

## **Mechatronics Control Training Systems p.1 - p.3**

- \*Modular CD Production System
- \*Modular Production System
- \*Comprehensive Mechatronics Workstation
- \*Shape Detection & Sorting Station
- \*Object Orientation Sensing & Correction Station
- \*Material Selection & Sorting Station
- \*Mechanism Trainer
- \*Impact Slider Motion Mechanism
- \*Toggle Mechanism
- \*Cylindrical CAM Motion Mechanism
- \*Disk CAM Mechanism
- \*Bevel Gear Motion Mechanism
- \*Geneva Mechanism
- \*Worm Shaft & Worm Gear Mechanism
- \*Scotch Yoke Mechanism
- \*Planetary Gear Motion Mechanism

## **Hydraulics Control Training Systems p.3**

- \*Hydraulic Servo/Proportional/Digital Control System
- \*Electro-Hydraulic Control System
- \*Acrylic Hydraulic Training System

## **Pneumatics Control Systems p.4-p.5**

- \*Basic Pneumatic Elements Lab
- \*Basic Pneumatic Loops Lab
- \*Electro-Pneumatic Lab
- \*Pneumatic PLC Control Lab

## **Microprocessor Trainer p.5- p.6**

- \*Microprocessor Training System
- \*Microcontroller Training System
- \*I/O control applications & experiments for MTS-8088 & IBM PC or compatible
- \*A/D,Thermal Sensor Board
- \*Motor Control Board
- \*Basic I/O Experiment Board
- \*Multi-function I/O Lab

## **Green Energy Trainers p.7**

- \*Wind Energy Trainer
- \*Solar Energy Trainer
- \*Solar Energy Demonstrator

## **Electronic/Electrical/Communication Labs p.7-p.14**

- \*Digital Circuit Lab
- \*Digital/Analog Circuit Lab
- \*Powered Project Lab
- \*Electronics & Electricity Lab
- \*Sensor Trainer
- \*CFLO/PPG A/ISY/BOSS LAB
- \*Fiber Optic Communication Lab
- \*Wireless/RF Communication Lab
- \*Microwave Active Circuit Design
- \*Digital Signal Processing(DSP)/Control Lab
- \*Power Electronic Trainer
- \*Electrical Machinery Experiments
- \*Automatic Control Trainer
- \*PLC Controls Lab

## **Educational Kits and Toolkits p.15 - p.16**

- \*Robot kits
- \*Arduino Apple Board
- \*Basic Telephone Kit
- \*Fuzzy Indoor Intercom
- \*Wireless A/V Sync.Transmitter Kit

## **Breadboards Jumper Wires p.17**

- \*Breadboards
- \*Powered Breadboard
- \*Jumper Wires

## **IC Tester and (E)EPROM Programmers p.17 - p.18**

- \*Pocket Universal Programmer
- \*Digital IC Tester
- \*Linear IC Tester
- \*Portable EPROM Eraser
- \*Universal IC Programmer

## **PCB Prototyping Machines p.18**

## **Test & Measuring Equipment p.18 - p.27**

- \*Audio Generator/Counter
- \*Signal Generator/Counter
- \*WOW-Rutter Meter
- \*Power Meter
- \*Dip Meter
- \*Frequency Counter
- \*Function Generator
- \*LCR Meter
- \*Digital Multimeter
- \*Single Output DC Power Supply
- \*Dual Output DC Power Supply
- \*Oscilloscope
- \*Analog/Digital Insulation Tester
- \*Electrical Network Analyzer
- \*Analog Earth Resistance Tester
- \*Analog/Digital ELCB Tester
- \*Anemometer
- \*Power Analyzer
- \*Probes/Test Leads
- \*Voltage Tester
- \*Live Circuit Detector/Voltage Tester
- \*Phase Sequence Indicator
- \*Temperature Probes

## **Automotive Equipment p.27**

- \*10-Function Diagnostic Analyzer
- \*Timing Lights

## **Tools and Toolkits p.27 - p.28**

## **Soldering and Desoldering Stations p.28 - p.29**

## **Alternative Energy Kits p.29**

- \*Solar Power Serial
- \*Solar Power Parallel
- \*Wind Power Parallel
- \*Solar Wind Power

**Mechatronics Control Training Systems****Modular CD Production System:****MCD-91100****Features:**

\*Innovative:

The first Mechatronics control system based on the concept of a CD production line in the world.

\*Training Efficiency:

Planning, assembly, programming, operation, maintenance, and troubleshooting of production systems can be taught at various complexity levels.

Hands-on Industrial Practice:

The knowledge obtained by simulating a CD Production Line, can be transferred to any automated production lines.

1. Automobile assembly, food packaging, electronics assembly, etc.

\*Control Training Concepts:

Mechanism design, Hydraulics, Pneumatics, Electrical, Sensors, PLC, and Troubleshooting Curvilinear training methods address each area separately. The MCD-91100

addresses all areas in a "systemic approach". Student learning is dramatically increased when this approach is implemented. Students seeing the entire process in action are better able to understand how individual parts and

components need to function.

**Includes:**

- A. Control Unit
- B. Distribution Station (ME-2001)
- C. Cooling Station (ME-3002)
- D. Buffing Station (ME-3004)
- E. Printing / Baking Station (ME-3004)
- F. Quality Control Station (ME-3005)
- G. Adhesive-Coating Station (ME-3006)
- H. UV Processing Station (ME-3007)
- I. Storage Station (ME-3008)

**Modular Production System****MPS-61200****Features:**

\*Training Efficiency:

Planning, assembly, programming, operation, maintenance, and troubleshooting of production systems can be taught at various complexity levels.

\* Hands-on Industrial Practice:

Experiences learned from MPS can be applied to industrial practice without any gap.

\*Control Training Concepts:

Mechanism Design, Hydraulics, Pneumatics, Electronics, Sensors, PLC, and Troubleshooting

**Includes:**

- A. Control Unit
- B. Distribution Station (ME-2001)
- C. Testing Station (ME-2002)
- D. Processing Station (ME-2003)
- E. Handling Station (ME-2004)
- F. Assembly Station (ME-2005)
- G. Buffing Station (ME-2006)
- H. Packing & Sorting Station (ME-2007)
- I. Storage Station (ME-2008)

**Comprehensive Mechatronics Workstation****CMW-61300****Features:****A. Distribution:**

1. A separate-type fiber optical sensor, detecting if the magazine is empty, is installed at the bottom of the magazine.

2. A double-acting cylinder delivers a workspace from the magazine onto by one.

3. A **micro switch, detecting if a work piece has reached the ready position for the Pick & Place Arm** to pick it up, is installed at a V-shaped platform.

