Intelligent Digitize Emulated Achievement Lab

*i*de@Lab-100

*Notebook is excluded

▶ Features

● The *i*de@Lab (Intelligent Digitize Emulated Achievement Lab) is a multimedia digitized experiment/learning platform. It can be divided into three major sections: Hardware Experiment Platform, Experiment Modules and Application Software Platform.

● The Hardware Experiment Platform consists of digital storage oscilloscope, logic analyser, frequency synthesis signal generator, two digital multi-meters, programmable power supply and internal central control and coordination interface, output display interface, module communication interface and the interface used for command and data exchange between *i*de@Lab and personal computer.

● The operating modes of Hardware Experiment Platform include Manual Control mode (using front-panel buttons) and PC Control mode (via USB interface). The goal of this design is to offer the signal sources and measurements required for experiment tasks. With this design, you can easily learn with various experiment modules even if you are only familiar with one operating mode of Hardware Experiment Platform.

● Modules used in the *i*de@Lab system are divided into Extension Unit and Experiment Module. The Extension Unit is designed to satisfy the special needs of experiment modules. The subjects of experiment modules cover the experiment units of basic electricity, electronic circuits, digital circuits, microcomputer and communications, etc. Each subject contains several experiment modules. The Application Software Platform contains the front-panel controls and displays of Hardware Experiment Platform, experiment module window, procedure steps, and experiment manual.

▶ System Componets

The *i*de@Lab system hardware consists of Main Unit *i*de@Lab-11001, Extension Unit, and various Experiment Modules. Details of components are described as follows.

● **Main Unit *i*de@Lab-11001**

1.Digital Storage Oscilloscope
- (1)Channel : Dual channel
- (2)Input Coupling : DC, AC
- (3)Input Impedance : 1MΩ ±2% in parallel with 20pf
- (4)Input Voltage : 40mVpp ~ 4Vpp (x1), 0.4Vpp ~ 40Vpp (x10)
- (5)Input Offset Voltage : -2V ~ +2V (x1), -20V ~ +20V (x10)
- (6)Bandwidth : DC ~ 100 KHz
- (7)Sample Rate : 5 Hz ~ 1 MHz
- (8)Resolution : 12 bits
- (9)Memory Depth : 2k x12, each chennel
- (10)Trigger Source : Internal Trigger (CH 1), Ext.+Edge Trigger, Trigger Volt. (CH 1/CH 2)

*i*de@Lab 11001

2.Logic Analyser

(1)Channel : 9 channels
(2)Input Level : TTL level signals
(3)Sample Rate : 5Hz ~ 1 MHz
(4)Trigger Type :
   high (1), low (0), don't care (x),
   Rising (↑), falling (↓)
(5)Memory Depth : 2k x 9

3.DDS FG (Direct Digital Synthesis FG)

(1)Output Waveforms :
   Sine, Triangle, Ramp, Square, Random-Wave,
   A.M./F.M.
(2)Amplitude : 0 ~ 20Vpp
(3)Offset : 0 ~ +/-10V, 100mv/step
(4)Frequency : 1Hz ~ 2MHz
(5)Output Impedance : 50Ω ±10%

4.DMM1 and DMM2 (Digital Multi-Meters)

(1)Resistance (Ω) :
   400Ω, 4KΩ, 40KΩ, 400KΩ, 4MΩ, 40MΩ auto range
(2)DC Voltage (DCV) : 400mV, 4V, 40V auto range
   Input Impedance : ≧10MΩ
(3)AC Voltage (ACV) :
   400mV, 4V, 40V, 400V rms auto range
   Input Impedance : ≧10MΩ
(4)DC Current (DCA) : 400mA(0.5A/250V fuse protected)
(5)AC Current (ACA) : 400mA(0.5A/250V fuse protected)
(6)Display : 3¾ digit LCD, Maximum indication 3999

