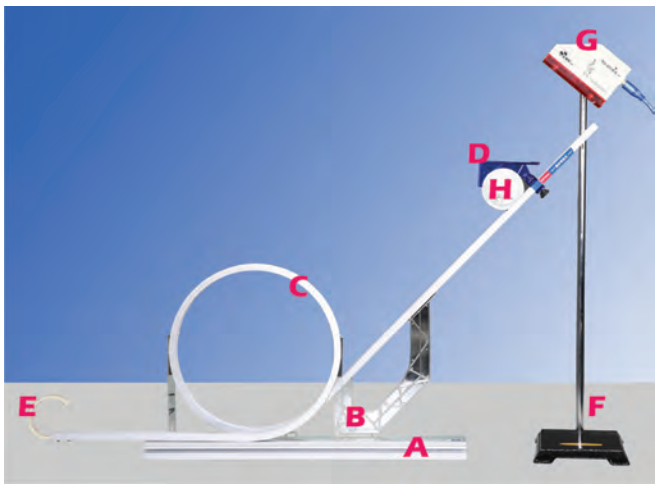




2-D Centrifugal Track

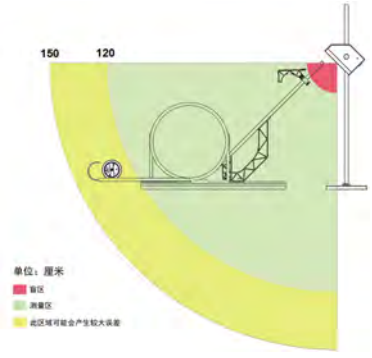
LW-Q704

•To describe the centrifugal motion trajectory.
• Use with stand support, 2-D Motion Receiver and Emitter



Components:

2-D Simple Pendulum System consists of 2-D Simple Pendulum Device and 2-D Motion Sensors. This equipment contains an iron stand A, a crossbar and a cross adapter B, a 2-D motion receiver fixing device C, a single pendulum string D, a 2-D motion transmitter fixing screw E, a releasing rod F, etc. It is used in conjunction with 2-D motion receiver G and transmitter H.

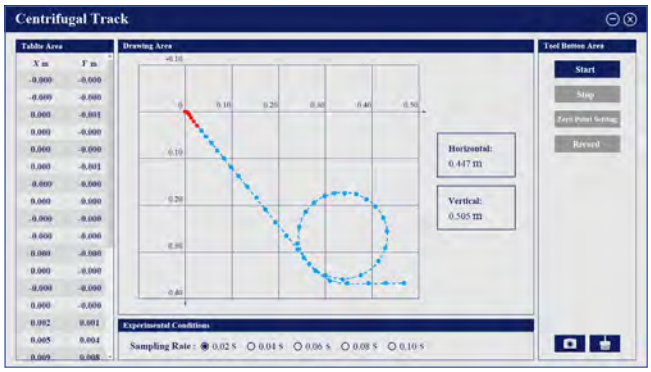


Working principle:

The 2-D Motion System emitter can be used as the moving object to make it move on the centrifugal track, and the trajectory of the object to do the centrifugal motion can be described (figure below). The light green area is the effective receiving area of the 2-D motion system.

Inferences:

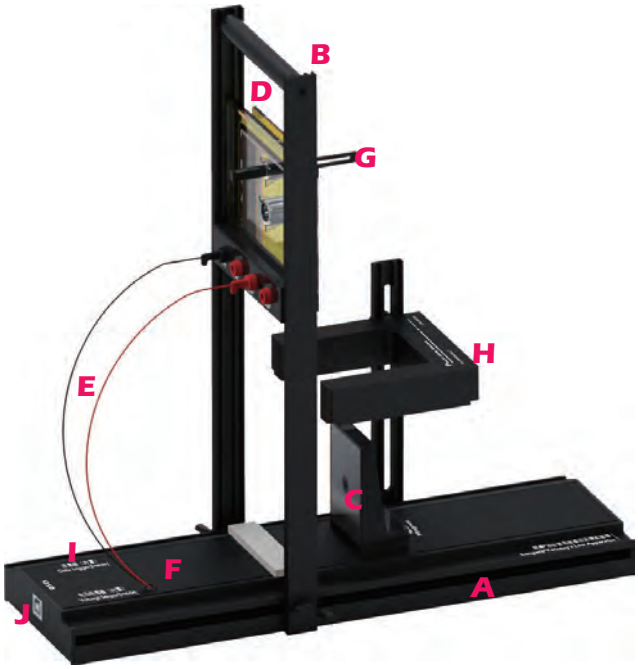
When releasing height H≤2.5R, the emitter can't reach the highest point of track ring.



Faraday's Law Apparatus I

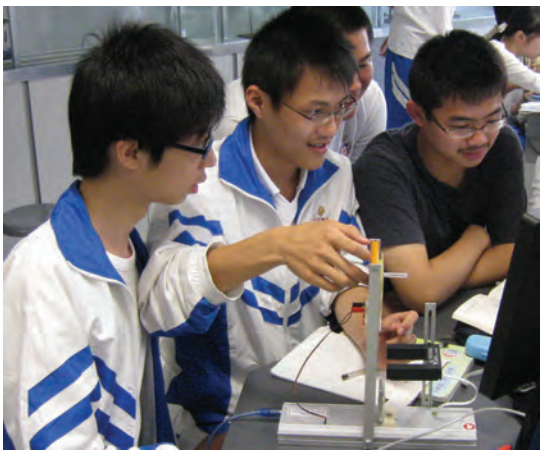
LW-Q812

Utility Model Patent No.: ZL201020569120.0



Components:

A · Base
B · Vertical Track
C · The Horizontal magnet field direction from the rectangular magnet
D · Coils
It can fall down with different heights
E · Thin wire
F · Build-in voltage Sensor
G · Light Blocking Sheet
H · Photo Gate Sensor
I · Data Logger Circuits
J · USB Port

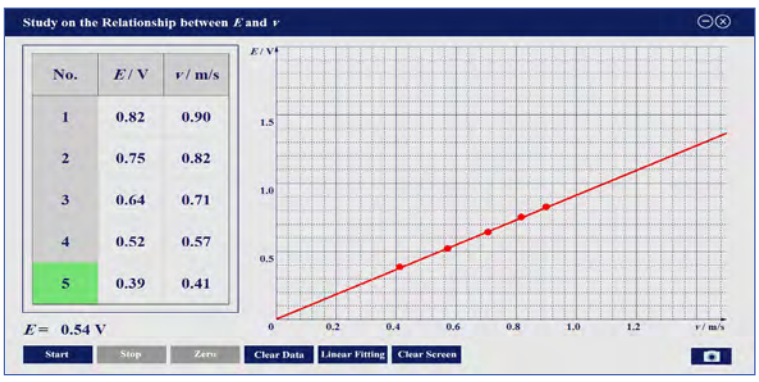


Working Principle:

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:

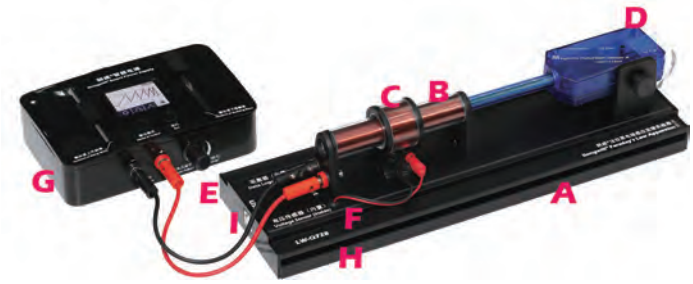
In this experiment, the three curves show the relation of motional electromotive force and the falling speed of conductor of different coil turns (100 turns, 200 turns and 300 turns) respectively. Each curve shows that the motional electromotive force is liner relationship with the falling speed of conductor; 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.



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*.

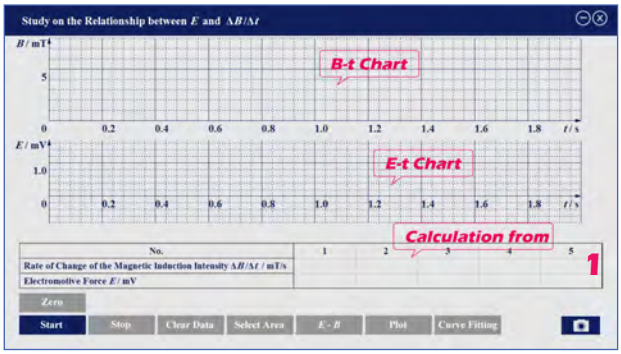
Figure 3 shows the continuously changing *B-t* and *E-t* lines obtained by using the Combined saw tooth wave output modeof smart power supply. Thus, we can obtain a set data of slope *K* of *B-t* line, and the corresponding *E* value.

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

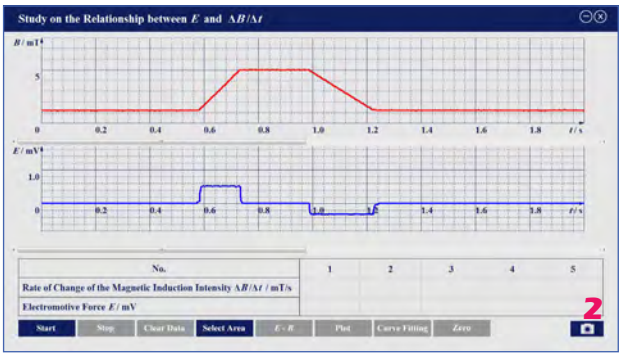
It can be inferred from Figure 4 that $E \propto K$, i.e. $E \propto \Delta B/\Delta t$.

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

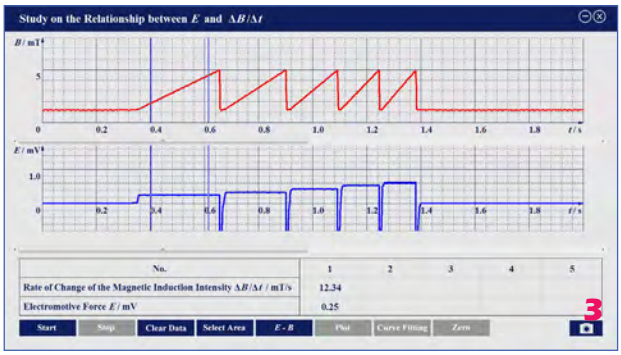
This is the ultimate expression of Faraday's law of electromagnetic induction.