4. Aluminum distribution mechanism.

**B. Pick & Place Arm:**

1. Arm rotation is driven by a DC gear-head motor.

2. A **pneumatic cylinder controls the vertical movement** of the arm.

3. Pneumatic gripper.

4. Aluminum structure with 4 linear roller bearings and 4 steel rods securely supports the DC gear-head motor.

**C. Conveyor:**

1. An inductive proximity switch determines if the part is metal or plastic. A photo-electric sensor verifies the color of the plastic part. A reflective proximity switch determines if a workspace is on the conveyor.

2. **Two detectors**, (Aluminum, or white plastic, black plastic), will be directed off the conveyor belt into two side slides and the other type of part will drop into the end bin.

3. A pneumatic cylinder ejects a part from the conveyor to the first side slide.

4. An AC solenoid mechanism, a solid-state relay works as the control interface, delivers a part to the second side bin.

5. Fixed-focus reflective photo-electric sensor verifies parts have dropped into the side slide.

6. A diffuse reflective fiber optical sensor verifies part has dropped into the end bin.

7. **Conveyor belt is driven by a stepper motor.**

8. Conveyor belt tension is adjustable by two belts.

**Shape Detection & Sorting Station: SDS-60100****Specifications:**

1. 3-point Assembly
2. Control Switch
3. 5W/2P single-pilot solenoid valve
4. Throttle Valve
5. Pneumatic Cylinder
6. Robotic Arm Mechanism
7. Cylinder Workspace Delivery Unit



8. Cable Workspace Delivery Unit

9. Sensors

10. Conveyor

11. Motor

12. Electrical Components

13. PLC

**14. Profile Aluminum Plate Experiments:**

1. Introduction to Pneumatic Circuits

2. Introduction to Robot Mechanism

3. Introduction to Shape Sensors

4. Introduction to Electro-Pneumatic Components

5. Circuit Design

6. PLC Program Design

**Color Identification & Sorting:****CIS-60200****Specifications:**

1. 3-point Assembly
2. Control Switch
3. 5W/2P single-pilot solenoid valve
4. 5 W/2P dual-pilot solenoid valve
5. Throttle Valve
6. Sliding Cylinder
7. Cylinder
8. Rotary Actuator
9. Vacuum Generator
10. Vacuum Sucker
11. Air Pressure Switch
12. Electrical Components
13. PLC
14. Profile Aluminum Plate
15. Sensors
16. Robot Mechanism Experiments:
1. Introduction to Pneumatic Circuits
2. Introduction to Robot Mechanism
3. Introduction to Color Sensors and Limit Switches
4. Introduction to Electro-Pneumatic Components
5. Circuit Design
6. PLC Program Design

**Object Orientation Sensing & Correction Station: OOS-60300****Specifications:**

1. 3-point Assembly
2. Control Switch
3. 5W/2P single-pilot solenoid valve



1. 3W/2P double-pilot solenoid valve
2. Check Valve
3. Cylinder
4. Throttle Valve
5. Vacuum Generator
6. Vacuum Switch
7. Pressure Switch
8. CAM Mechanism with motor
9. Electrical Components
10. Sensors
11. Profile Aluminum Plate
12. PLC

**Experiments**

1. Introduction to Pneumatic Circuits
2. Mechanism Installation
3. Introduction to Sensors
4. Introduction to Electro-Pneumatic Components
5. PLC Program Design and Wire Connection

**Material Selection & Sorting Station:****MS8-60400****Specifications**

1. 3-point Assembly
2. Control Switch
3. 3W/2P single-pilot solenoid valve
4. 3W/2P double-pilot solenoid valve
5. Throttle Valve
6. Cylinder
7. Sensors
8. Rotary Table Mechanism
9. Pressing Mechanism
10. Drill Bag Mechanism
11. Electrical Components
12. Profile Aluminum Plate
13. PLC

**Experiments**

1. Introduction to Pneumatic Circuits
2. Introduction to Robot Mechanism
3. Introduction to Material Sensors and Limit Switches
4. Introduction to Electro-Pneumatic Components
5. Circuit Design
6. PLC Program Design

**Mechanism Trainers: MT-10100**

- 30mm Screw Rod Slide Mechanism
- Conveyor Mechanism
- Indexing Mechanism
- Automatic Door Mechanism
- Photointerrupter
- Extension Shaft
- Worm Gear Speed Reducer Mechanism
- Main Shaft Mechanism of Drill (Type-II)
- L-Shape Steel
- Platform



- Weight Detection Mechanism
- Length Detection Mechanism
- Reflective Photoelectric Switches
- Limit Switch Mechanism
- Proximity Switch Mechanism
- Cylinder Object Sample
- Pneumatic Robots Arm Mechanism
- Motor Robotics Arm Mechanism
- Storage Rack Mechanism
- Z-axis Screw Rod Mechanism
- Elevator Mechanism
- Vibrator Feeder Mechanism
- Rocker Arm Mechanism
- Project Moving Guide Mechanism
- Gear Coupler Mechanism
- Rotary Table Mechanism
- Geneva Gear Indexing Mechanism
- Roller Gear Cam Mechanism
- Rack and Pinion (Gear) Mechanism
- Rack and One Way Clutch Gearing Mechanism
- One Way Clutch Mechanism
- Rack and One Way Ratchet Gearing Mechanism
- One Way Ratchet Gearing Mechanism
- Gearing Set Mechanism
- Cam Mechanism
- Crank Mechanism
- Rocking Lever Mechanism
- Toggle Joint Mechanism
- Sliding Platform Mechanism

**Input Slider Motion Mechanism: ISM-61401**

- AC inductive motor, 220V/15W/0.2A/1250 ~ 1550 r/min, toggle switch, fuse protection.
- Circular motion is converted to linear motion on the input slider through the connected bars.
- All bars are connected with dry bearings.
- Components are dyed in various colors to make transmission between components easily understood.
- Size: 260 x 180 x 215 mm (1 0.25" x 7" x 8.5")

**Toggle Mechanism: TM-61402**

- The input shaft (Ø 12 mm) moves linearly.
- Two pairs of beam, driven by the input shaft, move angularly.
- The output shaft moves linearly and is driven originally by the input shaft via two pairs of angular movement beams.
- Dry bearings are used to connect beams.
- Components are dyed in various colors which will make transmission between components easily understood.
- Size: 300 x 200 x 100 mm (11.75" x 8" x 4")

**Cylindrical CAM Motion Mechanism: CCM-61403**

- AC inductive motor, 220V/15W/0.2A/1250 ~ 1550 r/min, toggle switch, fuse protection.
- PVC cylinder with an enclosed curve slot along the surface.
- AC motor drives the cylinder which drives the linear motion output rod.
- A fixed length connecting bar between cylinder and output bar is fixed on the output bar and has a roller on the other end which fits into the enclosed curve slot. As the cylinder rotates, it moves back and forth.
- The output bar is supported by two stainless blocks. Linear motion bearings of low continuous linear motion as the motor drives the cylinder.

