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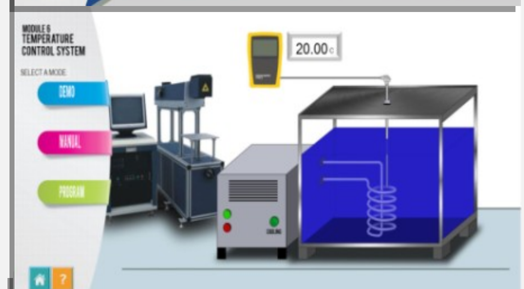
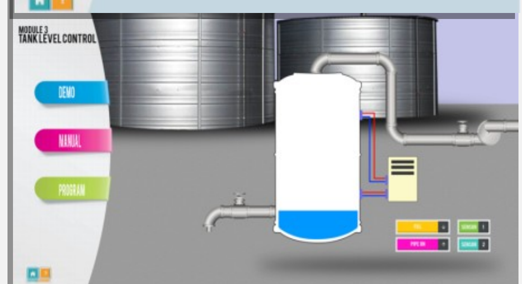
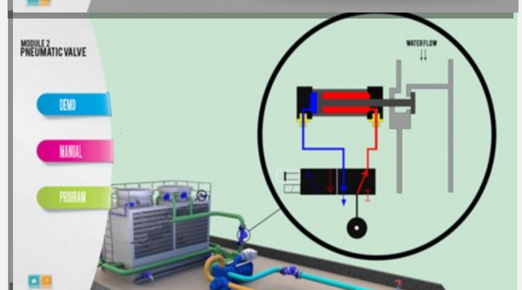
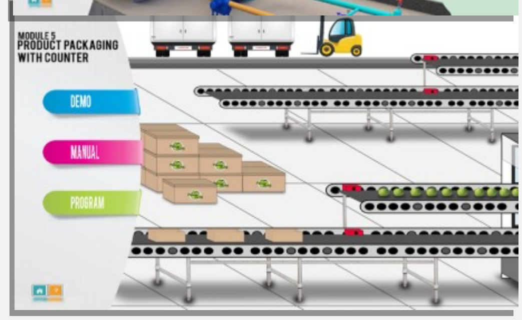
VIRTUAL REALITY PLC CONTROL SIMULATION & TRAINING SYSTEM
KD-PLC 0399









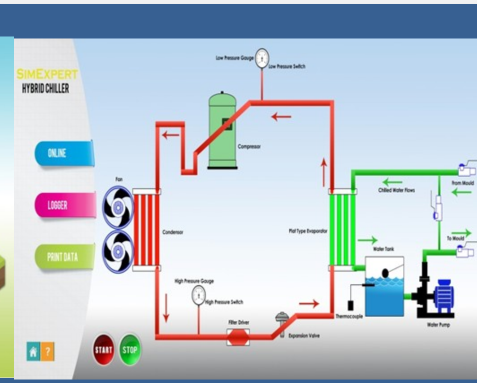
Innovative educational technology where you can learn and simulate industrial system in real time. It allows an easy learning on program, control and simulation of industrial applications through a virtual reality system emulator. This fully interactive simulation system is a new state-of-art training technology for educational subjects including Mechatronics, Industrial Automation, Power System, Renewable Energy, Control System, System Programming, Power Electronics, Thermo Dynamics, Artificial Intelligent and etc.

Interactive all-in-one educational training system that allows you to program, control and simulate various fields of industrial systems.