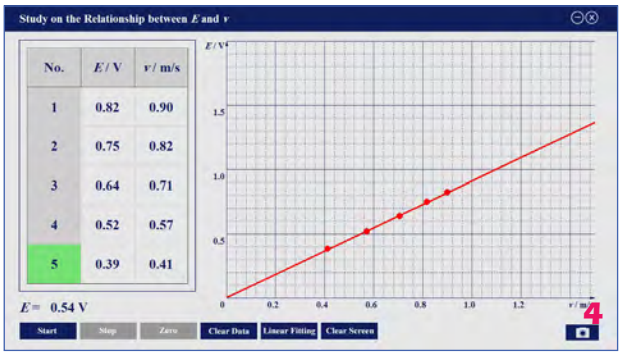
Software interface



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*

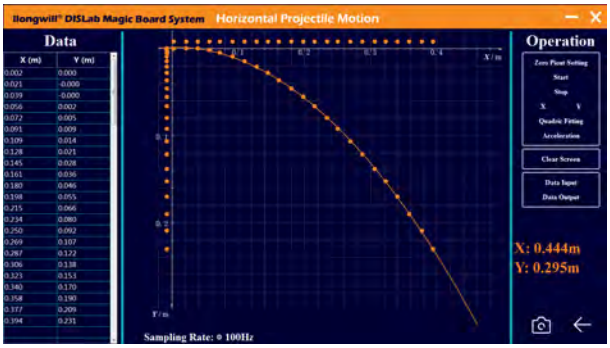
Magic Board System

LW-Q858

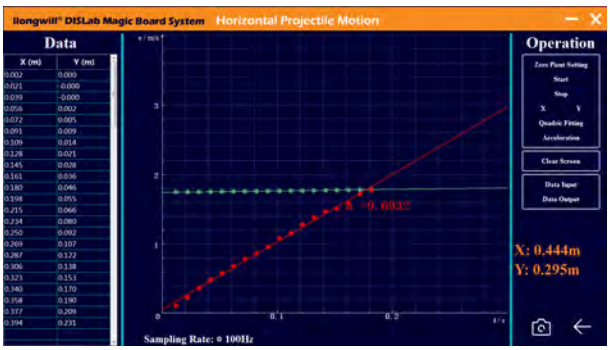
Invention Patent No.: 201610074750.2
Utility Model Patent No.: 201620107722.1

Typical Applications:

By using the 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.

NEW TECHNOLOGY FILLS UP GAPS IN EXPERIMENTS AND SOLVES EXPERIMENTAL PROBLEMS

Teaching Software

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

●Primary school science softeware: “Special + General” integrated software
●secondery 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, our 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 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
●2-D motion special software package—LW-S705
●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
●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

V8.0 Software Package

Loading of V8.0 Software Package:

Put 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 the V8.0 software is generated on the desktop. Click the shortcut icon of V8.0 software, then you would open the initial interface of the software.

Initial interface

Desktop Shortcut

Initial interface of V8.0 software package

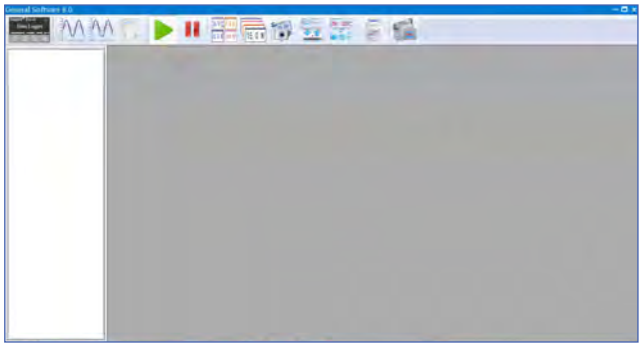
Function Introduction of General Software:

Fully Compatible
The General Software supports all kinds of 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
Becides 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.

LW-S801

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 our 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:

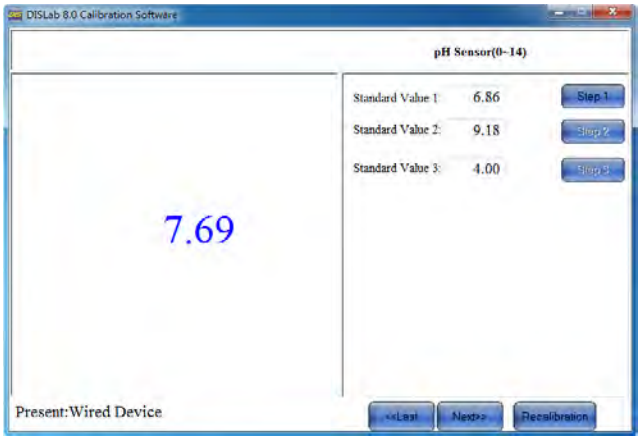
General software can support experiments in biology/ chemistry conducted with all biology/chemistry sensors. However, the distinctiveness of partial experiments in biology/chemistry is considered. Aimed at the requirements of relatively special display, process and records of a part of experiments in 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:

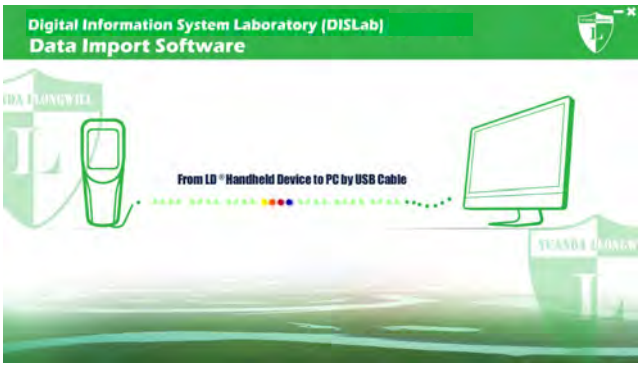
The chemistry sensors & biology sensors are different from physics sensors. The principles of many biology/chemistry sensors are chemical reaction process. Generally speaking, it is electrochemical process. In view of complexity of chemical reaction, calibration software aimed at biology/ chemistry sensors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



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:

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.



Wireless Centripetal Force Apparatus Software:

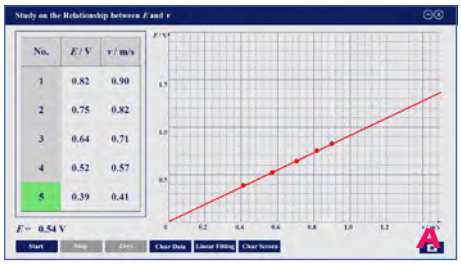
LW-S706

Wireless Centripetal Force Apparatus is a new developed intelligent experimental apparatus, aimed at the expanded requirement of centripetal force experiment (details refer to P83). 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 our 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 our special software. The main interface of the software is as below:

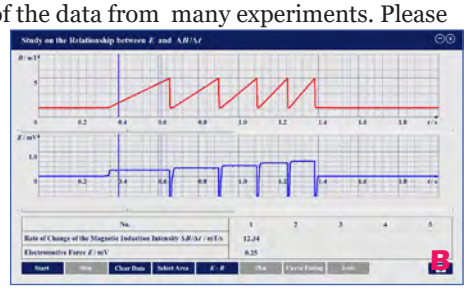
Faraday's Law Apparatus I. II Software:

LW-S707/S708

Faraday's Law apparatus **I** and **II** are intelligent apparatus which communicates with computers directly by USB mode (details refer to P88 & P89), 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**.



Logical Circuits Apparatus V2.0A Software:

LW-S710

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 P99) 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).

Robot Modular V2.0 Software:

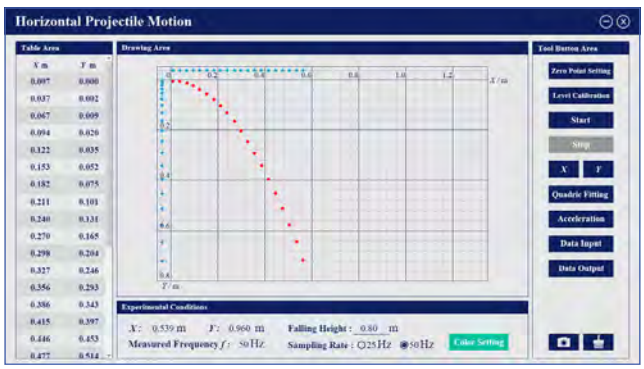
LW-S809

Robot Modular V2.0 is a support apparatus product used for STEM education (details refer to P95). 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.

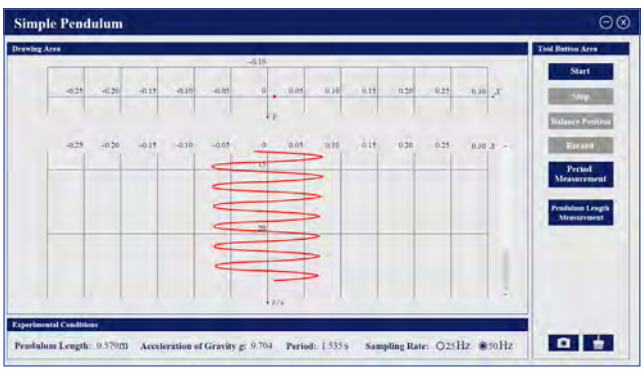
2-D Motion System Special Software Package: LW-S705

2-D Notion System special software package is specially developed for the expended application of 2-D motion sensor system. Since the 2D motion sensor system is an intelligent experimental apparatus which independently communicates with the computer through USB and its special expended application, it is mated with special software. After installing the package, an independent shortcut on the screen is created. In the main interface, supported experiment directories for 2D motion sensor expended applications are listed: projectile motion, composition of motions, uniform circular motion, simple pendulum, damped vibration, robot tracking, centrifugal track and Galileo's experiments.

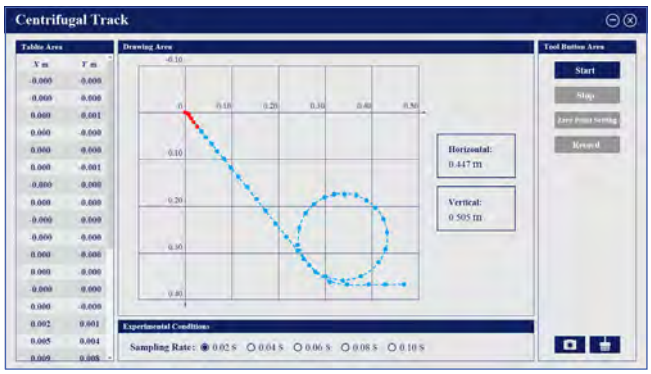
Here below shows the main interface of the software:



Experiment interface of 2-D projectile motion



Experiment interface of 2-D pendulum

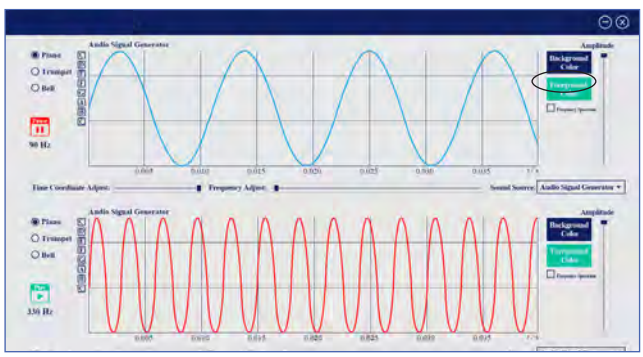


Experiment interface of 2-D Centrifugal Track

Experiment interface of 2-D Motion Composition

Acoustics Software: LW-S702

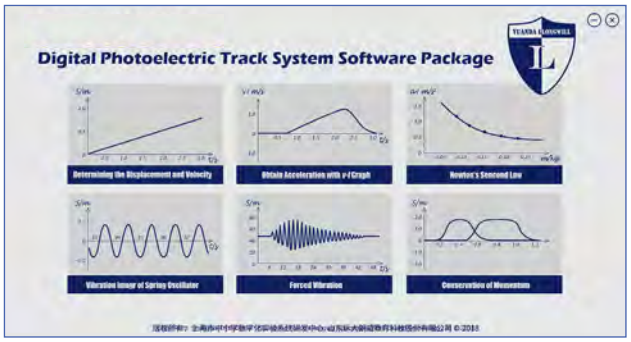
Acoustic Software's built-in audio generator and self-extending sound gallery own the three essential elements—"loudness, tone, timbre", indicating that "the essence of loudness is amplitude" and "the essence of tone is frequency", especially with the powerful "spectrum" function (inside the red circle 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.

