GB USER GUIDE

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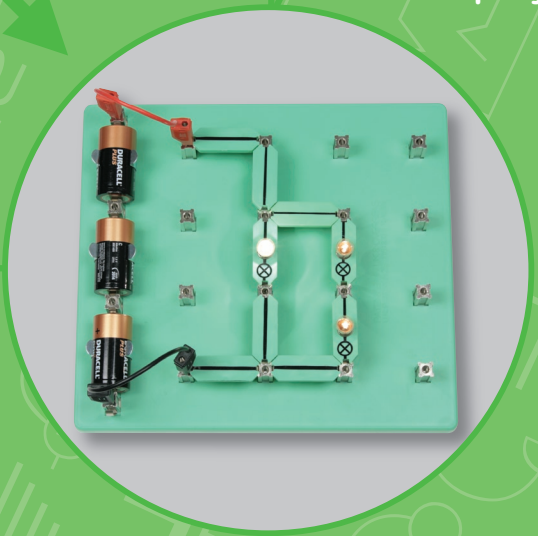
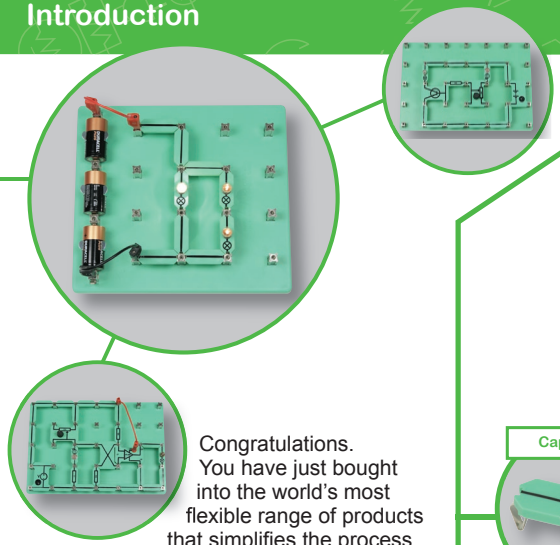
ES GUÍA DEL USUARIO

locktronics

Simplifying Electricity



MATRIX



Congratulations. You have just bought into the world's most flexible range of products that simplifies the process of learning and teaching electricity and electronics.

The core range consists of more than 200 electronic components mounted on rugged plastic carriers which are printed with the corresponding circuit symbol. Students use these carriers, in conjunction with a base board with interconnecting metal pillars, to build up a working circuit. They then use the software and curriculum provided to carry out experiments in electricity and electronics.

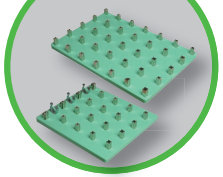
The key benefit of Locktronics is that as students construct the working circuit they can also see the corresponding circuit diagram. This helps students link theory to practise and simplifies the process of learning electricity and electronics.

Locktronics can be used in a wide range of subject areas including:

- Science
- Electronics
- Electrical and Electronic Engineering
- Automotive technology

The range includes:

Baseboards

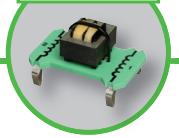


To which students add…

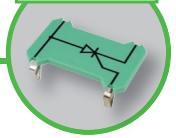
Capacitors

Resistors

Inductors

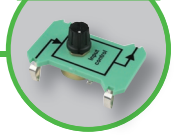


Semiconductors

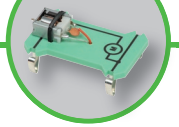


Logic gates

System blocks



Electromechanical



Lamps and LEDs

Curriculum packs

Power supplies

There are three stages in learning with Locktronics: Theory, Application, and Understanding.

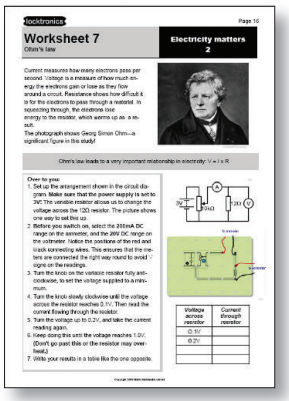
Locktronics is not designed to be a completely self study course - although this is encouraged as much as possible. We anticipate that students will be introduced to the relevant theory before they undertake an experiment, or that additional material containing theory will be available to facilitate self study - for example a text book. Students apply the theory by using a Locktronics kit in conjunction with a worksheet on the individual topic. Understanding is reached by completing the worksheet which involves building a circuit, taking measurements, drawing graphs and various other well-established learning techniques.

