model:Electrical & Electronic project-GTBD1900

Electrical and Electronic Project equipment

1. Features

1) It should be able to learn the operation principle and design ability of basic electric and electronic circuits, and it is possible to improve the understanding and application of more realistic electronic circuits through the mixed practice environment of analog IC and digital IC.
2) It consists of learning modules for each learning field, making it easy to practice and equipped with basic signal generator, power supply, voltage, current, and resistance measuring device.
3) Increased learning effect by providing analog signal measurement and real time monitoring by providing oscilloscope function
4) The durability of the practice module is ensured by the use of durable and spare parts.
5) It is equipped with detachable bread board, so it is possible to apply and learn through verification and transformation through separate wiring after practice.
6) Breadboard type connector used for each electronic module connection connector.
7) Each module is equipped with test pins at critical test points to verify signal measurement by the test equipment.
8) A wide range of frequency generators, duty variable and various waveforms can be output simultaneously.
9) It is possible to experiment with power circuit using AC voltage by generating various AC output voltages.
10) Two electronic circuit modules can be tested at the same time, so interlocking experiments are possible.
11) Equipped with an audible speaker to check and monitor the results of experiments using sight and hearing.
12) There are individual power protection circuits for the safety of the practice equipment, which automatically cuts off the power and generates an alarm when a short circuit occurs.
13) Various application practice is possible by selection switch operation.
14) Learn how to use basic instruments such as power supplies, oscilloscopes, and function generators.
15) Check the capacity and use of components such as resistors, capacitors, and inductors.

2. System configuration

3. Spec

1) Baseboard Hardware (Input)
   (1) resistance measurement
      ① Digital resistance measurement through resistance measurement terminal
      ② Measuring range: 10Ω, 100Ω, 1kΩ, 10kΩ, 100kΩ, 1MΩ
   (2) AC power: 0V, 6V, 9V, 12V
   (3) AC Voltmeter: 12V
   (4) Slide switch: + 5V 2EA, -5V 2EA, + 15V 2EA, -15V 2EA
   (5) Tact Switch: + 5V 1EA, -5V 1EA, + 15V 1EA, -15V 1EA
   (6) Waveform Generator & Output Level Adjuster
      ① Sine wave, triangle wave, square wave through built in waveform generator
      ② 0.1Hz ~ 100kHz
   (7) Duty Generator: 10% ~ 90%
   (8) Variable resistance generator: 4 range variable resistance regulators of 1kΩ, 10kΩ, 50kΩ, 100kΩ
   (9) Capacitor selector: 100F, 1nF, 10nF, 47nF, 100nF, 1000nF range measurement
   (10) Variable power generator: + 1.5V ~ + 18V, -1.5V ~ -18V
   (11) Fixed voltage output: + 5V, 5V, + 15V, 15V
   (12) Fixed frequency output: 0.5Hz, 1Hz, 50Hz, 100Hz
   (13) Variable Signal Voltage Generator: +5V ~ -5V
2) Baseboard Hardware (Output)
   (1) Frequency counter: 0Hz ~ 10kHz measurement
   (2) Analog & Digital Voltmeters: 0V to 30V, AC and DC Voltage Measurements
   (3) Analog & Digital Ammeters: 0A to 1A, AC and DC Current Measurements
   (4) Display function
      ① 7 Segment: 2ea
      ② LED: 8ea (for output display)
      ③ LED: 3ea (for displaying mode status)
      ④ Speaker: 1ea
      ⑤ Speaker Volume Control: 1ea
      ⑥ USB DAQ Input & Output: Each 1ea
      ⑦ Program waveform output: 1ea
      ⑧ Scope: 2 channels, 250KHz
   (5) Oscilloscope output: USB (Cortex M3)
   (6) DAQ output: USB To Serial (FTDI - FT232BL)
3) Module implementation
   (1) RF SMB Connectors: 25 Included for digital logic module compatibility
   (2) Simultaneous installation / practice of at least two training theme modules on the main body is possible.
4) Exercise Module
   (1) Ohm's law and series / parallel circuit of resistance
      ① parallel circuit of resistors
      ② series circuit of resistor
      ③ series / parallel circuit of resistance
   (2) Kirchhoff's law of current and voltage
      ① Kirchhoff's Law of Voltage
      ② Kirchhoff's law of current
   (3) Capacitor series / parallel circuit, R-C series circuit
      ① parallel circuit of capacitor
      ② series circuit of capacitor
      ③ R-C series circuit
   (4) Inductor series / parallel circuit, R-L series circuit
      ① parallel circuit of inductor
      ② series circuit of inductor
      ③ R-L series circuit
   (5) Differential and Integral of Waveform, R-C and R-L Parallel Circuits
      ① differential circuit
      ② integral circuit
      ③ R-C parallel circuit
      ④ R-L parallel circuit
   (6) Wheatstone Bridge
      ① Resistance measurement circuit of Wheatstone bridge
      ② Capacitor Measurement Circuit of Wheatstone Bridge
   (7) Voltage multiplier and current multiplier, maximum power transfer conditions and impedance matching circuit
      ① voltage multiplier circuit
      ② current multiplier circuit
      ③ Maximum power transfer condition and impedance matching circuit