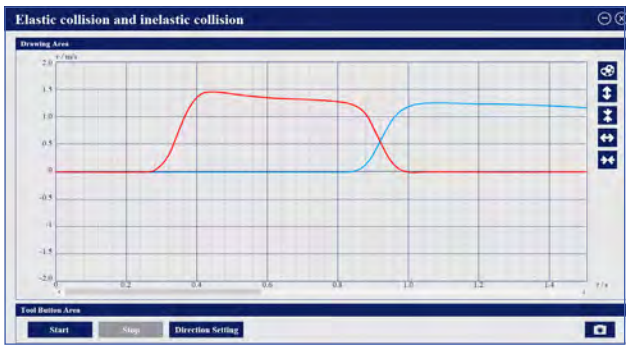


Experiment interface of relation between frequency and tone

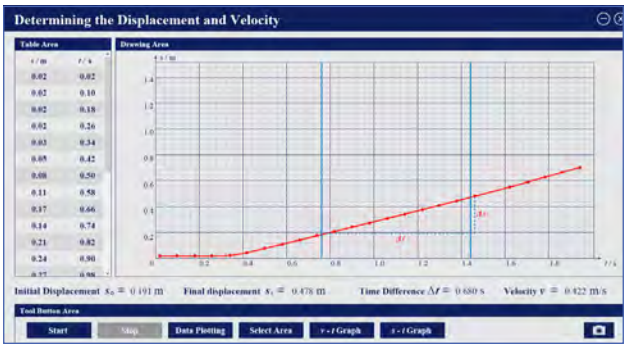
Digital Photoelectric Track System Software Package: LW-S820

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:

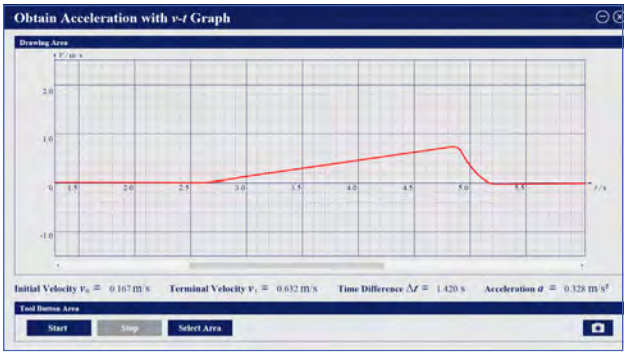




Experiment interface of elastic collision and inelastic collision



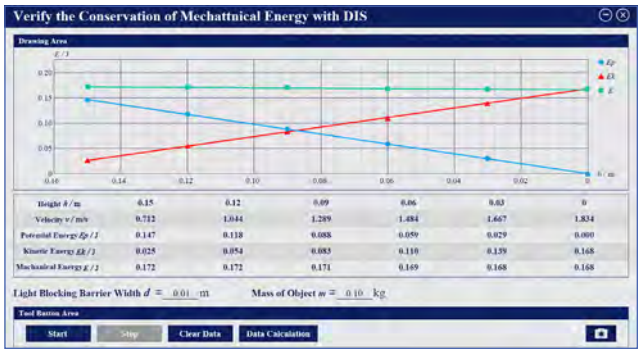
Experiment interface of displacement and velocity measurement



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

Conservation Law of Mechanical Energy Apparatus II Software: LW-S822

Conservation Law of Mechanical Energy ApparatusII is an intelligent experiment apparatus (details refer to P84). Since the experiment apparatus is a special intelligent device which independently communicates with the computer via USB, it is mated with the dedicated software.



Electrostatic Measurement Software: LW-S823

Electrostatic Measurement software is dedicated for the electrostatic sensor and the electrometer (details refer to P22). 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

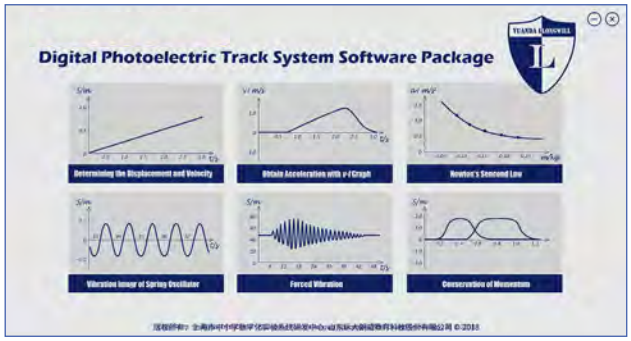
Experiment interface of charged glass rod after rubbing by silk

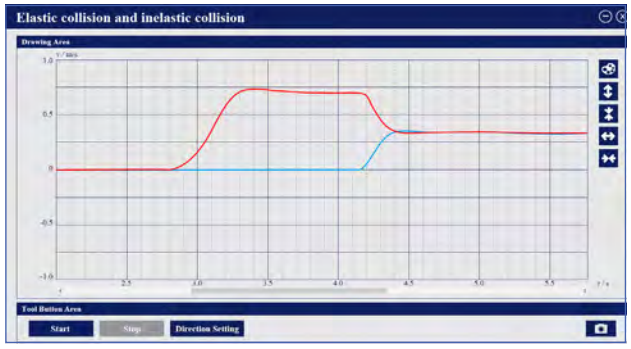
Photoelectric Range Finder System Software Package

LW-S825

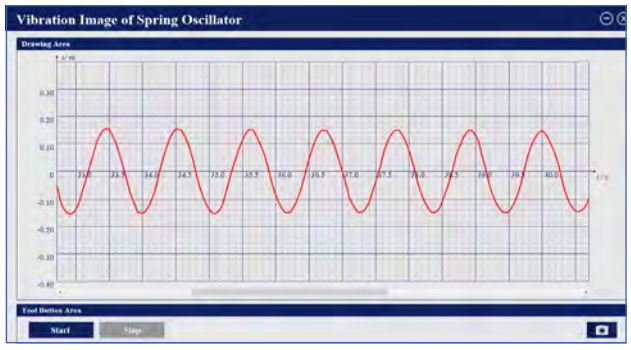
NEW

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

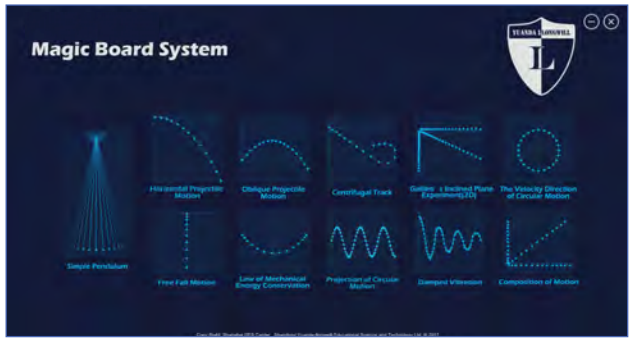
Experiment interface of Newton's second law

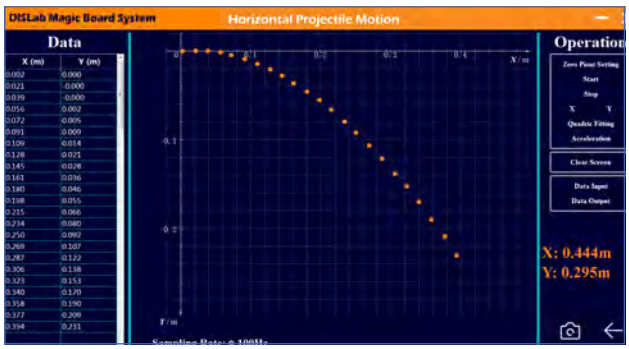
Magic Board System Software Package

LW-S826

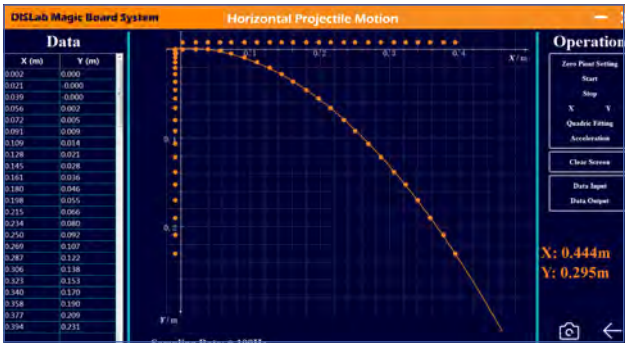
NEW

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:

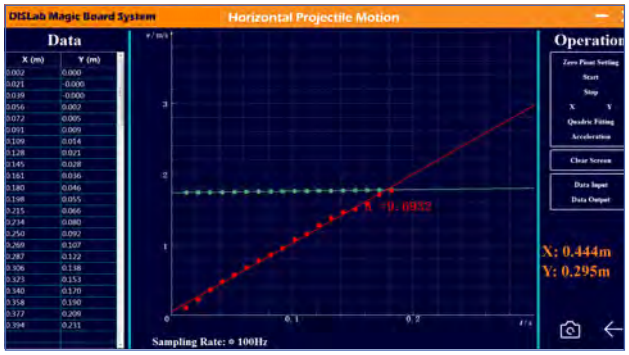




Experiment result of the projectile motion trajectory



Projection and fitting curve of projectile motion trajectory



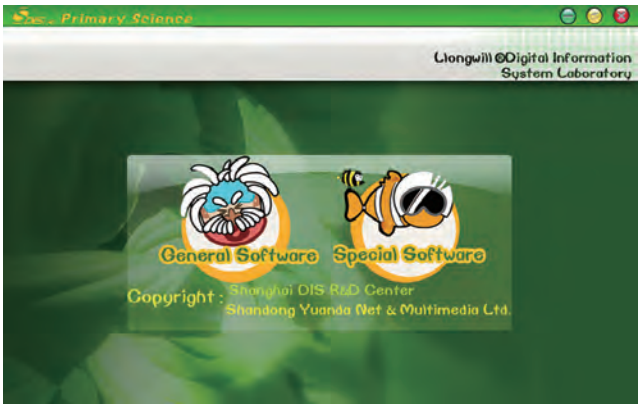
Experiment result of the acceleration in vertical direction of projectile motion

Primary School Science Software

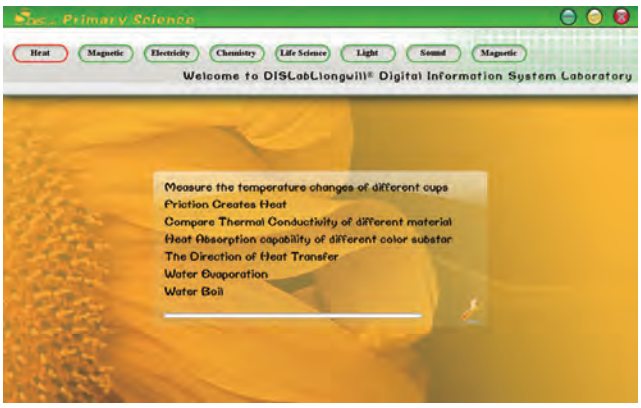
LW-XS801

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.