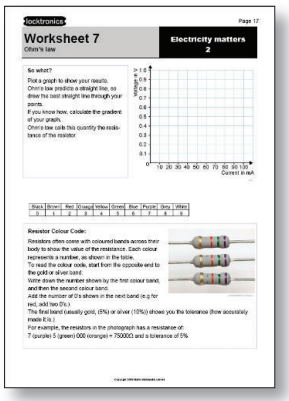
The key to managing this process is the worksheets which mostly include:

- an introduction to the topic;
- step-by-step instructions for the investigation that follows;
- a section headed 'So What', which aims to collate and summarise the results, offers some extension work, and promotes development of ideas and collaboration.
- Exercises for students in the form of drawing graphs, making measurements, or other challenges.
- Additional information that students can read or copy into their own notebooks.

All worksheets are free of charge and are shipped with your kit on a CD ROM. You can photocopy the worksheets and hand them out to students to write on, or students can read the worksheets and write answers and notes in their workbooks.

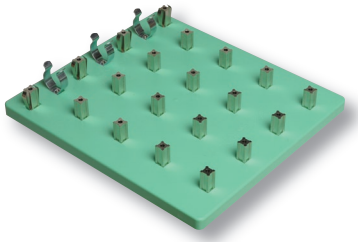
The most up to date versions of worksheets can be downloaded from our web site.



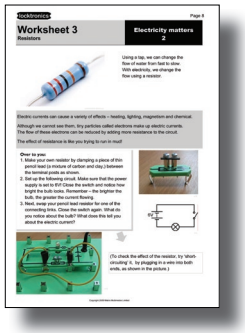


Using Locktronics is simple:

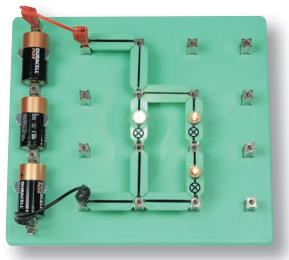
1 First pupils take a base board which consists of a plastic base with conducting metal pillars on a predefined grid.



2 Then students take one of our worksheet packs and read the instructions on how to set up a circuit.



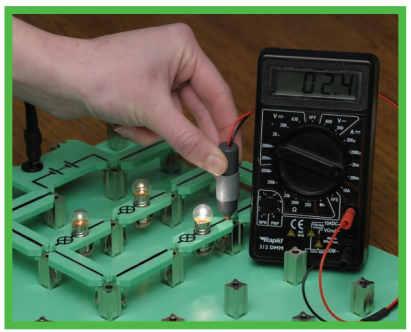
3 Students then take a circuit board and the relevant components and build the circuit from the diagram provided (beginners) or from the circuit diagram provided.



4 Students then follow the instructions on the worksheet to complete the assignment by making a note of the circuit performance, using test equipment to make measurements, calculate values, etc.

Using the current probe

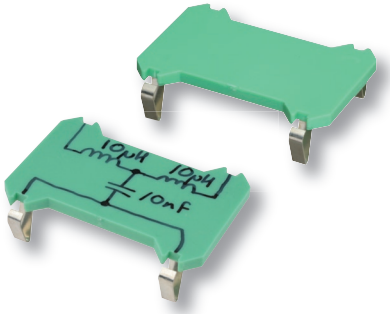
To measure current in the circuit students can remove a link in the circuit and insert an ammeter, or student can use the Locktronics current probe.
The current probe consists of a strip of double sided PCB laminate each side of which is attached to a 4mm 'banana' connector. The probe slides between the spring of the Locktronics carrier and the pillar on the baseboard. This interrupts the flow of current in the circuit and allows students to easily probe several parts of the circuit without removing any components.



Using Locktronics

Making your own carrier

There are more than 200 separate components in the Locktronics range, but occasionally you may want to use an electronic component that is not available. Because of this you can buy blank carriers that you can solder your own components to and use an indelible marker to draw the corresponding circuit symbol on.



Carriers with printed symbols of resistor, capacitor and electrolytic capacitor without values are also available.

Component symbols

Components are available with ANSI (north American) or DIN/SB (European) circuit symbols. For every component the value is clearly marked on the top of the carrier. The circuit symbols used correspond to the up-to-date conventions used by the international science and electronics community.

Value markings

The value markings show the SI unit symbol and use the Electronics industry convention of using the value multiplier to replace the decimal point for higher value components.
Hence we write '100Ω' for a 100 ohm resistor, but we write '2k2' for a 2.2kilo ohm resistor.

Safety in the lab

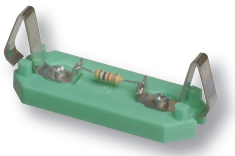
In no circumstances should Locktronics be used with voltages over 30V. Locktronics makes use of standard 4mm 'banana' type connectors. Leads supplied with Locktronics can be plugged into 'shrouded' 4mm connectors used by some high voltage equipment.

If you have a mixture of high voltage (>60V) and low voltage equipment in your lab then you will need to be very careful about how you manage the connecting wires you use. If you have high voltage and low voltage in the same lab we recommend that you use base board connecting pillars with 2mm holes in so that 4mm lead use with Locktronics is not necessary.

Students should always be briefed about the dangers of electricity before using Locktronics and should be supervised in the lab.

