

STUDY FROM HOME REMOTE LABS

60+ Real Hardware Electronics Circuits Experiments for Students

ONE HARDWARE UNIT FOR 50 OR MORE STUDENTS
SIMULTANEOUSLY



UTILIZING EMONA'S
FAST, TIME-SHARE
TECHNOLOGY



AT HOME



IN CLASS



ANYWHERE

Remote Labs - “meeting learning objectives” and “engaging”

Emona netCIRCUITlabs remote labs user experience:

“We are going to be using the remote lab system for the third time this year. Remote lab has let us meet student learning objectives in this lockdown as all other lab modules are shifted to simulation only.”

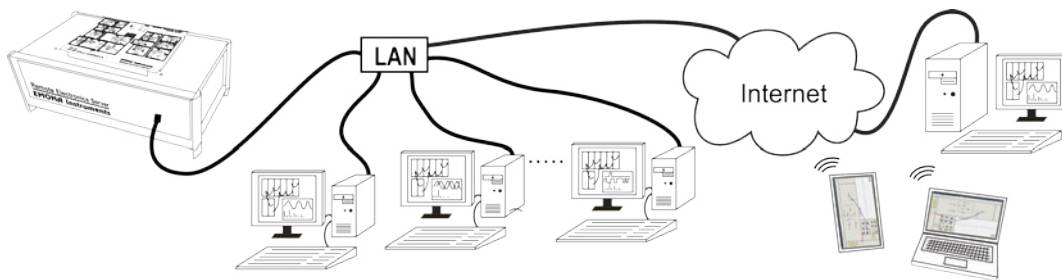
Dr Binesh Veetil, Lecturer, Electrical Engineering, Sydney, Australia

Emona netTIMS-FreeWire remote labs user experience:

“.....the students are engaging with the remote netTIMS -FreeWire hardware in a way that I would not expect for a simulation experience.

I am glad that we were able to arrange this experience for them, and my department head and I have begun discussing how we might integrate remote netTIMS hardware labs into our future curriculum in ‘normal’ times.”

Dr. M D. Feuer, Professor of Electrical Engineering, New York, USA



Complement Your Labs

1. TRADITIONAL LABS

Practical experience with real parts, real signals in realtime.

Hands-on hardware

Simulation software

2. SIMULATION LABS

On-screen experience with ideal parts, ideal waveforms, a valuable design tool.

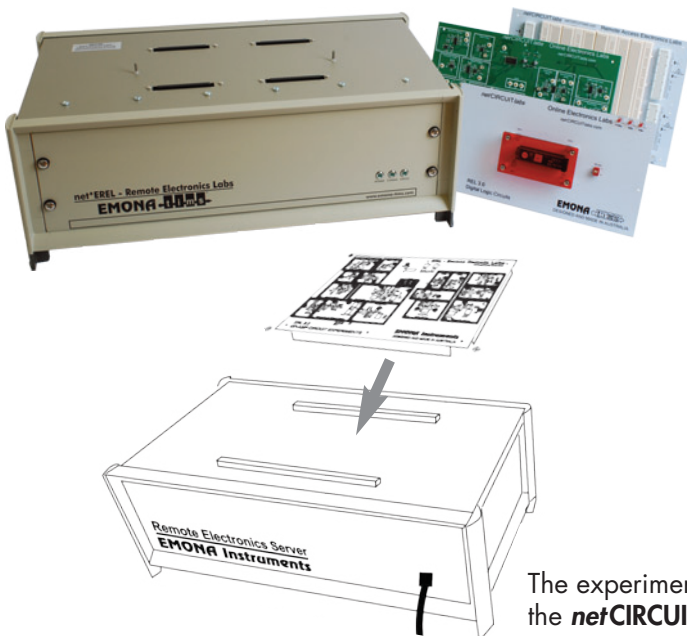
Remote controlled experiments

3. WEB ACCESSED REAL-TIME HARDWARE EXPERIMENTS

- ◆ 24/7 hands-on experiments
- ◆ 50+ unique user sessions AT THE SAME TIME
- ◆ Simple INTERNET BROWSER access