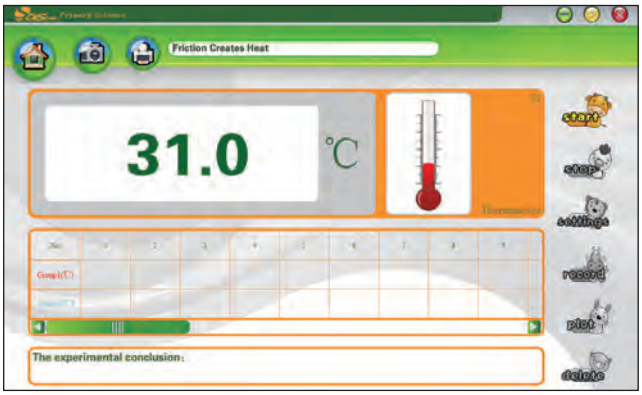
In the design of our primary school science software, the cognitive psychological feature of primary school students is fully considered. The software consists of two systems: special software and generel software. The initial interface, is shown in the image above the whole set of software is developed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



Our 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 learning packages of primary science.(detils refer to P45~P49). Indeed, the categoeis 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 our dedicated 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 discription based on experimental data, can be supported by the software.



Primary school science general software is desinged as the same structure of genenral 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 identifyed, and sensor name and real-time data can be presented.

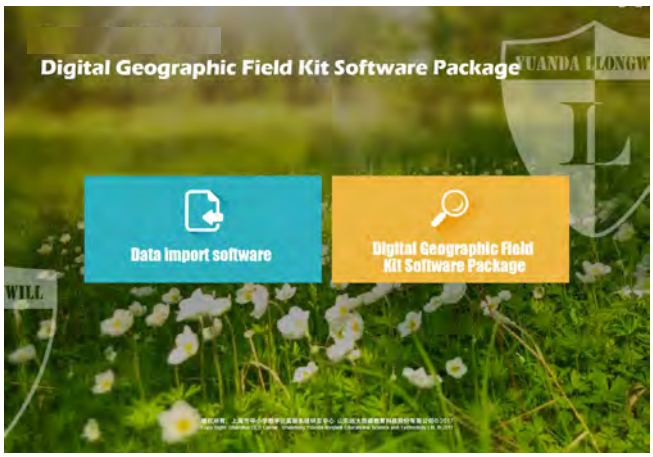
Functions description:

- "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.

Digital Geographic Field Kit Software Package

LW-WS812

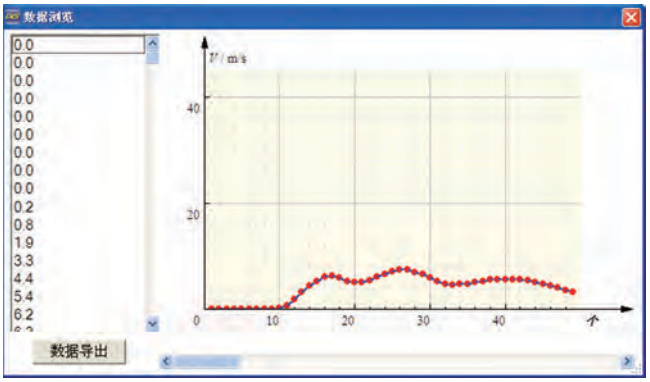
Digital Geographic Field Kit software package is the dedicated analysis software. By clicking the software, the activities of data testing, collection and analysis can be conducted after connecting to hardware. The main interface is shown as below:



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.

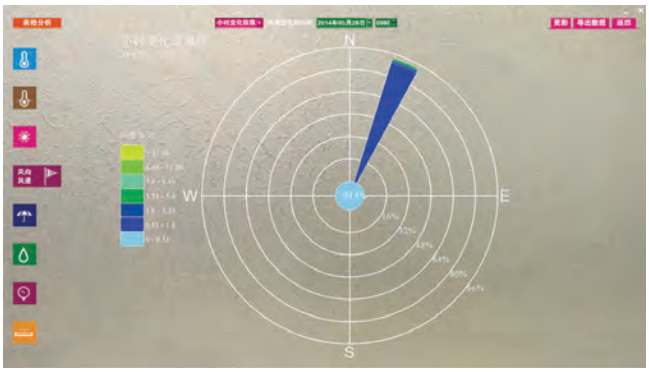


Digital Weather Station Software

LW-WS301

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 stataion 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" .

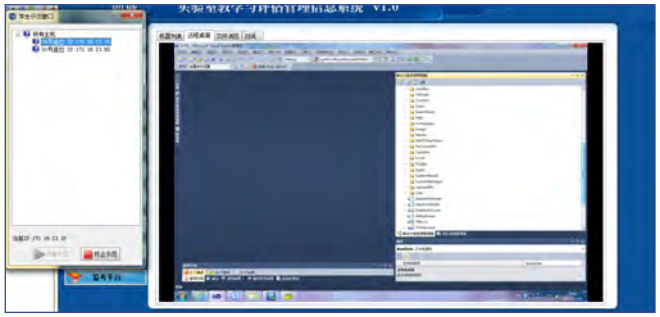
Option setting of data analysis interface: time curve option—click pull-down menu to check variation curves by hours, days, months and years; add new curve—set start time in option setting, then click "add new curve". Click "export data" to export the historical data stored in database as Excel document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

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 belo



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

Teacher Information Management System

LW-WS832

The Educational Equipment Information Management System has realizes 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.

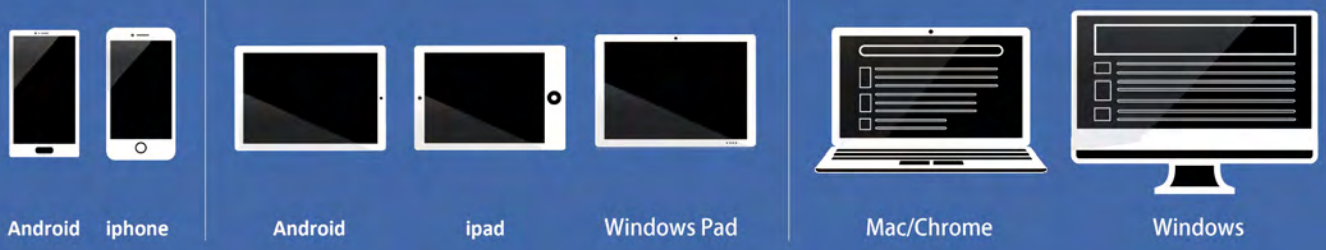
The system also provides various management functions for school's basic information, teaching space, buildings, school buses and equipment personnel:

Dynamic Statistics

Mobile Science Exploration System for Primary School

Multi-platform compatibility

Support multi-system and cross-platform application



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

NEW

Mobile Science Exploration System for Primary School

I. System Overview

Mobile Science Exploration System for Primary School consists of sensors, data display module, wireless transmitter, mobile terminals and App software.

(i) Sensors

NEW

A part of sensors are shown in Fig. 1-1.

Fig. 1-1 Part of sensors

Item NO.	Sensors Descriptions	Measurement Range
1	Force Sensor	Range: -20N~+20N
2	Displacement Sensor (Separated)	Ranges: 0 cm~200cm
3	Photo Gate Sensor	Graduation: 0.1ms
4	Temperature Sensor	Ranges: -20~+130℃
5	High Temperature Sensor	Ranges: 0℃~1200℃
6	IR Temperature Sensor	Ranges: -20℃~+200℃
7	Pressure Sensor	Ranges: 0Kpa~300 KPa
8	Sound Sensor	Ranges: 20 Hz ~20000Hz
9	Sound Level Sensor	Ranges: 20 dB~120 dB

Item NO.	Sensors Descriptions	Measurement Range
10	Illumination Sensor	Ranges: 0 Lux ~10000 Lux
11	Current Sensor	Ranges: -2A~+2A
12	Current Sensor (Multi-range)	Three measurement ranges available for switching A: -2A~+2A; B: -200 mA~+200 mA; C: -20 mA~+20 mA
13	Micro Current Sensor	Ranges: -1μA~+1μA
14	Voltage Sensor	Ranges: -20Volt~+20Volt
15	Voltage Sensor (Multi-range)	Three measurement ranges available for switching A: -20 Volt ~+20 Volt; B: -2 Volt ~+2 Volt; C: -0.2 Volt ~+0.2 Volt
16	Magnetic Induction Sensor	Ranges: -15 mTesla~+15 mTesla
17	pH Sensor	Ranges: 0~14
18	Conductivity Sensor	Ranges: 0 mSiemen/cm ~20 mSiemens/ cm
19	Chroma Sensor	Ranges: Absorbance 0~2
20	Turbidity Sensor	Ranges: 0 NTU~400 NTU
21	Oxygen Sensor	Ranges: 0~100%
22	Carbon Dioxide Sensor	Ranges: 0ppm~50000ppm
23	Relative Humidity Sensor	Ranges: 0~100%
24	Oxygen Sensor (Dissolved)	Ranges: 0mg/L~20mg/L
25	Heart Rate Sensor	Ranges: 0~200

Table 1 Sensor Specification

The quantity of the sensors is being expanded according to the teaching requirements.

(ii) Data Display Module

The data display module (Fig. 1-2) is a key device that can be plugged into sensors directly as a mini data logger. As well as, it can identify the type of sensor, display and record the real-time data of sensor automatically. We can upload the sensor data to the mobile terminal for further analysis.

Fig. 1-2 Data display module

(iii) Wireless Transmitter Module

The wireless transmitter module (Fig. 1-3) also can be plugged into sensors directly so as to establish the communication between the sensor and the mobile terminal by Bluetooth.