- Components are dyed in various colors which will make transmission between components easily understood.
- Linear movement input
- Size: 540 x 200 x 120 mm (13.5" x 8" x 4.75")

**Disk CAM Mechanism: DCM-61404**

- Two gears connect the input rotation bar and the bar drives the CAM disk and also convert rotation against X-axis to rotation against Z-axis.
- Disk CAM drives the follower roller to move regularly with the maximum linear displacement of 48 mm (1.5").
- The connecting beam is pinned in the middle and has two roller bearings at both ends to connect the driver (Disk CAM) and the output rod.
- The output rod is supported by two stainless blocks with a spring in between for auto return.
- Components are dyed in various colors which will make transmission between components easily understood.
- Rotational movement input
- Size: 260x220x 135 mm (10.25"x8.5"x5.25")

**Bevel Gear Motion Mechanism: BGM-61405**

- AC inductive motor, 220V/15W/0.2A/1250 ~ 1550 r/min, toggle switch, fuse protection.
- M2 x 18T bevel gear connected to motor shaft and driven two other bevel gears to rotate clockwise and counter clockwise, respectively.
- Two output rotation shafts are based on two roller bearings.
- Components are dyed in various colors which will make transmission between components easily understood.



- \* One rotation input, two rotation outputs
- \* Size: 248 x 188 x 166 mm (9.75" x 7" x 4.25")

#### Geneva Mechanism: GM-61486

- \* Blue shaft connector is fixed at the input and to take rotational input.
- \* A blue PVC wheel consists of two disks, 154 mm and 108 mm in diameters.
- \* A roller is fixed on the outer disk (Ø 154 mm) as the drive pin.
- \* There are 4 slots on the green metal wheel which is driven by the blue wheel.
- \* The rotational movement of the blue wheel is continuous but the green wheel rotates in steps.
- \* It takes four revolutions of the blue wheel to produce one revolution of the green wheel.
- \* Both blue and green wheels are supported by roller bearings.
- \* Components are dyed in various colors which will make transmission between components easily understood.
- \* Rotational input, rotational output.
- \* Size: 280 x 130 x 165 mm (11" x 4.25" x 5.25")

#### Worm Shaft & Worm Gear Mechanism: WSG-61407

- \* Gear ratio of Worm Shaft (Blue) to Worm Gear (Green) is 10 : 1
- \* Both Worm Gear and Worm Shaft are supported by roller bearings.
- \* Components are dyed in various colors which will make transmission between components easily understood.
- \* Rotational input, rotational output.
- \* Size: 160 x 140 x 140 mm (6.25" x 5.50" x 5.50")

#### Scotch Yoke Mechanism: SYM-61408

- \* The rotational input drives the link beam (red) to rotate with a radius of 50 mm (2").
- \* The dotted link beam (black) with an opening of 100 mm (4") translates the rotational movement (red link beam) to linear movement (output rod).
- \* The output arm (green) has a pendulum on one end.
- \* The output arm moves as lever movement as the stainless rod pushes and pulls on the other end.
- \* Components are dyed in various colors which will make transmission between components easily understood.
- \* Rotational input
- \* Size: 250 x 180 x 120 mm (10" x 7" x 12.50")

#### Planetary Gear Motion Mechanism (PGM-61409)

- \* AC inductive motor, 220V (15W) 0.2A/1250 - 1550 r/min, toggle switch, fuse protection.



- \* Motor drives the Sun gear, M1 x J2T (green) which drives 3 planetary gears, J4T, (blue) which rotate along the outer gear (yellow).
- \* 3 planetary gears with roller bearing are fixed at a triangle plate with a shaft at its center for rotational output.
- \* Components are dyed in various colors which will make transmission between components easily understood.
- \* Size: 220 x 200 x 150 mm (10" x 8.75" x 6")

#### Hydraulic Control Training Systems

##### Hydraulic Servo/Proportional/Digital Control System: HSPD-66100

###### Features

- \* This system provides closed-loop, feedback control concepts on servo, proportional, and digital selected high speed solenoid valve applications for students to learn advanced hydraulic controls.
- \* Instructors can choose either Servo or Proportional valve control or both to fit your teaching goals.
- \* Extruded aluminum T-slot bars make it easy to set up hydraulic elements.
- \* Built-in sensors with displays for displacement pressure and flow rate measurements.
- \* Specifications:  
Hydraulic Power Unit  
\* Pump, 2900 psi, 4 c.c./rev  
\* Electric motor, 1 HP, 3 phases  
\* Tank, 35 liters  
\* Pressure gauge  
\* Oil refill port  
\* Hydraulic inlet  
\* Hydraulic outlet  
\* Pressure relief valve  
Hydraulic Control Elements  
\* Pressure gauge 2 pcs  
\* Low-pressure filter 1pc  
\* Accumulator 1 pc  
\* High-pressure filter 1 pc

- \* Servo valve 3 pc  
\* Digital valve (high speed solenoid) 2 pcs  
\* Proportional directional valve 1 pc (for proportional valve control)
- \* Proportional flow control valve 1 pc (for proportional valve control)
- \* Proportional pressure relief valve 1 pc
- \* Flow meter with digital display 1 pc  
\* Transducer with digital display 1 pc  
\* External potential meter with digital display 1 pc  
\* Built-in potential meter with digital display 1 pc  
\* Load cell with digital display 1 pc  
\* Hydraulic motor with digital display 1 pc  
\* Pipe 25 pcs

###### Electric Control Unit

- \* Servo controller
- \* Silk-screen printed schematic control panel
- \* PC interface card
- Experiments

###### Servo Valve Controls

- \* Introduction to servo valves
- \* Servo valve flow properties
- \* Servo valve pressure properties
- \* Servo valve temperature properties
- \* Dumper properties in hydraulic servo system
- \* Inertia-loaded properties in hydraulic servo system
- \* Spring-loaded properties in hydraulic servo system
- \* Position control in hydraulic servo system
- \* Speed control in hydraulic servo system
- \* Force control in hydraulic servo system
- \* Angular displacement control in hydraulic servo system.