One Step Installation

netCIRCUITlabs CONTROL UNIT with MULTIPLE EXPERIMENT BOARDS

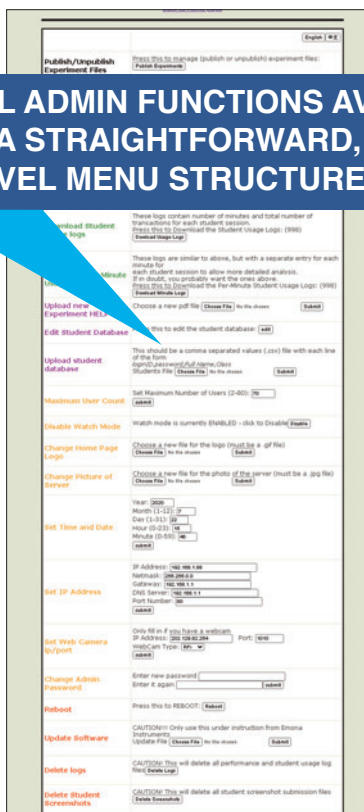


The experiments boards plugs into the **netCIRCUITlabs** Control Unit

- ▶ The netCIRCUITlabs Control Unit, located in your lab or office, and will accept any netCIRCUITlabs Lab Experiment board.
- ▶ Fast and easy implementation. No software to install and no setting up required.
- ▶ Secure access for professor to all ADMIN functions including student records and tracking.

ADMIN Pages for Student Management

ALL ADMIN FUNCTIONS AVAILABLE IN A STRAIGHTFORWARD, SINGLE-LEVEL MENU STRUCTURE



PROFESSOR'S ADMIN WEB PAGES

- ▶ Student database management
- ▶ Viewing & downloading student tracking & activities records
- ▶ Reviewing student saved experiment screenshots
- ▶ Experiment management
- ▶ IP / LAN and RTC setup
- ▶ Server software updates
- ▶ Uploading experiment HELP files

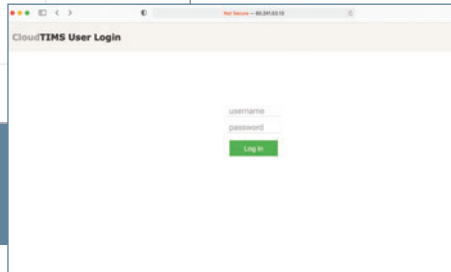
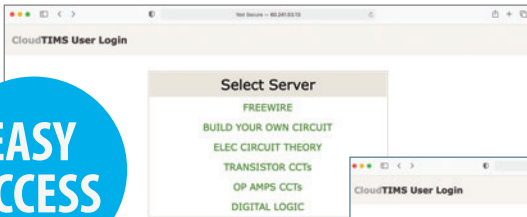
| Login | Host | Start Time | Transactions per minute |
|-------|--------------------|------------------|-------------------------|
| user | 192.168.0.10(1) | 2018-07-03 15:04 | 1 |
| user | 192.168.0.10(2) | 2018-07-03 15:13 | 1 |
| user | 192.168.1.10(3) | 2018-07-03 15:19 | 1 |
| user | 192.168.1.10(4) | 2018-07-03 15:21 | 1 |
| user | 220.244.129.198(5) | 2018-07-03 15:28 | 1 |
| user | 110.150.28.8(6) | 2018-07-03 18:32 | 1 |

INBUILT GRAPHICAL TOOLS TO ALLOW FAST, INTUITIVE OVERVIEW OF TIME-STAMPED STUDENT ACTIVITIES

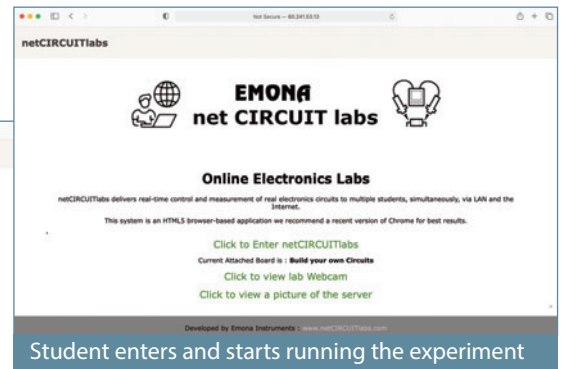
Simple Browser Login Page

EASY ACCESS

LAUNCH WEB BROWSER
ENTER THE ACCESS URL:
www.remote-access.education
Student selects the experiment.