(iv) Mobile Terminals

The system can be run on all kinds of mobile terminals, such as Android /iOS Pad, Phone and Chromebook, as shown in Fig. 1-4.

Fig. 1-3 Wireless transmitter module

Fig. 1-4 Mobile terminal

(v) App Software

System	The Version being supported	Unloading paths
Android	Android 4.4 & above	ANDROID APP ON Google play
iOS	iOS 8.0 & above	Available on the App Store
Chrome OS	Chrome OS 37& above	available in the chrome web store

1. Android Version

For Android App, it can be searched in Google Play using the keywords of "LD LAB Primary", as shown in Fig. 1-5. Click "INSTALL" button, the App software can be installed on the mobile terminal.

2. iOS Version

For iOS App, it can be searched in the Apple App Store using the keywords of "LD LAB Primary", as shown in Fig. 1-6. Click "INSTALL" button, the App software can be installed on the mobile terminal.

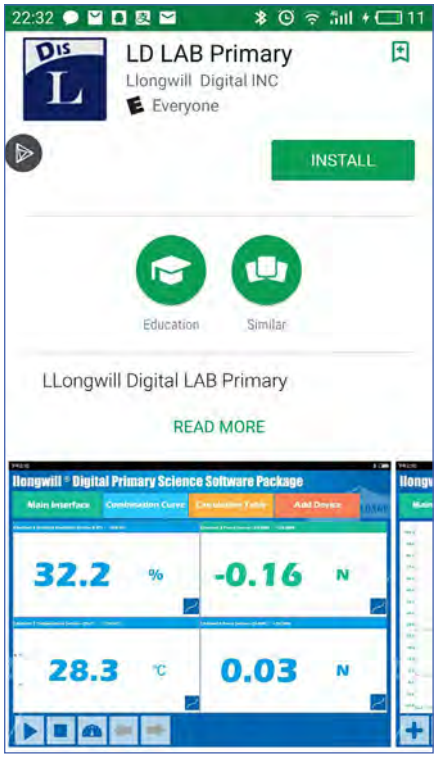


Fig. 1-5 Installation of App software based on Android

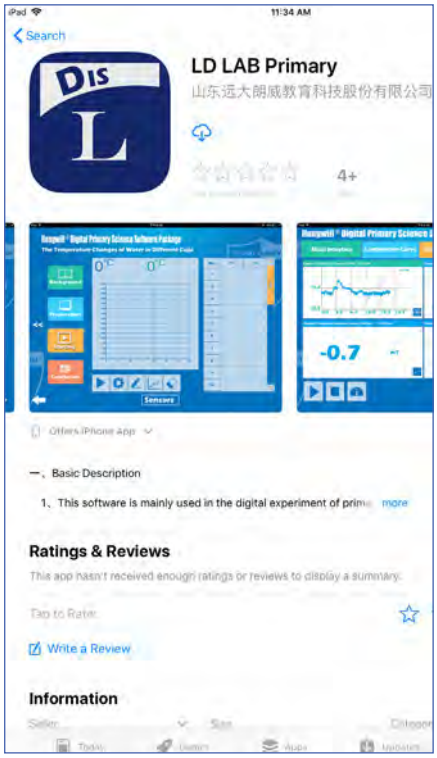


Fig. 1-6 Installation of App software based on iOS

3. Chrome OS Version

For Chrome App, it can be searched in the Chrome Web Store using the keywords of "LD Chrome LAB", as shown in Fig. 1-7. Click "ADD TO CHROME" button, the App software can be installed on the mobile terminal.

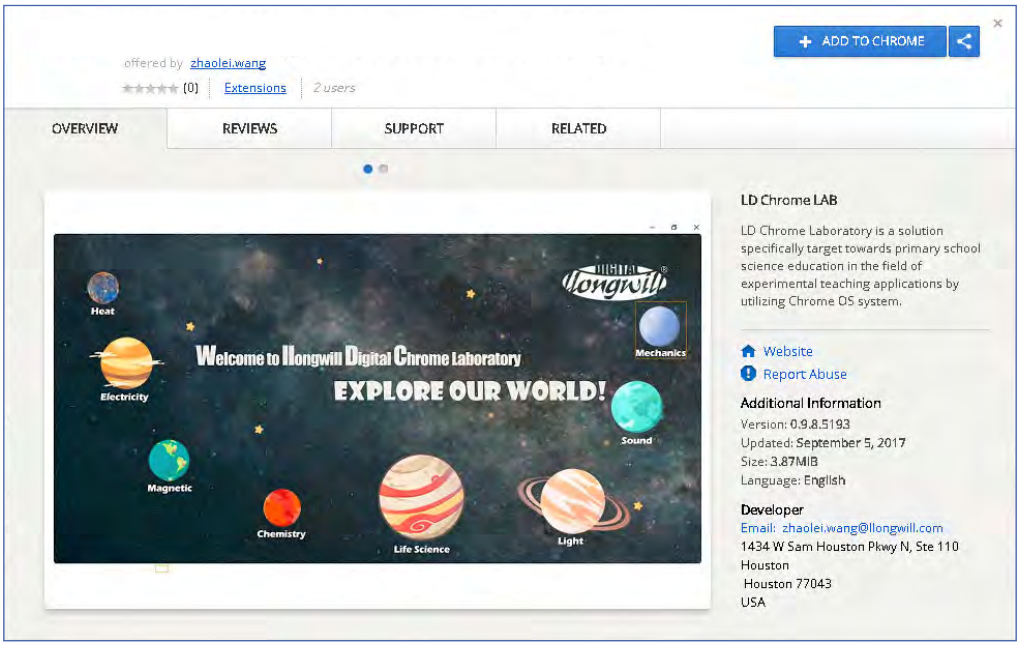


Fig. 1-7 Installation of App software based on Chrome OS

II. Application

We have two modes of application: one is DDM, which means "Sensor" + "Data Display Module"; and the other is WMT, which means "Sensor" + "Wireless Transmitter Module"+"Mobile Terminal".

(i) The Use of Digital Display Mode--DDM

When we just only need data collecting and recording in the science experiment or inquiry, we can select the DDM, and get rid of the burden of PC.

1. Data Measuring

Plug the data display module into the sensor (Fig. 2-1) and switch on it; the type of sensor, the real-time data, and the measurement unit can be observed on the module screen (Fig.2-2). All sensor data can be stored in the module after we switch on it.

Fig. 2-1 Connecting the data display module with the sensors

Fig. 2-2 The display mode

2. Data Upload

The data stored in the module can be uploaded to the mobile terminal by the data upload software.

(1) Open the App software on the mobile terminal and enter “Data Upload”(Fig.2-3), click the button of " " to enter the scanning interface and scan the QR code on the back of the module, as shown in Fig.2-4.

(2) After scanning, the module data can be uploaded automatically, as shown in Fig. 2-5.

(3) After uploading, data can be shown in table and displayed as curve (Fig.2-6).

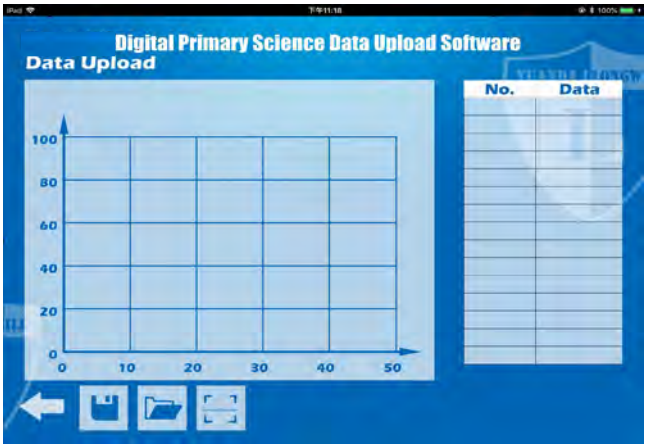


Fig. 2-3 Data upload main interface

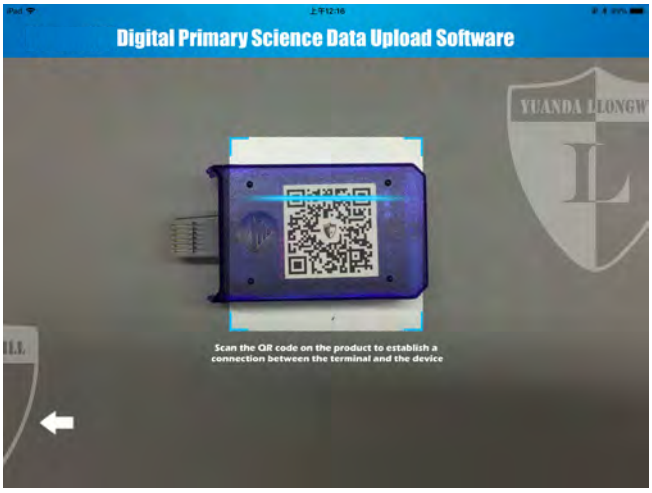


Fig. 2-4 Scanning QR code

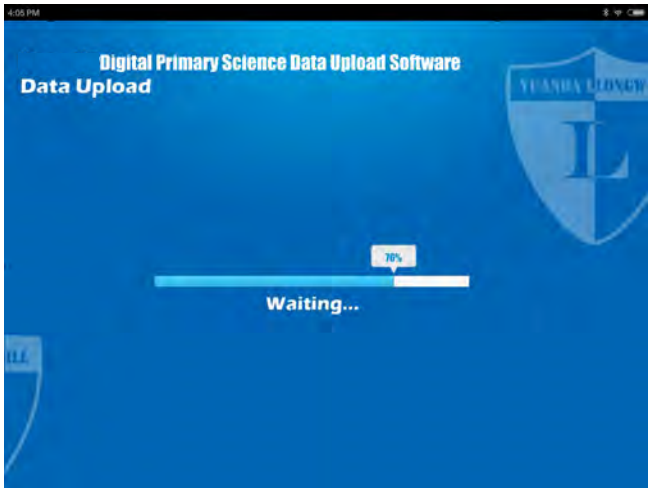


Fig. 2-5 Data uploading

3. Open the Date

Push the button of " " on the interface of Fig.2-6, open the file list(Fig.2-7), click the file name, the data can be shown as Fig. 2-6.

