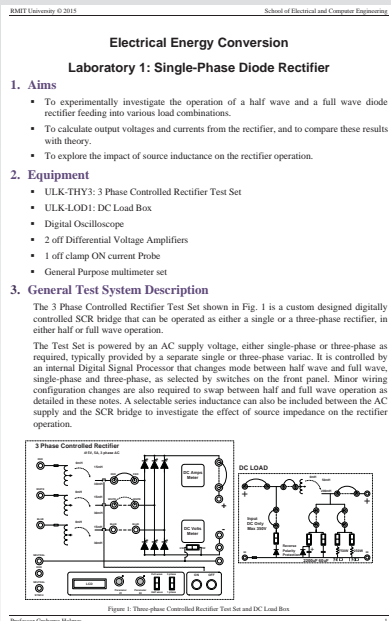
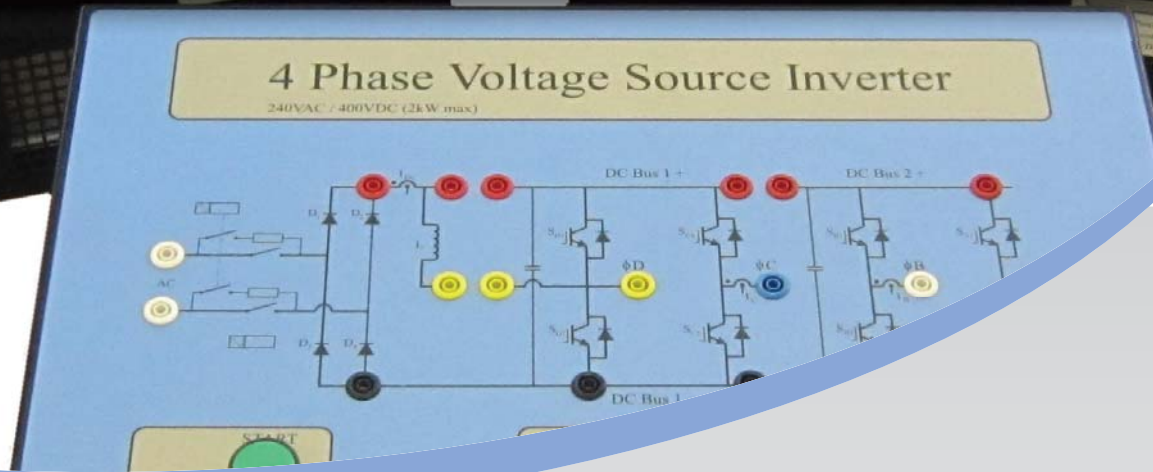
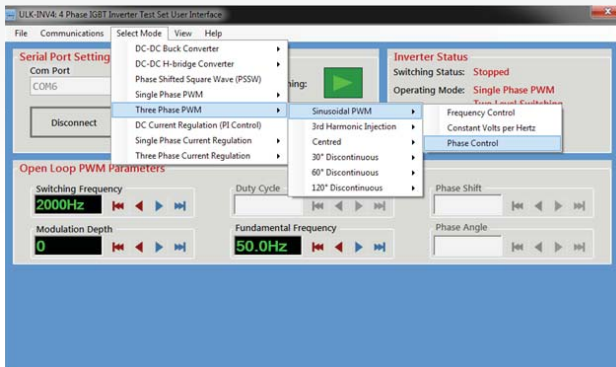


## Power Electronics Lab Experiments



Sample Experimental Laboratory Notes



PC Based User Interface for Inverter Configuration

The EPLTS System provides a complete platform for practical Power Electronics teaching.

The Power Electronics Lab Experiments are tailored to the EPLTS hardware platforms. They present a comprehensive range of experiments ranging from fundamental power electronic switching concepts, such as diode rectification, through to closed loop current regulation of a multi-phase inverter.

The Lab Experiments are free to API affiliated teaching institutions with ELPTS hardware.

### Features

- Comprehensive Range of Laboratory Experiments
- Proven Undergraduate Teaching Course
- Progressive Experimental Sequence
- Optimised for EPLTS Hardware Platforms
- Clear and Detailed Instructions
- Extension Options for Advanced Students
- Guidelines for Academic Staff
- Diode and Thyristor Rectification
- Single and Three-Phase Diode/SCR Experiments
- DC-DC Buck and Boost Converters
- DC-AC Single and Three-Phase Leg Inverter
- Inverter Extendable to Four-Phase Leg Operation
- Open and Closed Loop Control
- PC Graphical Interface for Inverter Control
- Built-in Equipment Protection

## Teaching

The ULK-INV4, ULK-THY3 and ULK-LOD1 hardware platforms provide a flexible and adaptable teaching and development tool for Power Electronic laboratories.

The comprehensive Power Electronics Lab Experiments are available to API Affiliated Universities with EPLTS hardware purchases. These laboratory notes are directly sourced from the proven courses used by the Electrical Engineering teaching program at RMIT University, Melbourne Australia.

The Lab Experiments are also available for non-API affiliated Universities. Please contact CPT for details.

## Flexibility

Each test set is easily reconfigurable, allowing them to be used in experiments ranging from single diode rectification to switching of multi-phase inverters.

The EPLTS also supports custom programming. Standard library support structures are available to aid software development and postgraduate research work.

Controller upgrades are available that include the latest Texas Instruments Microcontrollers.

## Safety

Safety within the undergraduate laboratory is a vital component of Power Electronics teaching.

The EPLTS range of products use 4mm shrouded safety sockets for all power connections. In addition, complete galvanic isolation is provided for all user control interfaces.

The Microcontroller and control circuitry is powered independently from the power stage to provide additional protection. This enables inverter switching from near zero voltage up to the inverter's maximum voltage rating.

## Diode / Thyristor Rectifiers

|                   |   |
|-------------------|---|
| Topics            | Single-Phase Diode Rectifier<br>Three-Phase Diode Rectifier<br>Single-Phase Thyristor Rectifier<br>Three-Phase Thyristor Rectifier  |
| Concepts Explored | Half and full wave rectification into various load combinations<br>Experimental voltage and currents compared against theory<br>Influence of source inductance<br>Phase angle control of SCRs |

## Inverter Based Laboratories

|                   |  |
|-------------------|--|
| Topics            | Buck and Boost Converters<br>DC/DC H-Bridge<br>Single-Phase PWM<br>Three-Phase PWM<br>Closed Loop Current Regulation   |
| Concepts Explored | IGBT Switching<br>PWM Fundamentals<br>Symmetrical and Asymmetrical Switching<br>Single and Three Phase Sinusoidal PWM<br>Space Vector Modulation<br>Closed-Loop Current Regulation |

## Equipment Required

|                           |   |
|---------------------------|---|
| EPLTS Hardware            | ULK-THY3, ULK-INV4, ULK-LOD1  |
| Additional Items Required | Digital Oscilloscope<br>Differential Voltage Amplifiers<br>Clamp-on Current Probe<br>General Purpose Multimeters<br>Single-Phase Variac<br>Three-Phase Variac |

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