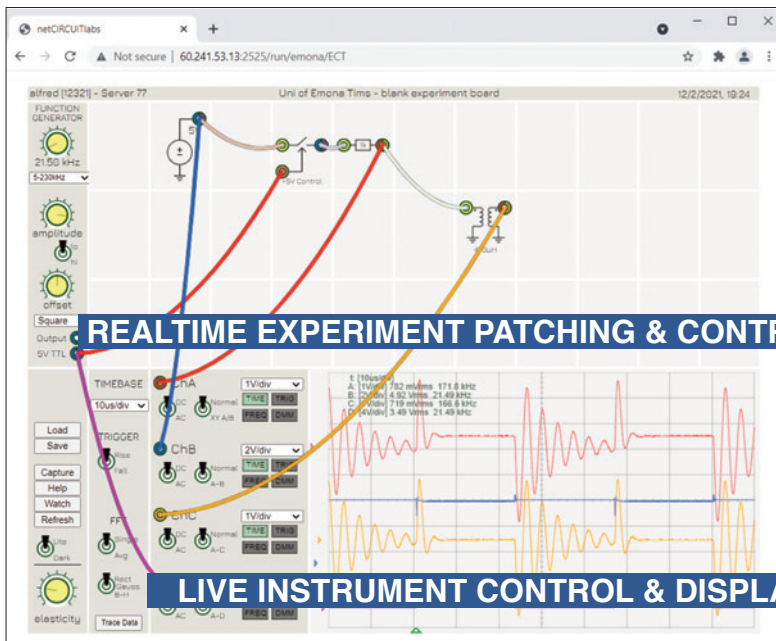


Student enters: USERNAME & PASSWORD



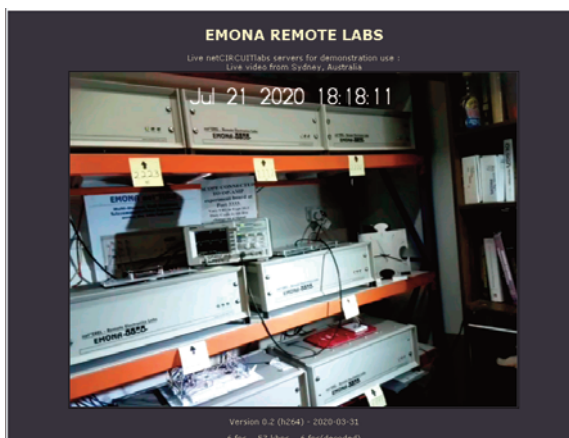
Student enters and starts running the experiment

Real-time Control & Real-time Circuit Responses



STUDENT CONTROL MEANS

- ▶ **PLACE** Click, select and place the circuit components
- ▶ **LOAD** or **LOAD** pre-wired electronic circuits
- ▶ **WIRING** Click to wire-up/patch-together output terminals to input terminals to build the circuit
- ▶ **SWITCHES** Click to control switches
- ▶ **POTENTIOMETERS** Click and drag to control potentiometers
- ▶ **WAVEFORMS** Click to select scope points to view waveforms, spectrum, Voltage & Frequency measurements
- ▶ **CAPTURE** Experiment set-up and waveforms for assessment
- ▶ **DOWNLOAD** Waveform data for analysis
- ▶ **SAVE** Your work for later



STUDENT CONFIDENCE BUILDING

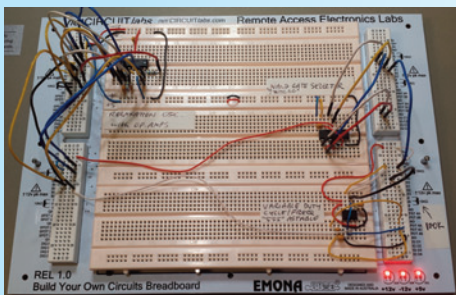
netCIRCUITlabs includes a **webcam** option so students can see the hardware they are controlling

Five Electronic Circuits Experiments Boards



netCIRCUITlabs CONTROL UNIT

With ONE experiment board plugged into the CONTROL UNIT at one time.