COMPARISON	CONVENTIONAL TRAINING SYSTEM	
Interactivity	Hardware emulator is limited to manual switches, display and LEDs.	Interesting virtual reality multimedia simulation and comprehensive interactive graphical animation
Interoperability	Normally confined	Not confined – usable for any type of programmable controller.
Setup Space	Space consuming. Different setups for different activities.	Compact. All are in one setup.
Setup Time	Time consuming	Easy and fast.
Cost Savings	Expensive. Many different units to be purchased.	Save cost by having an All-in-One unit.
User Friendly	Difficult to setup.	Easy to setup.
Safety	Risk to personnel and equipment damage.	No risk.
Effective Learning	Hard to understand and identify the overall operation of the sensors and actuators.	Student can easily understand the operation and diagnose the problems to complete the project application.
Demonstration and Manual Mode	Not available.	DEMO and MANUAL modes are available. Easier to understand with step-by-step operation.
Test Flexibility	Not easy in testing and trouble-shooting works.	Switch to PROGRAM mode to immediately test and control your systems.
Pre-Built Multi-Industrial Applications	Not available.	The pre-built scenes are based on what is commonly found in typical industrial plants. Simulate industrial scene on various selection of sensors, actuators, switches, water tank, temperature and flow control devices, etc.
Remote Supervision	Not available.	Can be supervised via internet network in the class room environment.
Learnability	Limited level (hard to emulate analog applications, eg. Airflow control)	Easier to learn and achieved from low to higher level.
Arrangement of module	Haphazard	From simple to complex in accordance to the Bloomfield taxonomy in education.

AVAILABLE AND UPCOMING SERIES

* Modbus Communication with Power Meter
* Solar PV with Power Monitoring System
* Motion Control with Industrial Stepper Motor
* Refrigeration System (Chiller, Air-Cond)
* ASCII Communication with Mini Robot Arm
* Flexible Manufacturing System
* Artificial Intelligence



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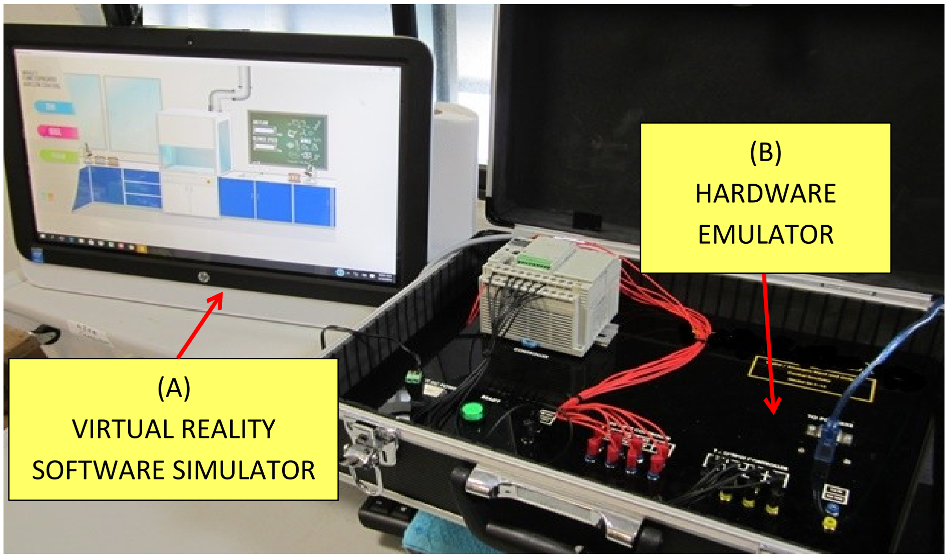
SPECIFICATIONS:

The “Virtual Reality PLC Control Simulation & Training System” consists of two main modules:

A. **Virtual Reality Software Simulator** comes with virtual reality, multimedia and comprehensive industrial graphical animation aided system.
B. **Hardware Emulator** comes with programmable controller.



A. VIRTUAL REALITY SOFTWARE SIMULATOR

The virtual reality software simulator comprises virtual reality and multimedia features with comprehensive industrial graphical animation aided simulation.

The software simulator consists of seven simulation and training modules as followings:

1) Control of Zebra-Crossing
2) Control of Four-Junction Traffic Lights
3) Control of Pneumatic-Actuated Water Flow Valve
4) Control of Water Level Tank System
5) Control of Packaging Conveyor System with Counter
6) Control of Water Chiller with Temperature Sensor and Cooling System
7) Control of Smart Fume-Cupboard System with Motorized Air Blower and Air Flow Sensor

Each simulation module consists of three control buttons: DEMO, MANUAL and PROGRAM. The DEMO button is to demonstrate the overall application for each of the training activities. The MANUAL button is to allow user to test the operation of the individual input and output devices. Finally, the PROGRAM button is to simulate the operation according to the user program via the programmable controller.