- \* Angular speed control in hydraulic servo system
- Proportional Valve Controls
- \* Proportional pressure relief valve properties
- \* Proportional flow control valve properties
- \* Proportional directional valve properties
- \* Hydraulic position control, proportional controller
- \* Hydraulic position control, proportional-directive controller
- \* Hydraulic position control, proportional-integral-derivative controller
- Hydraulic Servo Valve Control Only (HPC-66102): Hydraulic Proportional, Digital Valve Control only

##### Electro-Hydraulic Control System: EHC-66110



- Features  
EHC-66110 covers fundamental hydraulic, hydraulic logic, and Electro-Hydraulic controls

###### Includes

- Hydraulic Power System
- \* Tank, 60 liters
- \* Power switch
- \* Voltage/Ampere meter
- \* Pump, 1740 psi, 3.6 liter
- \* Electric motor, 1 HP, 3 phases
- \* Pressure relief valve
- \* Pressure gauge
- \* Thermometer
- \* Oil refill port
- Electrical Control System
- \* Power supply
- \* Limit switch
- \* 4-position selection switch
- \* Relay
- \* Reed switch
- \* Connection cords
- \* Load indicator
- \* Emergency stop
- \* Push button
- \* Timer

###### Hydraulic Control System

- \* Shut valve
- \* 3-point assembly
- \* Pressure relief valve
- \* Pilot-operated pressure reducing valve
- \* Pressure reducing valve
- \* Two-way flow control valve
- \* One-way flow control valve
- \* Sequence valve
- \* Check valve
- \* Load coil
- \* 6-port outlet
- \* 6-port inlet
- \* Hydraulic motor
- \* Motion lock valve
- \* 4W/3P directional valve, manual-controlled
- \* Differential cylinder
- \* Double-acting cylinder
- \* General Accumulator
- \* Pressure switch
- \* 3-way distributor
- \* 4-way distributor
- \* Single 4W/2P solenoid
- \* Double 4W/2P solenoid
- \* Connection pipe
- \* Pressure compensated flow control valve
- \* 4W/3P directional valve, manual-operated
- \* Check valve, pilot-operated



**Acrylic Hydraulic Training System****AHT-466000****Features:**

\* Clear cast Acrylic hydraulic elements will help students easily understand hydraulic technologies.

\* Students can actually see and feel the pressure and flow directions inside the elements.

\* This system is one of the best learning tools for students to fully understand the principles of hydraulic system.

**Includes:**

Hydraulic Power Unit  
Hydraulic Control Unit  
Acrylic Hydraulic Elements

**Pneumatic Control Systems****Pneumatic Control Systems**

These systems are designed for students in Mechanical, Control, and Industrial Engineering. The 3-level pneumatic training systems will teach the basics to the advanced pneumatic controls.

**Features:**

1. This system starts from the basic pneumatic element kits which gives a prerequisite understanding about how pneumatic elements work.
2. The second stage, Basic Pneumatic Loops Lab, will use the knowledge from the first stage to achieve various valve and cylinder controls.
3. Electro-Pneumatic control is introduced in the 3rd stage.
4. Pneumatics controlled by PLC is introduced in the fourth stage.

**Basic Pneumatic Elements Lab:****BPE-46001****Specifications:**

1. Plate Size: 23.5" x 28.5"
2. Three-Point Assembly: 1 pc
3. Air Supply Block: 1 pc
4. Double-Acting Cylinder: 1 pc
5. Single-Acting Cylinder: 1 pc
6. One-way Flow Control Valve: 2 pcs
7. 5/2 Two-way, Pilot-Operated Valve: 1 pc
8. 5W/2P Push Button Operated Valve: 1 pc
9. 7W/2P Normally Closed, Push Button Operated Valve
10. Delay Valve: 1 pc
11. Shuttle Valve: 1 pc
12. AND Gate Valve: 1 pc
13. Quick Exhaust Valve: 1 pc
14. Sequence Valve: 1 pc
15. Pressure Gauge: 1 pc
16. PU tube: 50 pcs
17. 3-Way Connector: 2 pcs
18. Experiment Manual: 1 pc

**Experiments:**

1. Introduction to Single-Acting Cylinder
2. Introduction to Double-Acting Cylinder
3. Introduction to Shuttle Valve
4. Introduction to One-way Flow Control Valve
5. Introduction to Quick Relief Valve
6. Introduction to AND gate Valve
7. Introduction to Flow Direction Control Valve
8. Introduction to Sequence Valve
9. Introduction to Delay Valve

**Basic Pneumatic Loops Lab:****BPL-46002****Specifications:**

1. Plate Size: 23.5" x 28.5"
2. Three-Point Assembly: 1 pc
3. Air Supply Block: 1 pc
4. Double-Acting Cylinder: 3 pcs
5. Single-Acting Cylinder: 1 pc
6. One-way Flow Control Valve: 4 pcs
7. 5/2 Two-way, Pilot-Operated Valve: 3 pcs
8. 5/2 One-way, Pilot-Operated Valve: 3 pcs
9. 3/2 Normally Closed, One-way Roller-Operated Valve: 4 pcs
10. 5/2 Normally Closed, Two-way Roller-Operated Valve: 6 pcs
11. Pressure Gauge: 1 pc
12. 3/2 Normally Closed, Pushbutton-operated Valve: 3 pcs
13. Delay Valve: 1 pc
14. Shuttle Valve: 1 pc
15. AND Gate Valve: 1 pc
16. Quick Relief Valve: 1 pc
17. Sequence Valve: 1 pc
18. PU tube: 50 pcs
19. 3-Way Connector: 3 pcs
20. Experiment Manual: 1 pc

**Experiments:**

1. Application of 3/2 pushbutton-operated valve on safety control loop
2. Single-Acting cylinder control loop
3. Double-Acting cylinder control loop
4. Manually control cylinder to move forward and it returns automatically
5. Manually control cylinder to move forward and it returns after a period of delay
6. A safety control loop controlled by two hands
7. Double-Acting cylinder moves forward slowly and backward quickly
8. Double-Acting cylinder automatic reciprocating
9. Application of emergency switch controlled loop
10. Interlock starting switch control loop:

A+B-B-A

**11. Two double-acting cylinder hand a working piece:**

A+A-B-B

12. Sequence control loop controlled by a cylinder with two roller switches: A+B-B-A
13. Anatomically and manually control manufacture loops
14. Feeding, drilling, and closing application

**15. Sequence control loop (I)****16. Sequence control loop (II)****Electro-Pneumatic Control Lab:****EPL-44403****Pneumatic Elements:**

1. Three-Point Assembly: 1 pc
2. Air Supply Block: 1 pc
3. Double-Acting Cylinder: 3 pcs
4. Single-Acting Cylinder: 1 pc
5. 5/2 Solenoid, Double-Pilot Valve: 3 pcs
6. 5/2 Solenoid, Single-Pilot Valve: 3 pcs
7. PU tube: 50 pcs
8. 3-Way Connector: 10 pcs
9. Pressure Switch: 1 pc
10. Limit Switch: 6 pcs
11. Electro-Pneumatic Control unit
12. 3/2 Pushbutton controlled one-way valve: 1 pc
13. 5/2 Pushbutton controlled one-way valve: 1 pc
14. 3/2 direction selection valve: 1 pc
15. 5/2 direction selection valve: 1 pc
16. 3/2 roller operated two-way valve: 6 pcs