5.Variable DC/AC Output

(1)DC : output, 2 channels, Positive V+ : 0 ~10 V,
                            Negative V- : 0 ~ -10 V
(2)AC : Sine, Triangle, Log, Ramp
   Vpp : 10 V
   Frequency : 7 ~ 150 Hz

6.Fixed DC Output : +12V/0.5A, -12V/0.5A, +5V/0.5A

7.Fixed AC Output : 9V-0-9V

8.Communications and Display Interface

(1)PC control and display :
   Communicating with PC via the USB cable
(2)Manual control and display :
   Function key settings (Mode/Parameter Setting) and
   a 4 x 20 character LCD display (DMM/DDS FG Display)

▶ System Requirement

● **Hardware :** 1 GHz or faster 32-bit (x86) or 64-bit (x64)
              processor, 512 MB RAM , 200MB available hard
              disk space
● **Software :** Windows XP/Vista/7

▶ Accessories

- Power Cord x 1
- USB Type A to Type B Cable x 1
- Connection plug and leads x 1set
- *i*de@Lab CD x 2(131xx/133xx, 132xx)
- User Manual x 1
- Circuit Simulation Software TINA Design Suite *(Option)*
- *i*de@Lab 13292 Storage rack x 2

▶ Extension Unit and Experiment Module

● Extension Unit

This unit extends the functions of Main Unit to satisfy
the needs of experiment tasks when it is added to the
*i*de@Lab system.

12001

*i*de@Lab-12001: Basic I/O Elements

1.Universal Counter :
   Function : Logic Probe/Frequency/Period
   8-digit 7-segment LED display and function select key
2.LED Display : L0~L7, input, TTL level
3.Debounce PB Switch :
   4 pushbuttons PSW1 ~ PSW4 with debounced outputs
4.Pulser : 2 sets, output A, $\overline{A}$, TTL level with P.P. & P.S. switch
5.Clock Generator :
   1 set (50Hz ~ 14KHz), output, TTL level
6.Stand Frequency :
   7 sets (0.1Hz, 1Hz, 10Hz, 1KHz, 10KHz, 100KHz, 1MHz),
   Output, TTL level
7.Data Switch : DP0~DP7, output, TTL level

● Experiment Modules
A series of experiment modules is designed for
different Subjects.

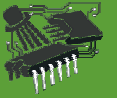### 1. *i*de@Lab-131xx: Basic Electricity
   13101 Basic Device Module
   13102 Basic Electricity Experiments Module

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2. *i*de@Lab-132xx: Electronic Circuits

13201 Diode, Clipper & Clamper Module
13202 Rectifier, Differential & Integral Circuit Module
13203 Transistor Amplifier Circuit Module
13204 Multi-Stage Amplifier Circuit Module
13205 FET Circuit Experiment Module
13206 OP Amplifier Circuit Module (1)
13207 OP Amplifier Circuit Module (2)
13208 OP Amplifier Circuit Module (3)
13209 OP Amplifier Circuit Module (4)
13210 OP Amplifier Circuit Module (5)

3. *i*de@Lab-133xx: Digital Logic Circuits

13301 Combinational Logic Circuit Experiment Module (1)
13302 Combinational Logic Circuit Experiment Module (2)
13303 Combinational Logic Circuit Experiment Module (3)
13304 Combinational Logic Circuit Experiment Module (4)
13305 Combinational Logic Circuit Experiment Module (5)
13306 Sequential Logic Circuit Experiment Module (1)
13307 Sequential Logic Circuit Experiment Module (2)

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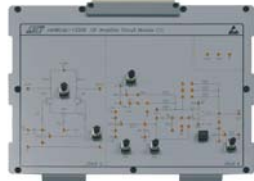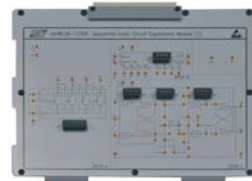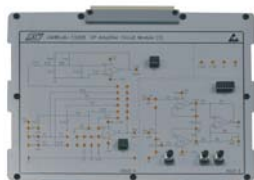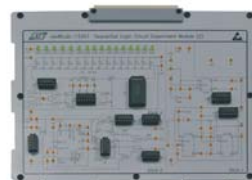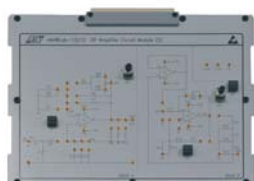
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● Software Features