The software installation requirements are as followings:

- Windows Vista or higher
- Intel Core 2 Duo at 2GHz or AMD Athlon 64x2 2GHz or higher
- 1Gb RAM Memory
- 500Mb hard disk space

B. HARDWARE EMULATOR

Hardware Emulator is an interfacing unit or an inter-medium between the programmable controller and the software simulator.

The Hardware Emulator is interoperable that is not confined to a single type of programmable controller. It is applicable to many different types and brands of programmable controllers.

The Hardware Emulator is packaged with the followings:

1) 12VDC Power Supply
2) Power Indicator Light
3) 8 Digital Input Terminals
4) 8 Digital Output Terminals
5) 1 Analogue Input Terminal
6) 1 Analogue Output Terminals
7) PC USB Communication Port
8) Programmable Logic Controller(CP1E-NA20DR-A)

The programmable logic controller (CP1E-NA20DR-A) allows user to program and control the simulated industrial systems on computer via the hardware emulator. It is packaged with the followings:

1) 240VAC Input Supply
2) 24VDC Digital Input (12 Points)
3) Analog Input (2 Points)
4) Relay Output (8 Points)
5) Analog Output (1 Point)

DELIVERABLES

1) Installation software “Virtual Reality PLC Control Simulation and Training Software” in compact disc or USB. The software can be operated ONLY when the hardware is connected.
2) Hardware emulator and programmable controller in a suit-case.
3) One year warranty card.
4) PC communication cable.
5) Wires and required accessories.
6) Laboratory manual with complete solutions.
7) Exclude personal computer / laptop.

LAB MODULES & LEARNING OBJECTIVES

LAB1: Control of Zebra-Crossing

This experiment will demonstrate the operation control of a zebra crossing which is a crosswalk designated for pedestrians to cross a road. The operation control of a crosswalk will be designed and programmed to keep a safe traffic situation for pedestrians and vehicles.

Operation:

- This experiment involves of 1 pushbutton, and two indicator lights (RED and GREEN).
- The initial operation starts with turning ON the red indicator light. When the input pushbutton is pressed, the red indicator light will be blinking for 5 times in 1 second time-interval. After that, the red indicator light will turn OFF, while the green indicator light will turn ON simultaneously. The green indicator will be ON for 5 seconds, and then blinking and buzzing for 5 times in 1 second time-interval, before turning back to red condition.

Objectives:

1. To observe and identify the system demonstration of a Zebra-Crossing operation.
2. To learn and understand the overall system operation and translate into a flow chart.
3. To learn on digital inputs/ outputs assignment and control.
4. To learn on inputs and outputs wiring connections.
5. To learn on system programming involves, I/O definition, timer, loop control.

LAB2: Control of Four-Junction Traffic Lights

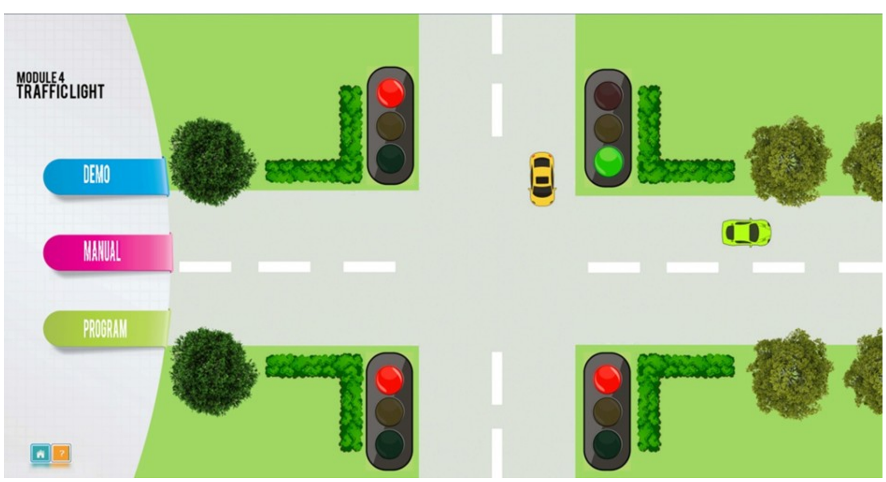
Traffic lights are typically controlled by a programmable logic controller. The traffic lights operation is normally with different setting of delays for different junctions. The delay for junction with higher volume of traffic should be set longer than the delay for the junction with lesser traffic. The steps in developing the traffic lights system involve primary study, software simulation, interfacing and connection, programming and testing.