17. 3/2 roller operated one-way valve: 1 pc
18. 3/2 pilot operated one-way valve: 1 pc
19. 5/2 pilot operated one-way valve: 1 pc
20. 5/2 pilot operated two-way valve: 1 pc
21. One-way flow control valve: 6 pcs
22. Quick Relief Valve: 1 pc
23. Shuttle Valve: 2 pcs
24. AND Gate Valve: 2 pcs
25. Timer Valve: 1 pc
26. Pressure Gauge: 1 pc
27. Sequence Control Valve: 1 pc
28. User's Manual: 1 pc

**Experiments:**

1. Single-pilot solenoid valve controlled loop
2. Single-pilot solenoid valve controlled loops with memory function
3. Single-pilot solenoid valve controlled loop-one cycle
4. Single-pilot solenoid valve controlled loop-continuously automatic reciprocating
5. Single-pilot solenoid valve controlled loop-with delay function
6. Single-pilot solenoid valve controlled loop-continuously automatic reciprocating with delay function
7. Single-pilot solenoid valve and single button (on/off) controlled loop
8. Double-pilot solenoid valve and double buttons controlled loop
9. Double-pilot solenoid valve and limit switch controlled loop
10. Double-pilot solenoid valve controlled loop-continuously automatic reciprocating
11. Double-pilot solenoid valve controlled loop-with delay function
12. Double-pilot solenoid valve controlled loop-one cycle
13. Double-pilot solenoid valve controlled loop-continuously automatic reciprocating
14. Double-pilot solenoid valve and single button (on/off) controlled loop
15. Single-pilot solenoid valve controls a double acting cylinder at sequence of A+B-A-B
16. Single-pilot solenoid valve controls a double acting cylinder at sequence of A+A-B-B
17. Double-pilot solenoid valve controls a double acting cylinder at sequence of A+A-B-B
18. Single-pilot solenoid valve controls a double acting cylinder in a delay loop
19. Double-pilot solenoid valve controls a double acting cylinder in a delay loop
20. Three cylinders and three single-pilot solenoid valves controlled sequence loop: A+B+C+B-A
21. Three cylinders and three single-pilot solenoid valves controlled sequence loop: A+A-B+C+B-C
22. Applications of pneumatic pressure switch

**Pneumatic PLC Control Lab: PPLC-4600****Specifications:**

1. Three-point Assembly
2. Air Supply Block: 1 pc
3. Single-Acting Cylinder: 1 pc
4. Double-Acting Cylinder: 3 pcs
5. 5/2 Double-pilot Solenoid Valve: 3 pcs
6. 5/2 Single-pilot Solenoid Valve: 3 pcs
7. PU tubes: 23 pcs
8. 5-Way Air Tube Connectors: 15 pcs
9. Pressure Switch: 1 pc
10. Electro-pneumatic limit switch: 6 pcs
11. Reed Switch: 7 pcs

12. Power Supply: 1 pc
13. Mitsubishi F7CN PLC: 1 pc
14. Cannonnet Wire with banana plugs: 100 pcs
15. User's Manual: 1 pc

**Experiments:**

1. Single-pilot solenoid valve loop-memory control
2. Single-pilot solenoid valve loops one-cycle
3. Single-pilot solenoid valve loop-continuously automatic reciprocating
4. Single-pilot solenoid valve loop-delay
5. Single-pilot solenoid valve loop-delay, continuously automatic reciprocating
6. Double-pilot solenoid valve, two buttons controlled loop
7. Double-pilot solenoid valve loop-limit switches, one cycle
8. Double-pilot solenoid valve loops continuously automatic reciprocating
9. Double-pilot solenoid valve loop-delay
10. Double-pilot solenoid valve loop-one cycle
11. Double-pilot solenoid valve loop-delay, continuously automatic reciprocating
12. A single-pilot solenoid valve controls a double-acting cylinder in the sequence of A+B-A-B-C+C-
13. A single-pilot solenoid valve controls a double-acting cylinder in the sequence of A+A-B+B-C+C-
14. A double-pilot solenoid valve controls a double-acting cylinder in the sequence of A+A+B-B-C+C-
15. A double-pilot solenoid valve controls a double-acting cylinder-delay
16. A double-pilot solenoid valve controls a double-acting cylinder-delay
17. Sequence-controlled loops with 2 cylinders and 3 single-pilot solenoid valves: A+A-B+B-C
18. Sequence-controlled loops with 3 cylinders and 3 single-pilot solenoid valves: A+B+C+C-B-A-
19. Applications of pressure switches

**Microprocessor Trainer****Microprocessor Training System  
MTS-8088**

Our low-cost Microprocessor trainer puts the way into advanced 8088/8086, etc. Our training systems will help teach learn BASIC, C, and ASSEMBLY programming languages, as well as Microprocessor and/or Microcontroller system hardware design and troubleshooting.

**Equipment Provided in each Set:**

1. System with 8K RAM & 16K ROM on board
2. 68 W Switching Power Supply provides +5VAC, +12V/1.5A, -12V/0.2A, +3.3V/8A, 90-260VAC, 47-63Hz input power
3. RS-232C System Communication Program Disk
4. User's Guide & Experiments Manual, Copyrighted in the USA
5. RS-232C Cable (2' approx.)
6. 58 pin Flatpack (1' approx.)
7. Aluminum Platform
8. 560 tie-points solderless circuit experiment breadboard

9. Elegant aluminum frame carrying case for safe & easy carrying and storage
10. RS-148-P jumper wires
11. Antistatic wrist band (5 ft)

**Hardware Description**

- \* 8088-2 CPU runs at 4.77 MHz. However, a clock rate of 8 MHz can be achieved by using a 24 MHz crystal oscillator.
- \* RAM: The system provides 32K SRAM, 24K of which is reserved for user applications. 1 MB of RAM is optional.
- \* ROM: The system provides 32K EPROM memory, 18K of which is reserved for user application programs.

- \* **Keyboard:** It has 56 keys which include the alphanumeric characters A - Z and 0 - 9 and special ASCII symbols
- \* **Display:** The on-board 4062 LCD module or an 80x24 monochrome monitor can be used. The latter requires a Hercules card.
- \* **Printer interface:** MTS-8088 provides a built-in standard Centronics printer interface, which is one of the most versatile general parallel printer interfaces available. The connection cable is the same as those used in IBM PCs.