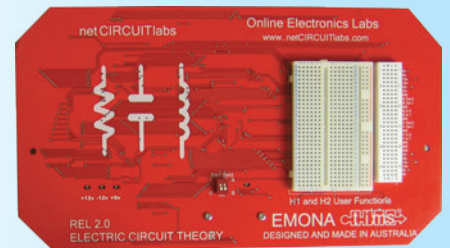


REL 1.0 BREADBOARD CIRCUITS BOARD

Allows staff and professors to replicate existing labs in a remote lab program by building their existing circuits on the breadboard. Students can then access and control these custom circuits for their experiments. Circuits are physically built on the breadboard and a graphic of the schematic is uploaded to the netCIRCUITlabs CONTROL UNIT.

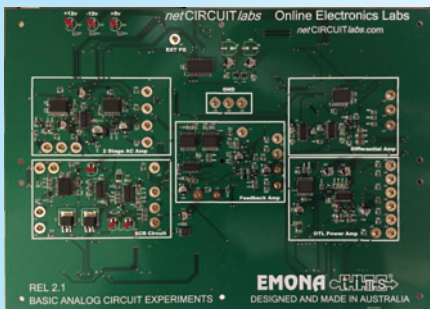
REL 2.0 CIRCUIT THEORY BOARD

More than 30 R, L and C components the student places on screen and wires together on-screen to build the experiment circuit.



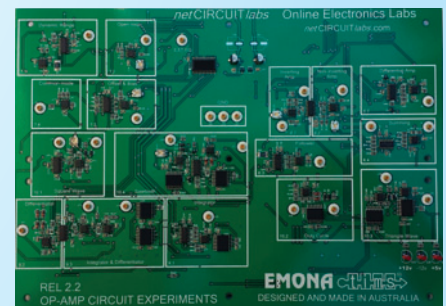
REL 2.1 TRANSISTORS BOARD

13 pre-wired transistor circuits for the student to control, monitor and explore.



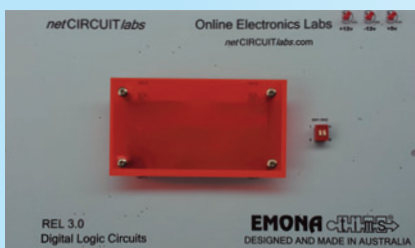
REL 2.2 OP-AMPS BOARD

16 pre-wired op-amp circuits for the student to control, monitor and explore.



REL 3.0 DIGITAL LOGIC BOARD

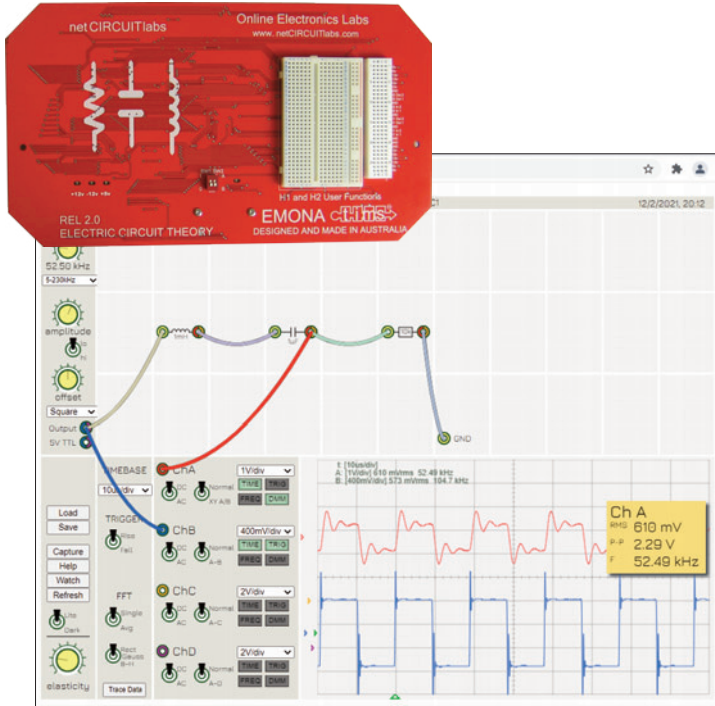
Over 30 switches, counters, gates flip-flops, inverters and a finite state machine, for the student to place on-screen, wire together on-screen and build the experiment circuits