Operation:

- This experiment involves 8 digital outputs.
- The traffic lights are assigned as the outputs accordingly. Each traffic light consists of Red, Yellow and Green. Two digital outputs are used to control each traffic light. Red and Green are controlled individually using the two digital outputs, while the Yellow will be activated if both of the digital outputs are turned ON at the same time. The overall traffic lights are to be controlled according to the correct sequence.

Objectives:

1. To observe and identify the system demonstration of a Four-Junction Traffic Lights operation.
2. To learn and understand the overall system operation and translate into a flow chart.
3. To learn on digital inputs/ outputs assignment and control.
4. To learn on inputs and outputs wiring connections.
5. To learn on system programming involves, I/O definition, timer, sequencing control and loop control.



LAB3: Control of Pneumatic-Actuated Water Flow Valve

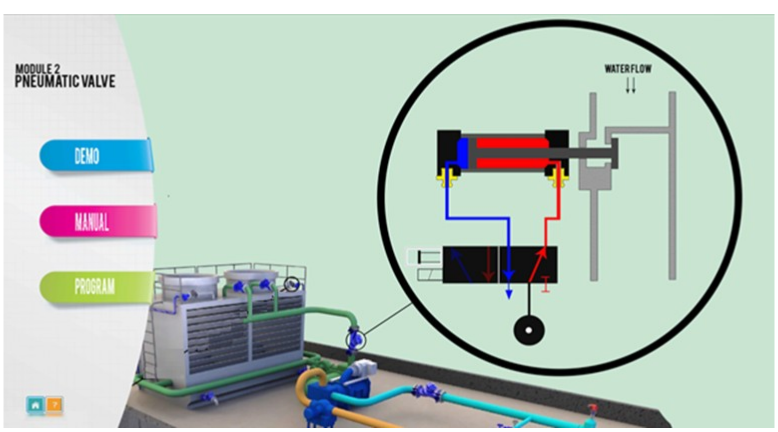
Pneumatic actuator coverts energy in the form of compressed air into mechanical motion. The motion can be rotary or linear. A pneumatic actuator mainly consists of a piston and a cylinder. The piston is covered by a seal which keeps the air in the upper or lower portion of the cylinder allowing air pressure to force and move the piston whether to extend or retract. The operation of the actuator is controlled by a pneumatic control valves. Pneumatic control valves are valves that control the flow of pressured air. It is used to control the direction or rate of flow in a pneumatic system. One of the most common applications of pneumatic system is a pneumatic-actuated water flow control valve.

Operation:

- This experiment involves of 1 start pushbutton, 1 reed sensor, and 1 digital output for solenoid valve with spring retract.
- When the start pushbutton is pressed, the solenoid valve will be activated, causing the piston to extend and allow the water to flow. Reed sensor will be turned ON when the piston is fully extended. Once the reed sensor is ON, timer will count for 5 seconds before the solenoid is deactivated and closing the water flow.

Objectives:

1. To observe and identify the system demonstration of a pneumatic-based water flow control valve operation with reed sensor.
2. To learn and understand the overall system operation and translate into a flow chart.
3. To learn on digital inputs/ outputs assignment and control.
4. To learn on inputs and outputs wiring connections.
5. To learn on system programming involves, I/O definition, reed sensor, timer, loop control.