- \* **RS-232C interface:** The 8255 controls the RS-232 interface. The protocol can be programmed for different baud rates, data bits, and stop bits.
- \* **I/O expansion slot:** This 61-pin expansion slot provides signals which are compatible with the IBM PC expansion slot, but the DMA function is missing.
- \* Any IBM PC compatible internal card with no DMA functions may be connected to the MTS-8088 through this expansion slot.

- \* **Status port:** The status port is used to display keyboard status such as Caps Lock, Ins, and Ctrl-P. Each of these statuses are indicated by LEDs which light when the function is enabled.

- In addition, it provides the speaker interface to generate sound.
- \* **Parallel control interface:** These IC's are used to provide parallel control. They are the 8255, which contains three 8-bit I/O ports, the 8254, which provides three timers, and the 8259A, which provides five interrupt signals.
- \* **Experiment area:** An area on the main board is reserved for circuit designs and experiments.
- \* **Power supply:** DC +5V, +12V, -12V, +3.3V ...

**Software Function**

- \* **Assemble/disassemble 8088 assembly codes**
- \* **Memory commands:** D-display, M-move, C-compare, E-edit, and P-kill
- \* **Display and rewrite the register contents.**
- \* **Single step program execution and debugging.**
- \* **Breakpoint debug:** for setting up to 10 break-points for program debugging.

- \* **Numerical systems conversions and calculations,** such as conversion from binary to decimal or addition of hexadecimal numbers
- \* **Communication routines for downloading and uploading between the MTS-8088 and external systems.**
- \* **Driver routines for RS-232C, Keyboard, Printer, Hercules card, and LCD display**

**Optional Accessories**

- \* Logic Pulser
- \* Logic Probe
- \* IC Tracer
- \* EPROM Programmer
- \* EPROM Eraser
- \* Digital I/O Tester
- \* Digital Multimeter with Logic, Capacitance, Frequency Test

**Optional I/O Experiment Boards**

- \* **Dynamic Scanning Board (EDS-8002)**
- \* **A/D, Thermal Sensor Board (EDS-8003)**
- \* **ADDA Experiment Board (EDS-8004)**
- \* **Stepping Motor Control Board (EDS-8005)**
- \* **Basic I/O Experiment Board (EDS-8006)**
- \* **Multi-Function I/O Lab (EDS-8009-1)**
- \* **Multi-I/O Lab Card (EDS-8014)**

**Microcontroller Training System: MTS-8052****Features**

- \* **Interface:** with accessory panel for safe, easy carrying & storage
- \* **Front panel design:** with safe and easy access power plug and switches
- \* **All possible required DC power supplies in today's electronic applications,** GND, +5V, +12V, -12V, & -15V, are provided on the banana colored binding posts for easy access.

**Hardware Specifications**

- \* **Control Process Unit:** 11 MHz Intel 8032 CPU
- \* **RAM:** 32K RAM, 8000H - FFFFH (516KRAM)
- \* **ROM:** 32K ROM, D000H - FFFFH for program
- \* **ROM:** 32K ROM, address range 0000H - FFFFH used by the system (generically to TFFFH)
- \* **I/O Range:** 7000 - FFFFH
- \* **Clock:** 1 - 12 MHz

- \* **Keyboard:** Large size, 56 keys, including alphanumeric keys and ASCII symbols
- \* **Printer Interface:** Built-in standard Centronics, using IBM PC printer cable
- \* **Display:** 48 x 2 LCD display
- \* 141 Alpha numeric digit LED
- \* 116 Red LED
- \* 85/567 dot matrix LED
- \* **RS-232C interface:** The 8032 internal serial port controls the data transmission. The baud rate, data bit, and stop bit protocol can be programmed.

- \* **Status Port:** The status port can be DISPLAYS to show the status of keys such as CAPS LOCK, INS, and CTRL-P.
- \* **Expansion Slot:** The Port B, Port 1, Port 3, Vcc, GND, address decode, and some control signal lines are extended for user applications.
- \* **Speaker:** The 2.25" speaker can be used for output applications.
- \* **Experiment area:** An area on the main board and solderless breadboard with 1580 tie-points are reserved for circuit designs and experiments.

- \* **DC Power:** +5V, +12V, -12V +3.3V, & GND, is provided on the banana colored binding posts.
- \* **Power supply:** 90 to 260VAC, 47 to 63Hz, Software Fuseable.
- \* **Two-pin Assembly:** The label field is assignable
- \* **8051/8032 assembler and disassembler:** Assembly language coding
- \* **Memory Display, Edit, Move, and Fill functions**
- \* **SFR register contents display & modify function**

- \* Single step execution
- \* Program execution Control: Display/ modify internal and external, and SFR registers. Breakpoint set up, multiple step execution, and skip software execution are provided for program debugging.

#### \* Communication Functions: Upload/Download programs for: Intel external systems.

- \* RS-232 Driver
- \* Keyboard Driver
- \* Printer Driver
- \* LCD Display Driver
- \* BIOS Resume Driver
- \* **EJEPROM Programmer**

#### \* Built-in experiment program examples

##### Each Set Includes:

1. Systems with 32K RAM & 32K ROM
2. 68V Switching Power Supply
3. RS-232C System Diskette
4. RS-232C Cable (2' approx.)
5. **58-pin Flatable (2' approx.)**
6. Aluminum Equipment Platform
7. 560 tie-points solderless circuit breadboard
8. Carrying case with accessory panel for safe & easy carrying and storage
9. 140-pc jumper wires
10. Automatic wrist band

#### II. MTS-8052 User's Guide and Experiment

Manual, copyrighted in the USA.

#### Optional Accessories:

- \* Logic Pulser
- \* Logic Probe
- \* IC Extractor
- \* IC tester, 8-pin to 68-pin
- \* **EJEPROM Programmer**
- \* EPROM Eraser
- \* Digital IC Tester
- \* Digital Multimeter
- \* EDS-5200 EJEPR0M Writer for additional data storage

#### IO control applications & experiments for MTS-8088 & IBM PC or other compatibles (Model EDS-XXXX)



#### Specifications:

- \* 58-pin PCI connector
- \* 4x7 matrix keyboard
- \* IC-Rally
- \* 7-segment LED module

#### Experiments:

- \* The 7-segment display
- \* Password lock
- \* Colligate experiment

#### A/D, Thermal Sensor Board: EDS-880

#### Specifications:

- \* 58-pin PCI connector
- \* AD 598 sensor set
- \* LM 135 sensor set



- \* ADC 0804
- \* Jumper for sensor type selection

#### Experiments:

- \* Thermal control (I)
- \* Thermal control (II)
- \* One-point thermal control
- \* Two-point thermal control