Component protection and repairing carriers

It is not possible to completely protect electronics components from damage without affecting electrical characteristics. However damage can be minimised by limiting the voltage students can use with our adjustable power supply.



If the component on a carrier should become damaged then it is easy to replace with a soldering iron. Note that damage to potentiometers is very easy and because of this a high wattage, low value, resistor is added to the wiper of many potentiometers to limit current.

Replacing damaged chips

Efforts have been made to minimise the possible damage to chips by the use of resistors in the outputs of chips to limit current. Where possible we have used conventional leaded chips so that if a chip should become damaged then it is easy to replace.

System blocks

Most system blocks and processor modules require a power and ground connection.
These are provided by 2mm connectors and 4mm to 2mm connector leads will be required for most users. System blocks are CMOS and operate up to 15V unless it is marked otherwise on the carrier.

Those customers using 2mm pillars will need 2mm to 2mm connectors.

Packaging and storage

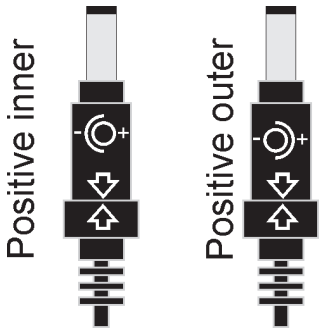
You can extend the life of your Locktronics components by making sure that they are properly stored in the foam packaging and trays we provide. These are all available from your dealer.

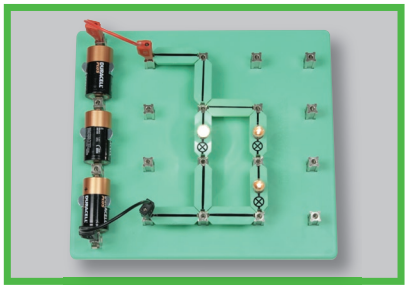
Using the adjustable power supply

Many of the teaching packs only require a modest DC power source. This can be provided by using batteries, by using a standard bench top power supply, or by using the adjustable Locktronics 'plug top' power supply shown here.

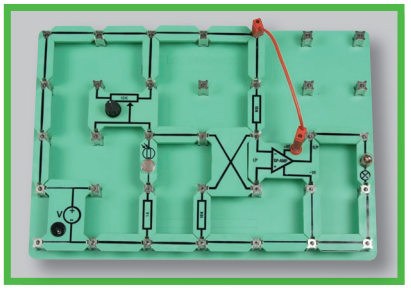
The adjustable power supply plugs into one of a number of Locktronics carriers to complete the circuit diagram.

You can adjust the power supply output voltage by using a screw driver or the small tab supplied. The power supply is supplied with several connectors: use the one marked with a 'D'. (2.1mm power jack) The removable connectors can be inserted either way into the power supply.
You should set the power supply up with the 'positive inner' connection.

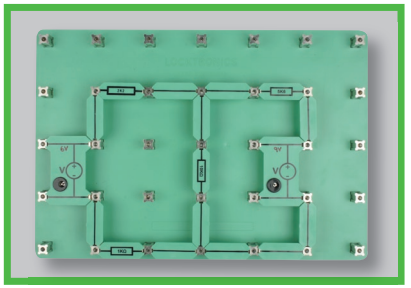




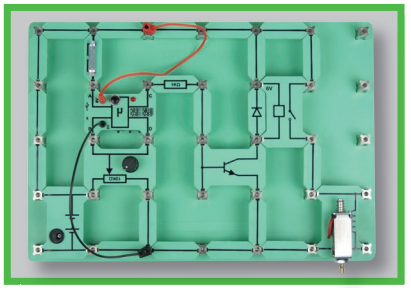
Locktronics can be used for the very basics of electricity like studying bulbs in series and parallel…..



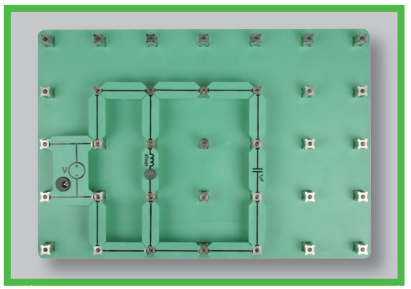
…for understanding more complex circuits such as operational amplifiers…



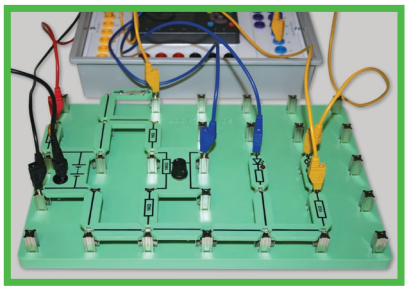
…for more complex dc circuits involving more than one voltage source….



…for working with programmable PICmicro microcontroller circuits and systems…



…for work in AC circuits and systems …



…and can be used in conjunction with the MIAC controller for understanding more complex control systems in engineering and automotive systems.