LAB4: Control of Water Level Tank System

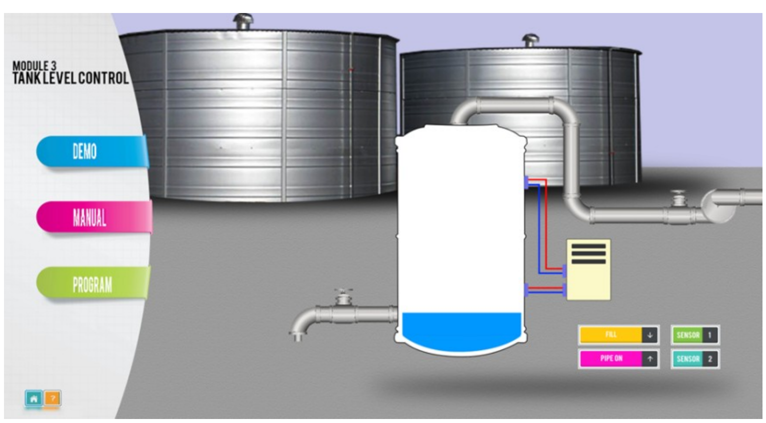
This experiment will demonstrate an automatic on/off water level control system.Automatic water level controllers are highly recommended for metro cities or areas where drinking water is supplied through pipelines which are further distributed in homes, hotels, societies and etc.The operation of a water level tank control will be designed and programmed to consistently supplying the water from the tank and toavoid any problem such aswater overflow.

Operation:

- This experiment involves 1 start pushbutton, 1 outlet flow valve, 1inlet flow valve, 2 digital level sensors for maximum and minimum limits.
- The system will start to operate when the start button is pressed. First of all, the inlet flow valve will be turned ON, in order to start filling the tank. The outlet flow valve will be turned ON when the minimum level limit is achieved. Hence, the water is supplied via the available piping connected to theoutlet valve. The task is to turning ON and OFF the inlet flow valve to automatically maintain the water level within the pre-fixed lower and upper level limits. Notably, the inlet valve is having higher rate of flow compare to the outlet valve of the system.

Objectives:

1. To observe and identify the system demonstration of a Water Level Tank Control operation.
2. To learn and understand the overall system operation and translate into a flow chart.
3. To learn on digital inputs/ outputs assignment and control.
4. To learn on inputs and outputs wiring connections.
5. To learn on system programming involves, I/O definition, minimum and maximum limits control, loop control.



LAB5: Control of Packaging Conveyor System with Counter

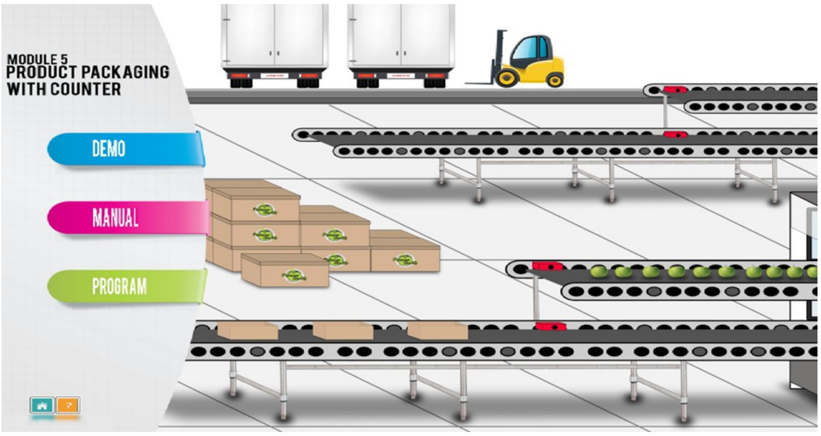
Packaging conveyor systems have been known to improve productivity, eliminate unnecessary labor costs and reduce operational expenses in the packaging industry. The packaging conveyor system is driven by a motor. The types of conveyor includes; belting conveyors, flex-link conveyors, and roller conveyors.

Operation:

- This experiment involves of 1 digital start pushbutton, 2 digital outputs for conveyors, 2 digital inputs for sensor and counter.
- When start button is pressed, conveyor B will operate and convey the empty box to stop at sensor B position. Then, conveyor A will operate to convey the products to be filled into the box for packaging. The number of product A will be counted by the count sensor. Conveyor A will stop after 10 counts and the process will be repeated for the other boxes.

Objectives:

1. To observe and identify the system demonstration of a Packaging Conveyor System.
2. To learn and understand the overall system operation and translate into a flow chart.
3. To learn on digital inputs/ outputs assignment and control.
4. To learn on inputs and outputs wiring connections.
5. To learn on system programming involves I/O definition, counter, loop control.