(8) R-L-C series and parallel resonant circuit
① R-L-C series resonant circuit
② R-L-C parallel resonant circuit
(9) Thevenin and Norton's Theorem
① Thevenin's Theorem Circuit
② Thevenin's Theorem equivalent circuit
③ Norton's Theorem Circuit
(10) The principle of superposition, the characteristics of the diode
① principle of superposition circuit
② Characteristics of junction diode
③ Characteristics of Zener Diode
④ Characteristics of LED
(11) Half wave rectification and full wave rectification circuit
① Half wave rectifier circuit
② Radio wave center tap rectifier circuit
③ full wave bridge rectifier circuit
(12) Operational Amplifier Circuit 2
① inverting amplifier
② non-inverting amplifier
③ adder
④ Subtractor
⑤ Voltage follower
(13) Oscillation circuit
① sine wave generator
② square wave generator
③ triangle wave generator
④ LC oscillation circuit
⑤ RC oscillation circuit
(14) Pulse circuit
① Unstable Multivibrator
② Monostable Multivibrator
③ Clipper
④ Clamper
⑤ RLC response waveform
(15) Programmable Logic Controller Module
① It consists of a separate terminal terminal block to prevent damage to the terminal block of PLC main body.
② Manufactured as a clamp type module to attach and detach the working board.
③ Operation method: repeat, fixed cycle, interrupt operation, fixed cycle scan
④ I / O control method: scan synchronous batch processing method
(refresh method), immediate input and output by command (direct method)
① Programming language: ladder diagram (LD), instruction list (IL)
② Operation processing: 83us / Step
③ Program Capacity: 15k Steps
④ Operation Mode: RUN, STOP, DEBUG
⑤ Program Port: RS 232C (1CH), USB (1CH)
⑥ Input unit
* Input points: 16 points
* Insulation method: photo coupler insulation
⑦ Output Unit
* Output score: 16 points
* Insulation method: relay insulation
⑧ Rated Load Voltage / Current: DC24V 2A (Resistance Load) / AC220V 2A (COSΦ = 1), 5A / COM
⑨ Rated Input Power: AC100 ~ 240V
(16) Input control module
① Push Switch
② Toggle Switch
③ EMG Switch
④ Compatible with PLC Unit.
⑤ Name Silk Printing Treatment
(17) Output Lab Module
① LAMP UNIT
* working voltage: DC24V
* Red lamp: 4ea (4 points 1COM)
* Blue lamp: 4ea (4 points 1COM)
② BUZZER UNIT
* Operating voltage: DC24V
* Power supply 4mm terminal block

* Compatible with PLC Unit.
* name silk printing treatment

(18) 7 Segment Display UNIT
① Digital Display (2digits)
② 4mm terminal block
③ Compatible structure with PLC unit
④ Name Silk Printing Process

(19) DC MOTOR UNIT
① Driving voltage: DC24V
② rotation detection disc
③ Rotating Disc Detection Photo Sensor
④ Power Supply 4mm Terminal Block

(20) Step Motor Training Department
① Motor: Stepping Motor
② Drive power: DC24V
③ Rotary disc attachment type
④ Rotating Disc Detection Photo Sensor
* Compatible with PLC unit.
* designation silk printing treatment

(21) PHOTOVOLTAIC CELL MODULE
① Light source incident angle adjustment function
② Solar cell
* Max.Power: Pm: 5W
* Max.Power Voltage: Vmp: 17.5V
* Max. Power Current: Imp: 300mA
* Open Voltage (Voc): 21.4V
* Short Circuit Current: Isc: 390mA
③ PV output terminal (4mm insulation type)
④ Module handle (aluminum): Front panel left and right

(22) Smart Farm (greenhouse model) MODULE
① Size: 640 (W) x 820 (D) x 500 (H) mm
② Sensor: temperature, humidity, soil sensor, CDS, CO2,
③ Potted water cycle pump (LED bar water flow indication)
④ Illuminated LED Bar
⑤ Ceiling open motor (Push Pull type linear step motor) x 2 EA
⑥ Fan Fan (DC 5V)
⑦ Model flower bed: 530 (W) x 730 (D) mm or more
⑧ Linear Step Motor Control Board
⑨ Door hinge attachment and window acrylic attachment
⑩ Power: AC 220V / DC 12V, 5V built in power
⑪ ATmega 2560 Module
* Clock: 16MHz or more
* Digital input / output pin: 54 or more
* Analog Port Pin: 16 or more
* PWM CH: 15 or more
* Flash memory: 256KBytes or more
* SRAM: 8KBytes or more
* EEPROM: 4KBytes or more
* USB cable