The user interface for ide@Lab system is designed to contain the instruments (DMM, DSO, FG, VDC, LA) which correspond to the instruments on the front panel of ide@Lab-11001 Main Unit, as well as the explanation algorithm of the programming language for Human-Machine communication. For easy reference, the required data and information when you are performing an experiment are stored in Experiment Manual especially represented in HTML format, so you can open the Experiment Manual by clicking the Manual icon.

The user interface offer the link of each experiment to the simulate file (*.TSC) designed by Tina Design Suite.

In addition, for your convenience Experiment Mode is divided into three modes: Reference, Guide and Time Slice modes. Details are described as follows:

Reference Mode:
The Reference mode is a tutorial mode running under pure software environment. In this mode, you only need to select an experiment unit and then click a single-run button, the system will automatically inform you the connections, required equipments and instruments, and the related parameters about each procedure step, and display the corresponding results. In the Reference mode, the system does not physically request the hardware to feed data back, all the information and data are already stored in the related experiment files.

Guide Mode:
In this mode, the system will ask you to follow the prompts displayed on PC screen and operate on physical hardware. Any action in each of procedure steps is prompted in text and wiring connection, but the system do not check for connection errors and don't inform you whether the experimental results are correct or wrong. In the Guide mode, the system requests the hardware to feed data back and represents the actual state of physical connections on the corresponding screens.

Time Slice Mode:
Similar to the Guide mode, the Time Slice mode is also hardware-dependent. The only difference is that the system operating in Guide mode will request the hardware to feed data back if it is needed in the procedure steps. In the Time Slice mode, the system repetitively requests the hardware to feed data back before proceeding to the next procedure step. This allows you to adjust related parameters or change connections and observe the experimental results.

● System Diagram
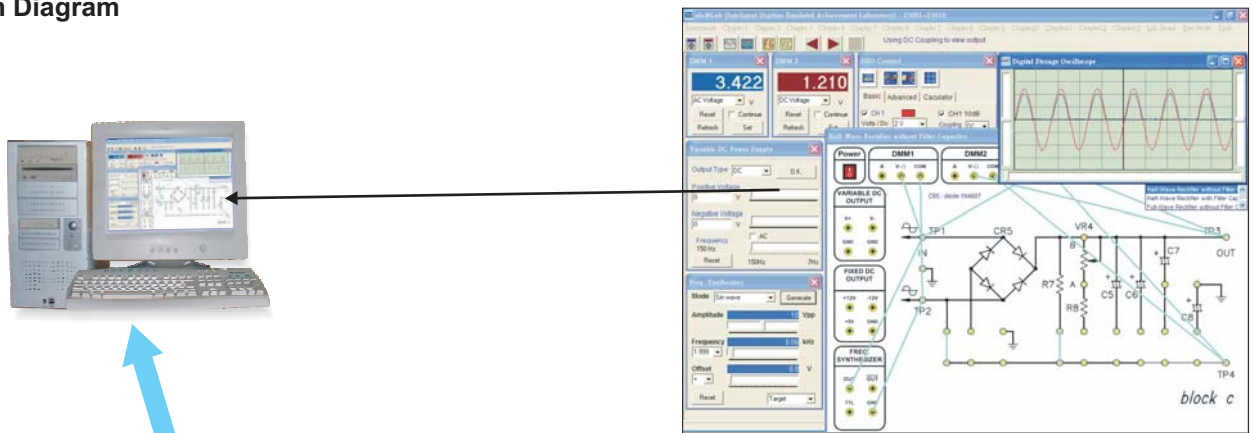
User Interface

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