LAB6: Control of Water Chiller with Temperature Sensor and Chiller System

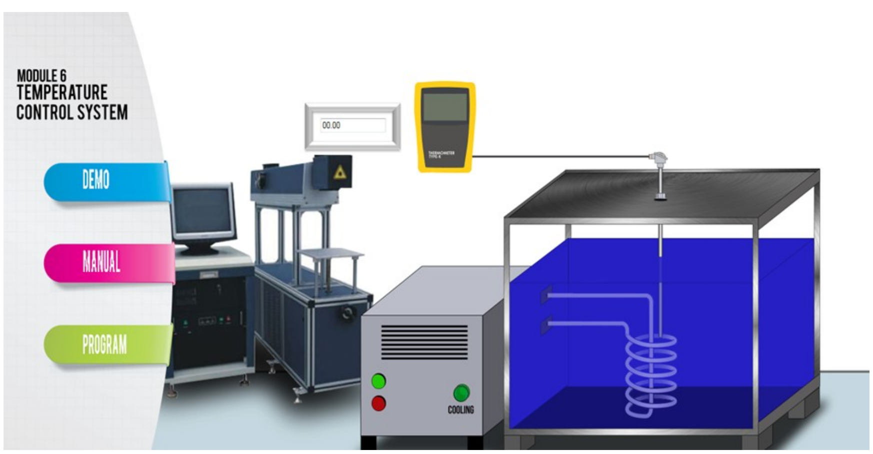
A chiller is an equipment to control temperature of a medium at a specific temperature set-point. A chiller systemcontrols fluid, such as cold distilled water and circulate the fluid to the machine (e.g. laser cutting machine) for cooling purposes. Water-cooled chiller consists of a water tank with cooling coils and a temperature sensor. The cooling coils are to cool the water in the tank. Normally the cooling coils are linked to a condenser and compressor unit (Refrigeration Unit). The cold water will be circulated to the external machine using a motorized pump.

Operation:

- This experiment involves 1 digital start button, 1 digital output contactor for the Refrigeration Cooling Unit, 1 analogue input for the temperature sensor.
- When the start button is pressed, the Refrigeration Unit will be turned ON to cool the water in the tank. The water temperature will be monitored by the temperature sensor. The Refrigeration Unit will be turned ON and OFF to maintain the water temperature according the temperature set-point.

Objectives:

1. To observe and identify the system demonstration of a Water Chiller Control operation.
2. To learn and understand the overall system operation and translate into a flow chart.
3. To learn on digital and analogue inputs/ outputs assignment and control.
4. To learn on inputs and outputs wiring connections.
5. To learn on system programming involves I/O definition, analogue input monitoring, cut-off point control, loop control.



LAB7: Control of Smart Fume-Cupboard with Motorized Air Blower and Air Flow Sensor

Fume cupboards are intended to keep harmful substances away from the user in the laboratory. A fume cupboard or a fume hood is a type of local ventilation device that is designed to limit exposure to hazardous or toxic fumes, vapors or dusts. A smart or modern fume cupboard system with a variable-air-volume (VAV) is controlled and equipped with a motorized speed-control air blower and an air flow sensor. The VAV controller monitors the internal air flow (affected by the sash/door position) and continually adjusts the air-blower speed or motor inverter frequency to maintain a constant air velocity, as the sash height changes.

Operation:

- This experiment involves 1 digital start button, 1 analogue input air-flow sensor, 1 analogue output motor blower speed-control.
- When the start button is pressed, the air blower will be turned ON. The air-flow sensor will monitor the internal flow which will be affected by the opening and closing of the sash (door). The internal air-flow rate will be maintained at the air-flow set-point, by adjusting the AC motor inverter frequency accordingly.

Objectives:

1. To observe and identify the system demonstration of a Smart Fume Cupboard operation.
2. To learn and understand the overall system operation and translate into a flow chart.
3. To learn on digital and analogue inputs/ outputs assignment and control.
4. To learn on inputs and outputs wiring connections.
5. To learn on system programming involves, I/O definition, timer, analogue input monitoring, analogue output control for motor inverter frequency control, cut-off point control, loop control.