Covers Most Curriculum

REL 2.0 CIRCUIT THEORY EXPERIMENTS BOARD

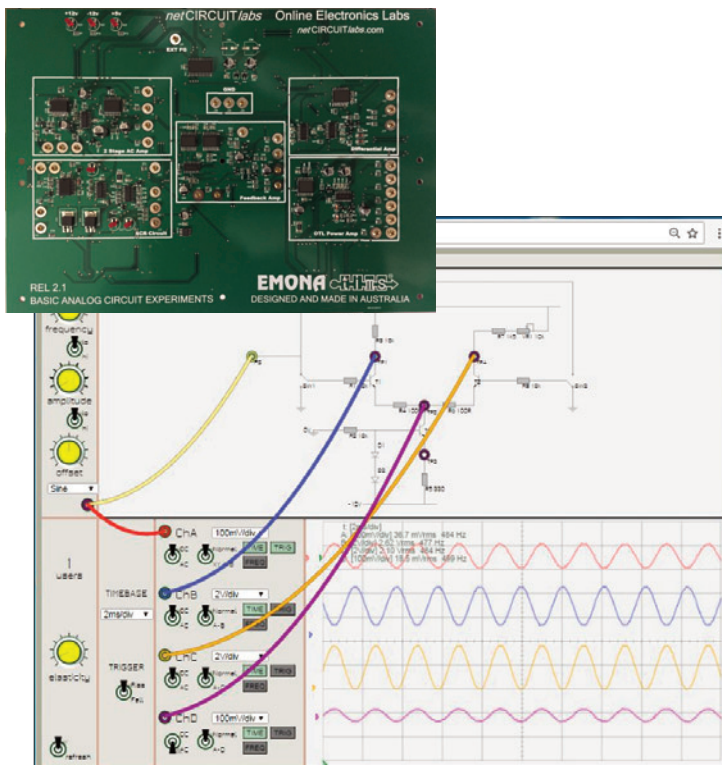
More than 30 R, L and C components the student places on screen and wires together on-screen to build the experiment circuit.



1. Determining the connection resistance using Ohm's Law
2. Voltage division with series resistors
3. Current division with parallel resistors
4. Voltage & current division with series & parallel resistors
5. Thevenin's Theorem
6. Thevenin's Theorem & maximum power transfer
7. Kirchhoff's Voltage Law
8. Mesh-current method
9. Nodal analysis
10. Superposition
11. 1st order RC circuits
12. 2nd order series RLC circuits
13. Sinusoids & phasors
14. Complex impedance
15. Magnetic coupled circuits
16. Two-port circuits