#### AD/DA Experiment Board: EDS-8804

#### Specifications:

- \* 58-pin PCI Connector
- \* AD 590 Sensor set
- \* LM 135 Sensor set
- \* ADC 0804

#### \* Jumper for sensor type selection

#### Experiments:

- \* A/D voltmeter
- \* Digital voltmeter
- \* Generating sawtooth waveforms
- \* Generating staircase waveforms
- \* Voltage supplier



#### Motor Control Board: EDS-8805



#### Specifications:

- \* 58-pin PCI connector
- \* 5VDC servo motor
- \* 1/8" Stepper motor
- \* Signal adjustment/jumper

#### Experiments:

- \* **Stepper motor, 1-step rotation**
- \* Stepper motor, Forward rotation
- \* Stepper motor, Reverse rotation
- \* Stepper motor, Forward rotation
- \* Servo motor, Forward rotation
- \* Servo motor, Reverse rotation
- \* Servo motor, Rotate forward 1 cycle
- \* Servo motor, Rotate reverse 1 cycle
- \* Servo motor, Colligate control

#### Basic IO Experiment Board: EDS-8806



#### Specifications:

- \* 58-pin PCI connector
- \* Port A LEDs
- \* Thumbwheel switch
- \* 8p Dip-switch
- \* Tact switch
- \* 7-segment LED module (2 displays)
- \* 8254 / 8255 / 8255 signal bus
- \* Jumper for signal selection

#### Experiments:

- \* Racing light
- \* Dip switch
- \* Using the 7-segment display
- \* The 5x7 Dot matrix LED module
- \* The Thumbwheel switch
- \* Key counter (I)

- \* Key counter (II)
- \* Handshake Reading of the Thumbwheel Switch
- \* Handshake Displays on the 7-segment LED
- \* Bi-directional Handshaking
- \* Programming the 8254 and the 8255

#### Multi-function IO Lab: EDS-8899-I



#### Specifications:

- \* 58-pin PCI connector
- \* Port A, B, and C LEDs
- \* 8x8 LED module
- \* Stepping motor
- \* 16-pin DIP flatable
- \* **Port A, B, and C DIP switch control**
- \* Stepper motor emulator
- \* Stepper motor connector

#### Experiments:

- \* Racing light
- \* Sign bulb simulation
- \* Reading the Thumbwheel switch
- \* **Digital clock I**
- \* Static display, Dot Matrix LED
- \* Dynamic display, Dot Matrix LED
- \* Speaker control I
- \* Speaker control II
- \* Control of 4x7 matrix keyboard I
- \* Control of 4x7 matrix keyboard II
- \* **Electric piano simulation**
- \* 8255 Mode 1 polling handshaking
- \* 8255 Mode 2 polling handshaking
- \* Data handshaking by interrupt control
- \* External interrupt control
- \* Digital clock I
- \* Digital clock II
- \* **Digital stop watch**
- \* Stepper motor control I
- \* Stepper motor control (II)
- \* Stepper motor simulation I
- \* Stepper motor simulation II
- \* Stepper motor simulation (III)

#### Multi-IO Lab Card: EDS-8814



#### Specifications:

- \* 58-pin PCI flatable
- \* 58-pin PCI connector
- \* (2) 8255 PPI chips
- \* 8254 timer counter chip
- \* 58-pin IDC flatable
- \* **8-pin DIP switches for IO address selection**
- \* References & Software
- \* User's guide included

## Green Energy Trainers

## Green Wind Energy Trainer: GWE-40107



## Features:

- \* Portable and compact kit allows for easy transportation and storage
- \* Easy assembly of the tail and blades allow quick and efficient setup
- \* A dual energy input for wind and solar energy allow the kit to be directly connected to external solar panels (up to 120W)
- \* Built-in USB jack allows connection to computer peripherals
- \* Additional storage space included with the kit
- \* Wind-deflection function of the turbine adjusts the angle of the blades to reduce harmful impact to the generator

## Specifications:

- \* Turbine Simulator Unit: 5 Blades with a Tail, a Blade Diameter = 30"
- b. Generation: 12V, 2.5A at Wind Speeds of 40" per second.
- c. Turbine Rotation: 710ccm at above wind speeds.
- \* Charging Control Circuit: Dual-Input, Handles up to 2 sources of power generation.
- \* Over-charging bypass Resistor: 10Ω, 50W.
- \* Power Output Unit: USB and 12VDC connection block.
- \* Battery: 12VDC, 10AH, deep cycle, sealed.
- \* Carrying case: Heavy duty, durable polypropylene
- \* Weight: 19lb.
- \* Dimensions: 17.5" x 9.5" x 8.8"

## Green Solar Energy Trainer: GSE-40106

## Features:

- 1. Hands on application of the MPPT algorithm.
- 2. LCD displays measurements of the current, power, and input/output voltage.
- 3. "DC TO DC Converter" and "DC To AC Inverter" Modules for output transformation experiments
- 4. "Charging" and "Load" Modules teaches and emphasizes solar power regeneration
- 5. Open Design nature of the kit allows the user expand their knowledge and creativity by changing various factors during the experiment for an ideal learning environment.

## Specifications:

- \* Microcontroller for Main Board
- \* USB Interface, cable included
- \* Solar Panel:
  - \* Output Voltage 8V Max
  - \* Output Current 800mA max approximately.
- \* Input Power: 108WAC = 240VAC, 50 ~ 60Hz
- \* AC power adapter, included, 500mA
- \* Bluetooth module, included
- \* Various Length 2-pile Connection Wires, 4 piece min
- \* 4 AAA rechargeable batteries
- \* Instructor's Guide



## \* Experiment Manual

## \* Source Code Examples.

## Contents &amp; Experiments:

- \* Green Energy Introduction
- \* Components and Function Blocks
- \* Function Block Diagrams and Circuits
- \* Microcontroller Software Development Tool - KEIL-C
- \* Learning C Language and Programming
- \* Fundamentals of Microcontroller (MPC)
- \* MPC Input/Output (I/O) Interface and Control Programming

## \* LCD Display Module Control Programming

## \* A/D Converter Control

## \* Pulse Width Modulation (PWM) Principle and Control

- \* DC to DC Converter Principle and Control
- \* Battery Charging and Discharging Control
- \* Maximum Power Point Track (MPPT) Algorithms and Tracking
- \* DC to AC Converter Circuit and Software Program

## Solar Energy Demonstrator

## SED-38510

## Experiments

- \* Circuit with solar module
- \* Current-Voltage Characteristic & Capability Curve at different Illuminance
- \* Non Load Voltage
- \* Solar Power Systems with Accumulator