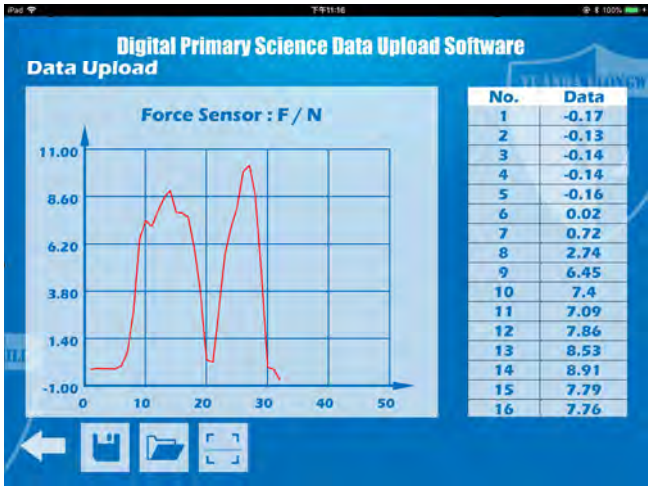


Fig. 2-6 Data Upload Main Interface

Fig. 2-7 File list

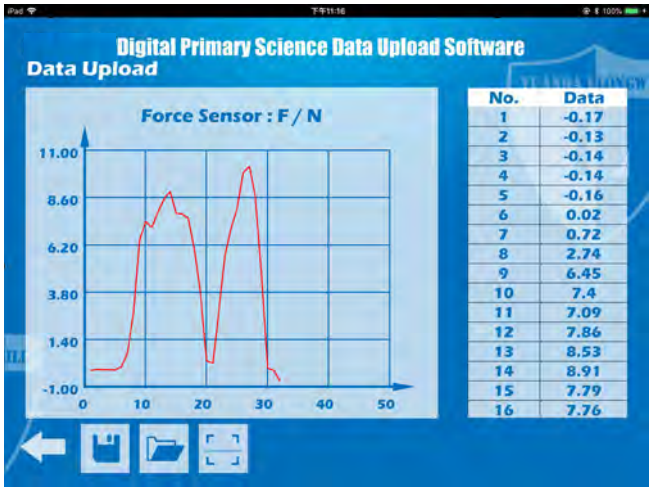


Fig. 2-6 Data Upload Main Interface

Fig. 2-7 File list

(ii) The Use of Terminal Mode---WMT

1. The Application on the Android/iOS terminal

There are three kinds of software in Android/iOS App: General Software, Special Software, and Data Upload Software(Fig. 2-8).

(1) General Software

• The general software has a "one-to-many" function, which supports up to four sensors (same kind or different kinds), and sensor's data logging, recording, calculating and graph analysis.

• Add Sensor

In general software main interface as shown in Fig. 2-9, click the"Add Sensor" to enter the interface as shown in Fig. 2-10.

Plug the wireless transmitter into the sensor and switch on it. Scan the QR code on the back of the wireless transmitter (Fig. 2-11). The App will give a prompt automatically after scanning successfully (Fig. 2-12). Repeat the above steps, more sensors can be added. Push the button of "NO" , the App will return to the main interface of general software(Fig. 2-9).

Fig. 2-8 the App software on Android/iOS

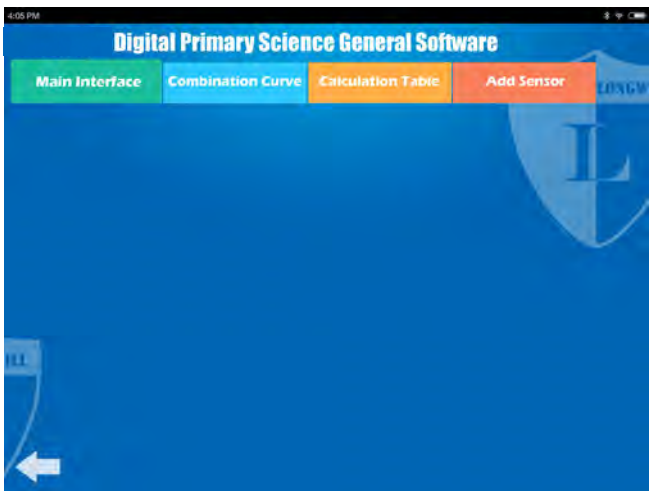


Fig. 2-9 General software main interface

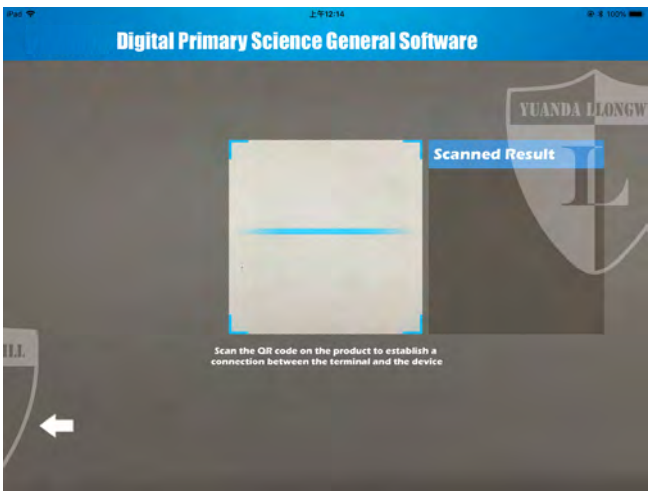


Fig. 2-10:Scan QR Code

Fig. 2-11 Scaning

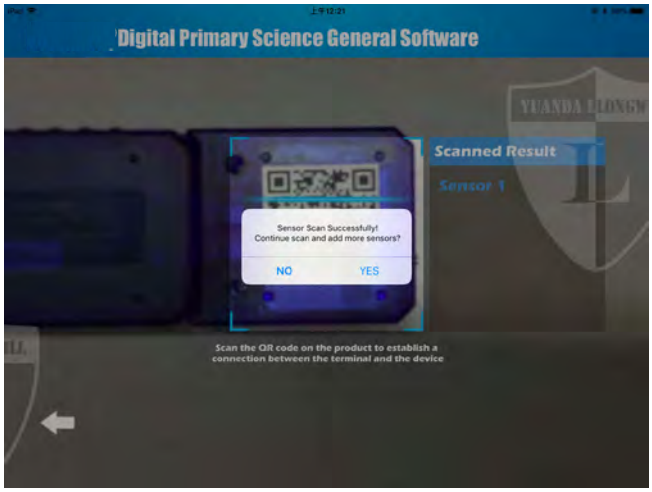


Fig. 2-12 Scan successfully

• *General Software Main Interface*

The main interface of General Software can support up to four sensors data parallel display. Each sensor owns a data windows, which show the sensor' type, measurement range and series number in the title bar. If there are more than one data windows, the title bar, number and unit of the selected windows will change to green, while the others keep blue (Fig. 2-13).

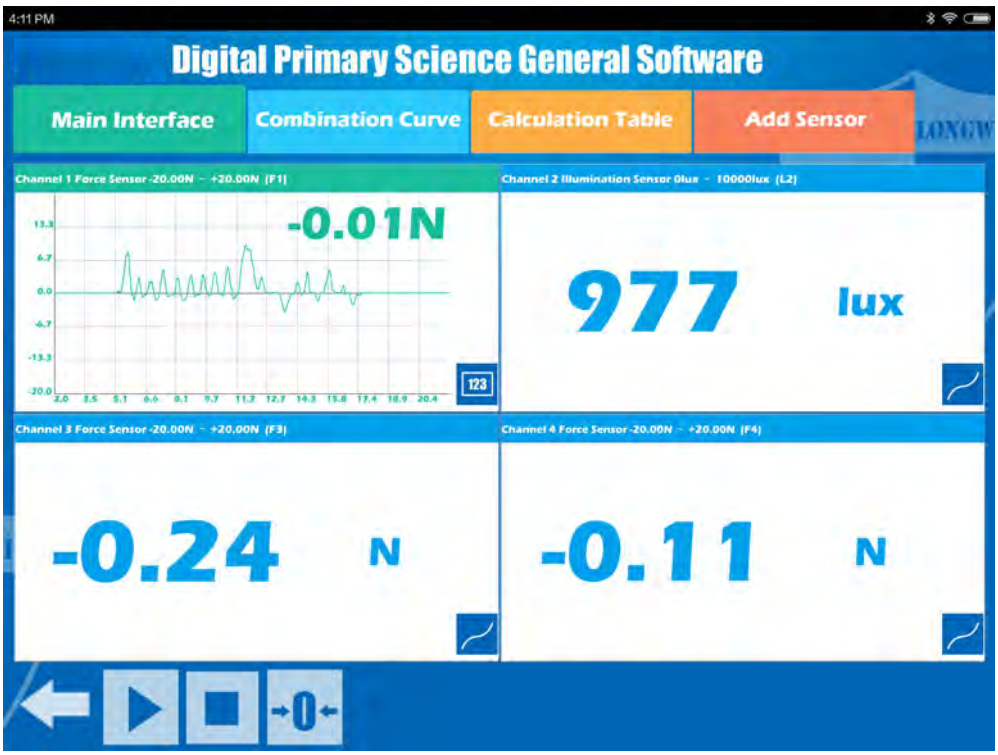


Fig. 2-13 General software main interface

Icon interpretation

——Switch the display mode to curve

——Start the data record

——Switch the display mode to digit

—— Stop the data record

——Sensor zero adjustment (Attention: Only part of the sensor has this function. Sensors that measure environmental information can't be zeroed.)

• Combination Curve

Clicking the "Combination Curve" can put multiple sensor data curves in the same coordinate system, which is convenient for comparative study (Fig. 2-14).

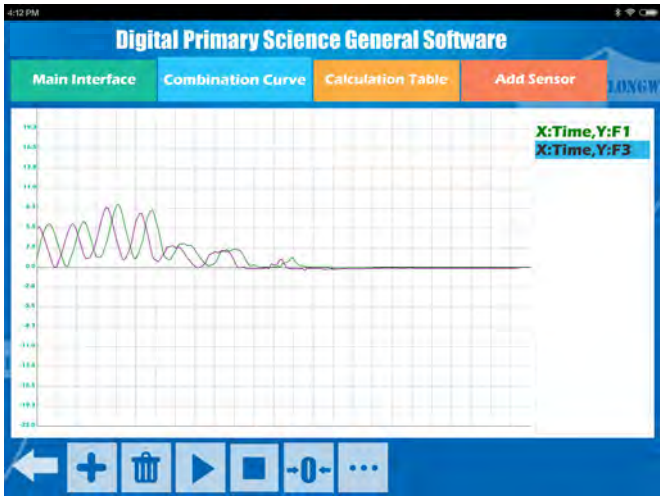


Fig. 2-14 Combination Curve

Icon interpretation

——Add a new curve

——Start the data record

——Delete curve (Firstly, need to choose the name of the curve in the right list area of the window)

—— Stop the data record

—— Sensor zero adjustment (Attention: Only part of the sensor has this function. Sensors that measure environmental information can't be zeroed.)