REL 2.1 TRANSISTORS CIRCUITS EXPERIMENTS BOARD

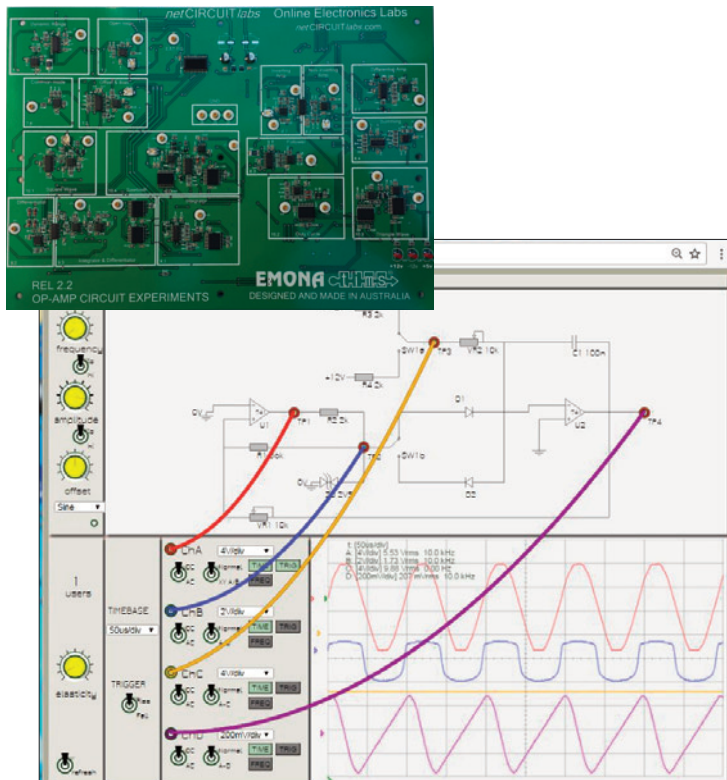
13 pre-wired transistor circuits for the student to control, monitor and explore.



1. Voltage divider biasing
2. DC quiescent conditions
3. AC performance of Common Emitter BJT amplifier
4. Unloaded voltage gain
5. Loaded voltage gain
6. Cascaded amplifiers
7. Maximum peak-to-peak output voltage
8. Emitter resistor by-pass capacitor
9. Negative feedback
10. Differential amplifier
11. SCR operation
12. SCR dimmer
13. OTL amplifier

REL 2.2 OP-AMPS CIRCUITS EXPERIMENTS BOARD

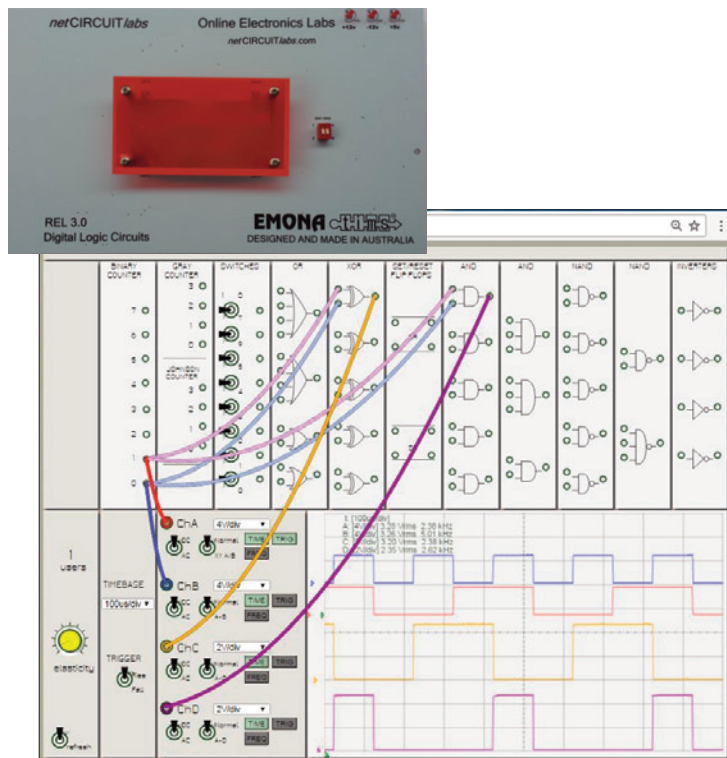
16 pre-wired op-amp circuits for the student to control, monitor and explore.