(23) Robot Control Module
① Servo Drive
* Voltage / frequency: single phase AC200 ~ 230V / 50, 60Hz or three phase AC200 ~ 230V / 50, 60Hz
* Control method: sine wave PWM control, current control method
* Position Control Mode: Maximum Input Pulse Frequency 1Mpps
* Speed control mode: Speed control range: Analog speed command 1: 2000, internal speed command 1: 5000
* Torque control: Analog torque command input: DC0 to ± 8 V / maximum torque (input impedance 10 to 12 kΩ)
② Servo Motor
* rated power: more than 50W
* rated rotation speed: 3000 r / min
③ Smart Servo Actuator Unit
* Max Input Speed: 3000 rpm
* Moving Speed: 250 mm / s

5) Electronic circuit simulation software
(1) Schematic Capture
① Support for more than 68,000 libraries and real time updates via the Internet
② Simultaneous simulation and PCB artwork for the designed drawing

③ Color display of various Net trace function and wiring connection information
④ Intelligent wire work and auto junction function
⑤ Schematic & PCB Layout Cross Probe (Waire, Routing, Component, PAD, PIN, Text ...)
⑥ Provides various ECAD Data Import functions such as OrCAD, P cad, Board Station, Expedition, DxDesigner, Pads, Protel, CADStar, Allegro Design, Eagle CAD
⑦ Mirror function for each part
⑧ Provide circuit composition using device sheet
⑨ Support Net Class, DifferentialPair, PCB Design Rule setting in circuit diagram

(2) Simulation
① Mixed analog and digital circuit simulation with Xspice 3f5 engine.
② Simultaneous Simulation of Schematic Circuit and PCB Layout
③ DC Sweep, Temperature Sweep, Transfer Function, Monte Carlo, Transient / Fourier, AC Small Signal, Noise, Parameter Sweep
④ Support output signal operation
⑤ Select function and multi viewer function for output waveform
⑥ Aldec OEM simulator

(3) PCB design
① Layer Stack and Layer thickness application function for the whole board
② Display function for board and electrical port
③ Signal Integrity Simulation based on powerful DRC Rules
④ Single PAD, Via, solder and Paste Mask Setting
⑤ OrCAD, PCAD, Power PCB (Pads), Tango, Cadstar, MxDesigner, Cadence Alegro, AutoCAD File Format Automatic Export and Import
⑥ Gerver Data and NC Drill File Output Function
⑦ Board Wizard, Gerver Wizard, Bom Data Wizard, PCB Component Wizard ...
⑧ PCB Output File Management through CAM Manager
⑨ Output File Format Preparation Considering CAM Equipment Layer Stack Automatic Display Function
⑩ Switchable to direct Schematic to PCB and PCB to Schematic
⑪ True PCB Design Collaboration
⑫ The next generation of Interactive Routing
⑬ Footprint Comparison Report
⑭ Custom Cartesian and Polar Grids
⑮ Variants shown in the PCB editor
⑯ Atmel QTouch (R) support
⒔. Cursor Snap Management and Working Guides

(4) Auto route
① Manufacture PCB based on Windows
② Simultaneous routing of multi layer boards (8 wiring directions: horizontal, vertical, any, etc.)
③ Design Capability: 30F / Infinity
④ Automatic Test Point Generation
⑤ Create Via Hold according to user's working environment
⑥ Select Route function such as Component, Area, Connection, Net, All ...
⑦ Memory, Fan Out Used SMD Pins, Pattem, Shape Router Push And Shove, Shape Router Rip Up, Clean During Routing, Clean After Routing, Evenly Space Tracks, Add Testpoints, Pre route
⑧ Automatic image retention after routing
⑨ Rules application function for Net Level and Class Level
⑩ Spectra Auto Router Support

(5) FPGA peripheral cores
① CAN Controller - parallel to serial interface, implementing the BOSCH® CAN 2.0B Data Link Layer Protocol.
② FPGA Startup - user definable power up delay, used to implement power on reset.
③ I2C - parallel to serial interface, implementing an Inter Integrated Circuit (I2C) 2 wire serial bus on the serial side.
④ Keypad Controller - 4 by 4 keypad scanner with de bounce. Can be used in a polled or interrupt driven system.
⑤ LCD Controller - bus style interface controller for a 2 line by 16 character LCD module.
⑥ Port extension units - 8 bit output and input / output port units, available in 1, 2 and 4 port wide configurations
⑦ PS2 Controller - parallel to serial interface providing a bidirectional, synchronous serial interface between a host MCU and a PS / 2 device (keyboard or mouse).
⑧ SRL0 - simple parallel to serial interface, full duplex, single byte buffering.
⑨ TMR3 - dual timer unit, 16, 13 and 8 bit timer / counter modes.
⑩ VGA - VGA controller that presents video memory as a flat address space. Supports VGA and SVGA resolutions, and B & W, 16 and 64 color. Outputs digital RGB and H + V sync.

(6) 3D View
① 3D parts creation and IMPORT / EXPORT available
② PCB BOARD Export / Import
③ DATA compatible with 3D CAD.