—— Data calculation (including average, maximum and minimum)

• Data Table

Icon interpretations in the data table (Fig.2-15)

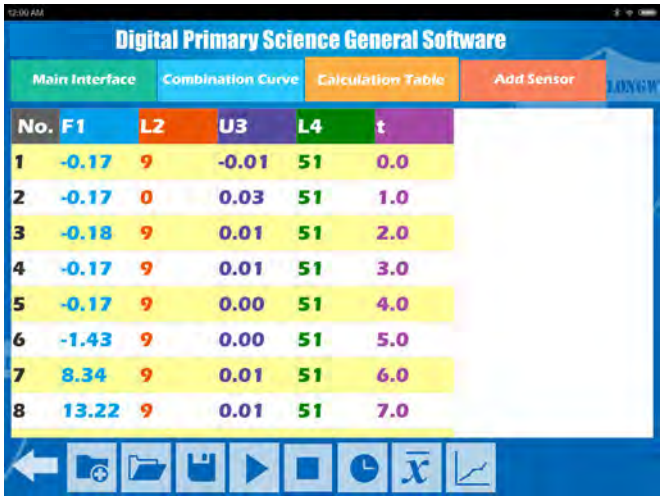


Fig. 2-15 Data table

Icon interpretation

——Add a new table

——Start the data record

——Open the saved data file

——Stop the data record

——Save file

——Set the time interval of recording

——Average

——Drawing curve based on the data in table

Application case "Thermal Expansion and Contraction" by using the general software

Apparatus: wireless transmitter, force sensor, mobile terminal, thermal expansion and contraction apparatus, alcohol burner, as shown in Fig. 2-16.

Operations: Plug the wireless transmitter into the force sensor; scan the QR code; start the general software and select “curve" display mode, heat the middle of the wire on thermal expansion and contraction apparatus by the alcohol burner, the curve of force will continuously drop down; Stop heating, it will rise up, as shown in Fig. 2-17.

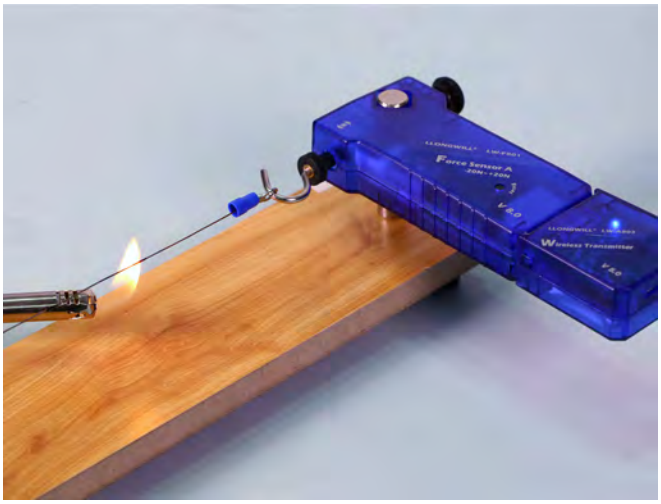


Fig. 2-16 Experimental Installation for Thermal Expansion and Contraction

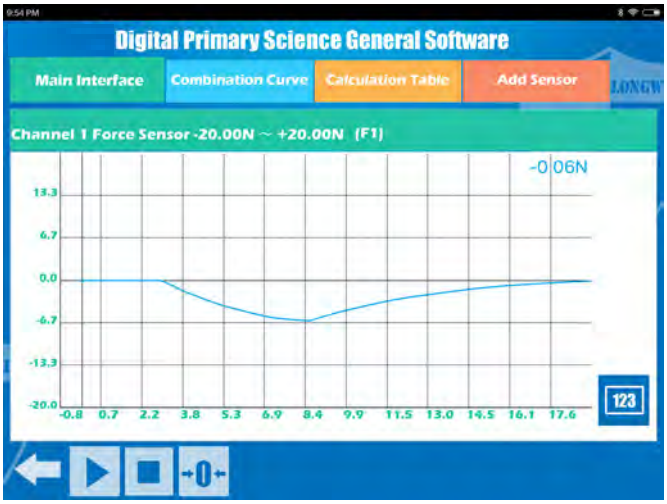


Fig. 2-17 General software experiment curve on thermal expansion and contraction

(2) The special software

The special software is a software package composed of multiple independent software interfaces. Each independent software interface corresponds to a scientific experiment or inquiry project. According to project requirements, special software presets the corresponding operation steps and sequence. The current list of specific items for specific software is as follows:

Subjects	Heat	Mechanics	Life Science	Electricity
Descriptions	Measuring changes in water temperature	Study on buoyancy	Comparison of air and exhaled gases	Study on the conductivity with different materials
	Friction heat	Study on friction	Study on photosynthesis	Fruit battery
	Study on heat conducting	Study on slope	Heart rate effected by physical activities	Conducting by glass
	Study on heat absorption capacity	Study on lever		Thermoelectric power generation
	Study on heat transferring	Study on pulley		
	Water evaporation	Study fast and slow		
	Water boiling	The secret of the pendulum		
		Study magnetic force		

Subjects	Magnetism	Chemistry	Optics	Sound
Descriptions	Study on magnets	Study on pH of water	Study on light	Visible sound
				Study on sound intensity

Special software is developed in accordance with the common requirements of science experiment and inquiry. Therefore, the quantity of the special software is in continuously expanded. After entering the special software, select the subject firstly, and then select the specific project entry, as shown in Fig. 2-18.

After clicking the specific project and enter the background as shown in Fig.2-19.

Click “Preparation”and enter preparation interface, understanding the equipment and operation steps required by the project (Fig.2-20)

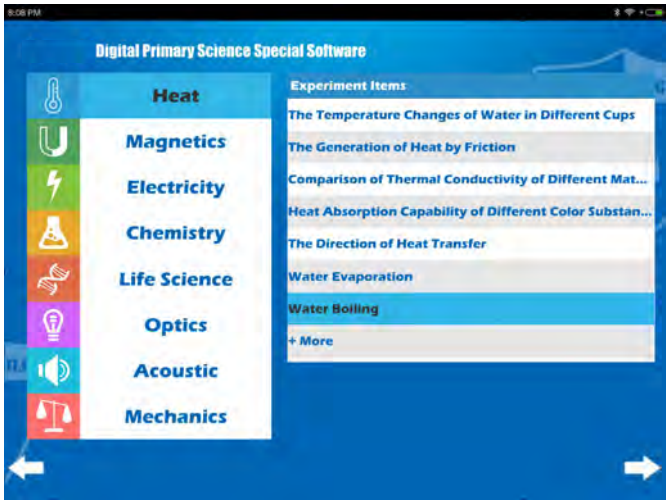


Fig. 2-18 Project items

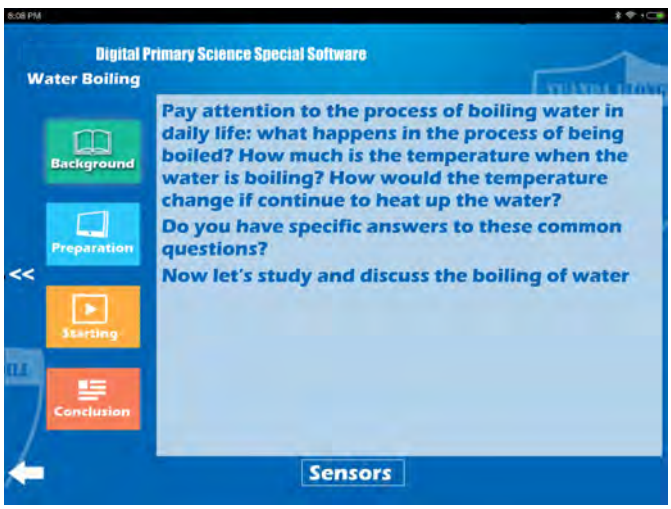


Fig. 2-19 Backgroud

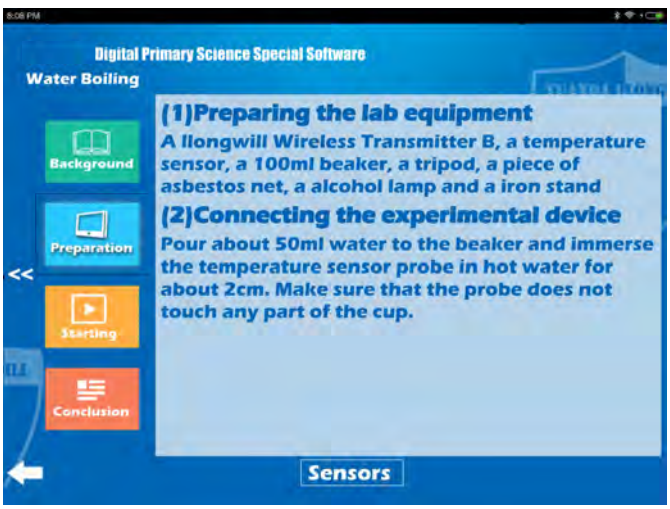


Fig. 2-20 Preparation

Click "Starting" and enter experiment interface (Fig. 2-21)

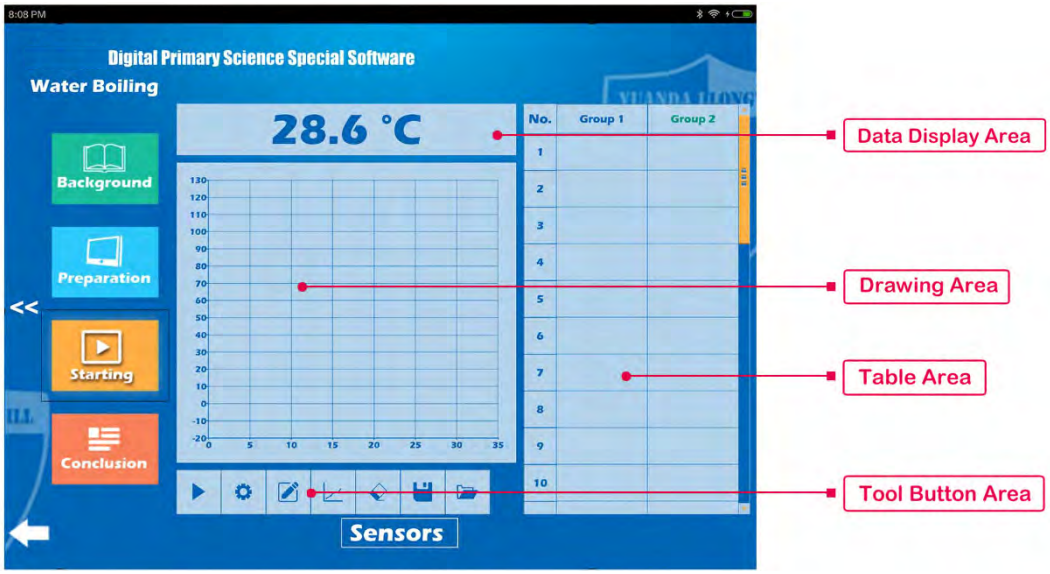


Fig. 2-21 Starting

Click “Sensors” and enter adding sensor interface (Fig.2-22).
Plug the wireless transmitter module into the sensor and switch on it. Scan the QR code on the back of the wireless transmitter module, then display the result on the left side of the interface after scanning successfully (Fig.2-23).