1. Dynamic range & slew rate
2. Open loop
3. Input offset voltage & current
4. Common mode
5. Inverting amplifier
6. Non-inverting amplifier
7. Voltage follower
8. Summing amplifier
9. Differential amplifier
10. The integrator
11. The differentiator
12. Combined integration & differentiation
13. Squarewave generator
14. Duty cycle
15. Triangle wave generation
16. Sawtooth wave generation

REL 3.0 DIGITAL LOGIC - SEQUENTIAL LOGIC EXPERIMENTS BOARD

Over 30 switches, counters, gates flip-flops, inverters and a finite state machine, for the student to place on-screen, wire together on-screen and build the experiment circuits



SIGNAL SOURCES:

- HI/LO Logic Switches x 8
- 8 bit Binary Counter
- 4 bit Gray Counter
- 4 bit Johnson Counter

OVER 60 GATES & FLIP-FLOPS:

- 2, 3 & 4-input OR gates
- X-OR gates
- 2, 3 & 4-input AND gates
- Inverters
- S/R, D & J/K Flip-Flops, Inverters
- Finite State Machines

STUDY:

- Boolean logic and algebra
- Combinatorial circuits
- Truth tables
- Karnaugh Maps
- Quine-McCluskey method
- Designing Synch & Asynch sequential circuits
- Flip flops
- State diagrams
- Design of FSM
- Registers, Counters, Multiplexers, Encoders etc
- Introduction to HDL (Verilog)

Custom Circuits Built by the Professor and Staff

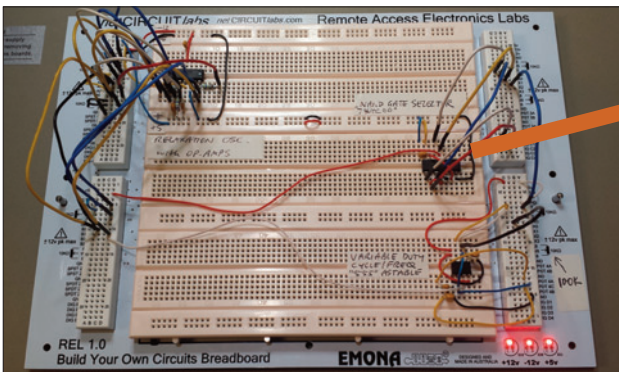


- REL1.0 Breadboard plug-in board installed in netCIRCUITlabs Control Unit.

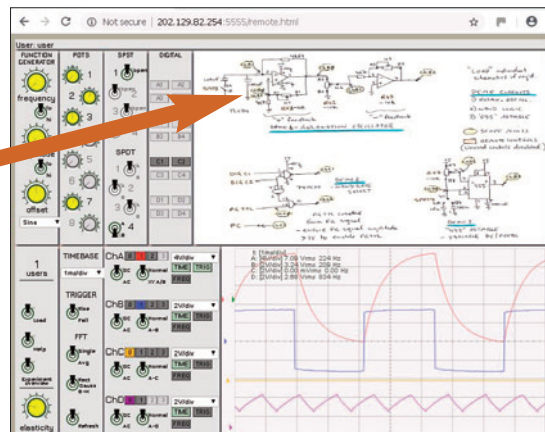
- ▶ Build 1, 2, 3 or more custom electronic circuits on the one, large breadboard. Deliver each circuits independently.
- ▶ Quick upload of the circuit schematics as PNG file.
- ▶ User controlled components and instruments include: Function Generator, Oscilloscope (4 x 4 channels), Potentiometers, Switches and Digital Logic outputs.

USER CONTROLLED COMPONENTS INCLUDE:

1. Large 2,692 point solderless breadboard with distribution strips and component breadboarding area.
2. 8 x POTENTIOMETERS, User remotely controllable:
7 x 10kR; 1 x 100kR
3. 4 x SPST switches, User remotely controllable
4. 4 x SPDT switches, User remotely controllable
5. 16 x Oscilloscope inputs, User remotely controllable:
4 x 4 channels
6. 16 x DIGITAL outputs (HI/LO signals), User remotely controllable
7. Protected triple output DCV power supply: +5V, +12V, -12V



- Electronic circuits implemented on the REL1.0 Breadboard.



- Schematics of electronic circuits implemented on the breadboard are displayed to the user.
- 4 User Controlled blocks are also displayed: Function Generator, Potentiometers, Switches and Digital Outputs.

Available from:

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