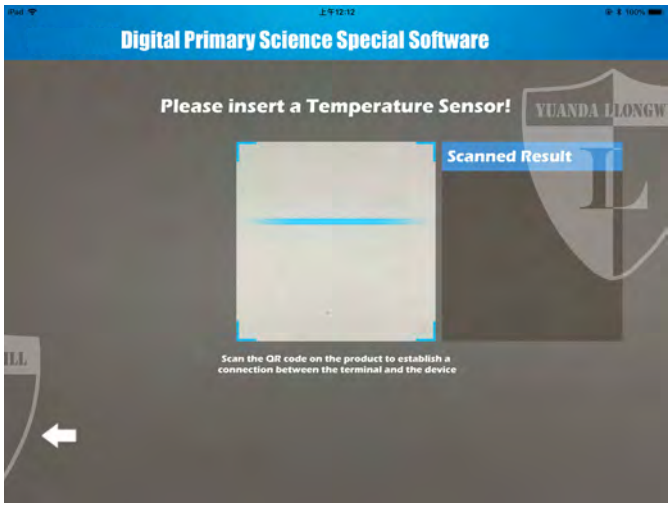


Fig. 2-22 Scan QR Code

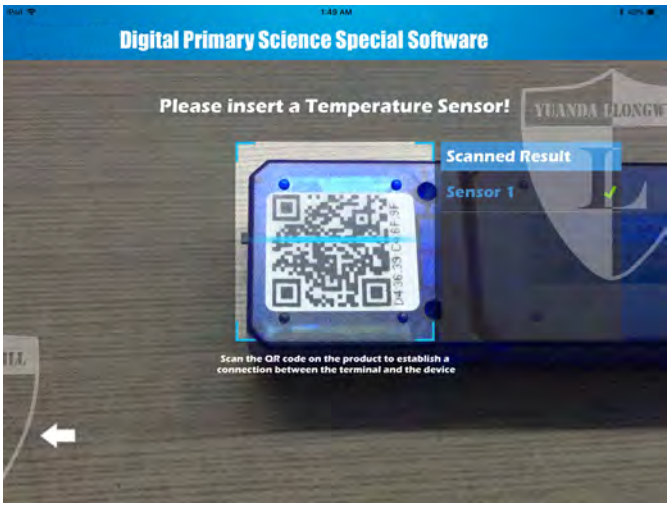


Fig. 2-23 Scaning QR Code

Click “  ” icon return into the experiment interface of specific software (Fig.2-21). At this point, the temperature real-time data is displayed in the data display area.

Data Display Area ——Display the data measured with sensors
Table Area ——Record and display data on the table
Drawing Area ——Draw curves based on the data in the table
Tool Button Area ——Provide data processing tools

 ——Start the data record

 ——Drawing curve based on the data in table

 ——Record the data in table

 ——Activities or project setting

 ——Clear the data recorded in table

 ——Open the saved data file

Application case "The Study of Boiling Water" by using special software

Apparatus: wireless transmitter, temperature sensor, mobile terminal, tripod, asbestos mesh, 100 ml beaker, alcohol burner, water, as shown in Fig. 2-25.

Fig. 2-25 Experimental Installation for The Study of Boiling Water

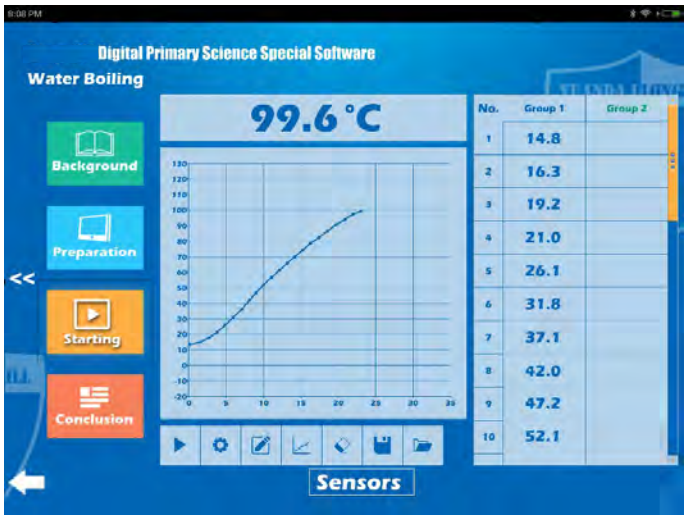


Fig. 2-26 The experiment on water boiling

Operations: Plug the wireless transmitter into the temperature sensor, scan the QR code, start the special software of Water Boiling , click "Set" and select "Automatic Recording", set the time interval (such as 15 seconds); light alcohol burner, heat the water in the beaker, insert the temperature sensor probe into the water, click "Record", the water temperature will be recorded automatically as 15 seconds interval; Click "Draw", we will get the water temperature curve (Fig. 2-26).

2. The Application on Chromebook

(1)Operation preparation

Open the App software and select the appropriate function Click in icon to start the software, as shown

•Enter the main interface, we will find different science experiments or inquiry topics divided into 8 categories: Heat, Electricity, Magnetic, Chemistry, Life Science, Light, Sound, and Mechanics, as shown in Fig. 2-28.

• Connecting and identifying sensors

Click" " to open the sensor connection window, as shown in Fig. 2-29; scan the QR code on the rear of the wireless transmitter, establish a connection between sensor and the mobile terminal. If there is no built-in camera in the mobile terminal, we also can click the "Connect" button and type MAC address manually.

Fig. 2-27 Interface of app software on Chrome OS

Fig. 2-28 Interface on experiment entry

(2)Application case

Click on a project software, you can enter the operation interface as shown in Fig. 2-30. The interface is divided into four parts: data display area, curve display area, data recording area, and operation button area.

Data display area: Instantly display the data measured with the sensors. "[ ]" is the icon of code scanning and click to connect the sensor in the display area.

Curve display area: Multiple curves can be displayed at the same time , and supports the playback , zoom-in, zoom-out, and restore operations of the curve.

Fig. 2-29 Window on sensor connecting

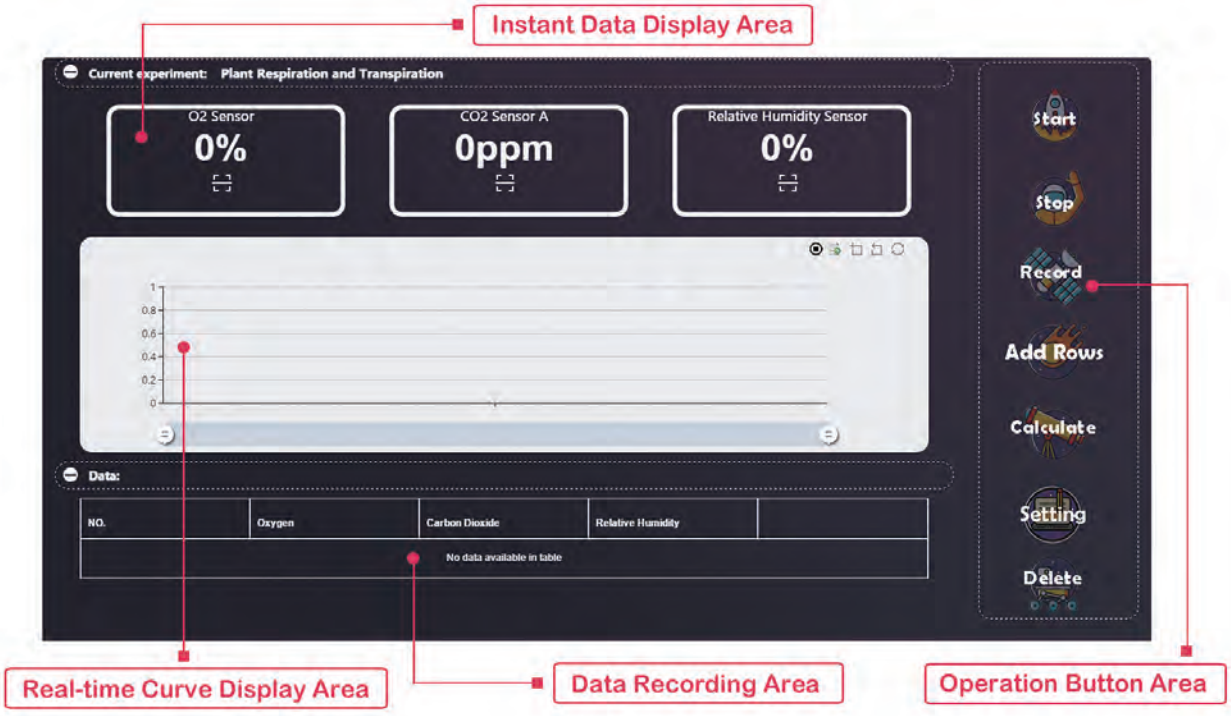


Fig. 2-30 Software interface

Operation button area: Operate the item.

—— Start, record data in the table.

—— Setting, configure basic parameters.

—— Stop, stop recording data automatically.

—— Delete, delete the selected row in the table area.

—— Add rows, add blank rows in the table area.

Data recording area: Stores recorded data, column headers can be customized, and data tables can be paged.

Application case "Visible Sound"

Apparatus: wireless transmitter, sound sensor, mobile terminal, 125Hz tuning fork, as shown in Fig. 2-31.

Fig. 2-31 Experimental Installation for Visible Sound

Operations: Select the sound topic of "Visible Sound", plug the wireless transmitter module into the sound sensor, establish the connection between the mobile terminal and sensor by scanning the QR code. Tap the tuning fork and observe the sound curve, as shown in Fig. 2-32.

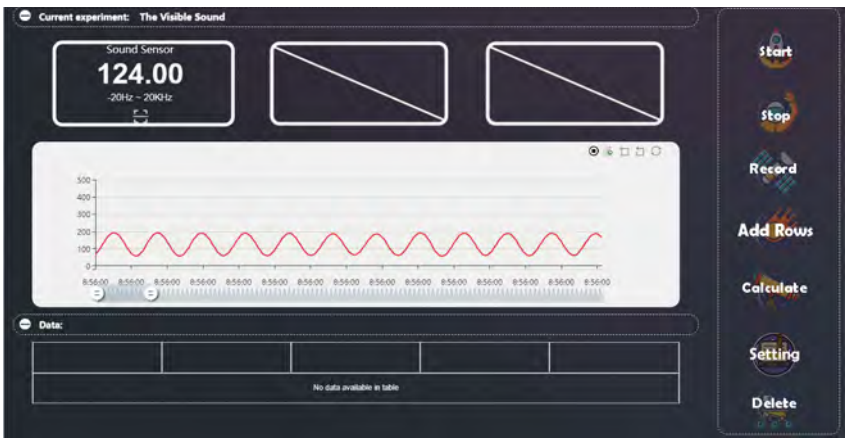


Fig. 2-32 Experimental curve on sound


worlddidac
MEMBER
GOLD