## Specifications:

## \* Solar Cell

## \* Charge Unit Control

- \* Accumulator
- \* Lamp Socket
- \* Ammeter
- \* Filament Lamp
- \* Voltage Transformer of DC to AC (Inverter)

## Electronic/Electrical/Communication Labs

## Digital Circuit Lab: DCL-455000



## Specifications:

1. SOLDERLESS BREADBOARD: Interconnected, nickelplated with 2320 tie points, fits all DIP sizes and components with lead and solid wire AWG #22-30 (0.3 - 0.8mm). Can be changed/replaced and can be converted to a demountable panel.
2. DC PULSER SUPPLY: Fixed +5VDC, 1A; Fixed -5VDC, 300mA; Variable 2V ~ 15VDC, 500mA; Variable -3V ~ -15VDC, 500mA.
3. MODE SELECTION SWITCH: TTL and CMOS selection
4. TWO DIGITS OF 7-SEGMENT LED DISPLAY
5. PULSE GENERATOR: Duty Cycle: 50%  
Frequency Range: 1Hz ~ 10 Hz/ 10Hz ~ 1000Hz/ 100Hz ~ 1KHz/ 1KHz ~ 10KHz/ 10KHz ~ 100KHz/ 100 KHz ~ 1KHz  
Amplitude: 0-10 Vpp  
TTL/CMOS Output:  
TTL: +5V  
CMOS: +VDC (depends on the +VDC output)
6. EIGHT BITS LED DISPLAY

## 7. TWO PULSER SWITCHES:

## 8. EIGHT DATA SWITCHES:

TTL: 0H ~ 5V, Lo ~ 0V

CMOS: 0H ~ +VDC, Lo ~ 0V

## 9. DIGITAL PROBE:

(a) Mode Selector in the "TTL" Position

(b) Mode Selector in the "CMOS" Position

(c) Memory: The two points of LED next to the 7 segment

LED Display will keep lighting while they are in the

"Level Transition" (Lo-&gt;Hi or Hi-&gt;Lo)

10. DIMENSIONS: (L) 8.94" (W) X 3.75" (H)

11. WEIGHT: 5.5 lbs

## Digital Analog Circuit Lab: DAC-457000

## Specifications:

1. Solderless breadboard AD-22 Interconnected with 2112 tie points nickel plated contact, fits all DIP sizes and all components with lead and solid wire AWG #22-30 (0.3 - 0.8mm).
2. DC power supply: (A) Fixed DC output: +5V, 1AMP. (B) Fixed DC output: -5V, 300mA AMP. (C) Variable DC output: 0V to +15V, 1 AMP.
- (D) Variable DC output: 0V to -15V, 1 AMP.
3. Potentiometer: (A) Variable resistor VR1 = 1K (Ω), (B) Variable resistor VR2 = 100K (Ω)
4. Function generator: (A) Frequency range: 1 Hz ~ 300Hz, 10Hz ~ 100Hz, 100Hz ~ 1KHz, 1 kHz ~ 10KHz, 10KHz ~ 100KHz
- (B) Amplitude: Sine wave output: 0 ~ 6 Vpp variable Square wave output: 0 ~ 8 Vpp variable TTL mode output: 5 Vpp 5. 16 Bit Data Switch

16 pos of toggle switches and corresponding output line. When switch is set at "down" position, the output is LO level; contrary, it is in the HI level while setting at "up" position.

6. Speaker: 2-1/2 inch diameter, 9 Ohm, 0.25W to be used for lead.

## 7. Four Channel Adapter:

Both of the two banana sockets and two BNC jacks/ port tips are interchangeable, it is suitable for the station to be connected with peripherals.

## 8. TWO DIGITS OF SEGMENT LED DISPLAY:

## 9. TWO PULSE SWITCH

10. 16 BITS LED DISPLAY: 6 BITS LED DISPLAY:

16 red LEDs separate input terminals. The LED will light when input is "Hi" level, and it will be turned off when it is at an input or "Lo" level".

## 11. UNIVERSAL CONNECTOR FIXED HOLDER:

It receives universal connector fixed holder on the panel in order to be connected with various universal connectors, which are available as below:

(A) Standard accessory: UC-05 Straight header 60 pins.

## Powered Project Lab: PPL-456000

## Specifications:

Solderless Breadboard - Interconnected w/2520 tie points. Contact is nickel plated. Easily changed out to suit other purposes.

## DC Power Supply:

## Variable DC Output:

0V to +15V, 500mA

## Variable DC Output:

0V to -15V, 500mA

## Fixed DC Output:

+5V, 1A

## Fixed DC Output:

-5V, 500mA



AC output: 12V-6V-6V-12V, 500mA

**Basic Electricity Circuit Lab: BEC-450000****Specifications:****Transformer**

(0-12-24VAC/1A)

**Fuse (1A)****Ammeter**

(0-0.50-1A, AC/DC)

**Voltmeter**

(0-25V, AC/DC)

Resistor (21L, 41L, 81L, 16L, 31.5L, 63L, 250L, 500L, 1000L, 2000L)

Potentiometer (0-100K, 25W)

**Diode (6A, 100V)**

Capacitor (100µF/25VDC, 500µF/25VDC)

Inductor (80mH/0.5A)

**Lamp (24V)**

Resistor (24VAC)

**Pushbutton**

Two-way switch and Switch

**Electromagnetic relay (24V)****Electronics & Electricity Lab:****BEL-101 100 (includes A,B,C,D,E)****Industrial Electronics Trainer:****IET-101000A (includes B,C,D,E)****A. Basic Electricity Experiments**

BEL-101000

\* Ampere's rule

\* Coulomb's rule

\* Lenz's law

\* Fleming's rules

**\* Digital multimeter**

\* Analog multimeter

\* DC RLC series and parallel circuits

\* The Venet's theorem

\* Maximum power transfer circuits

\* Ammeter

\* Potentiometer

**\* Wheatstone bridge**

\* Slide wire bridge

\* Safe current and insulation resistance

\* Dual trace oscilloscope

\* Function generator

\* Frequency counter

\* DC RLC transient state circuits

**\* AC RLC series and parallel circuits**

\* Harmonic oscillation circuits

\* Single phase voltmeter &amp; multi range power meter

\* Single phase power-factor meter

\* Single phase watt-hour meter

\* Temperature coefficient of resistance

\* Joule's Law

**B. Basic Electronics Experiments: BEC-100100**

\* Half-Wave and Full-Wave rectifier filter circuit

\* Constant-Voltage supply

\* Transistor and FET switching circuit

\* Transistor Bias and Amplifier circuit

\* Single input, single channel output differential amplifier

\* Dual input, single/dual output amplifier

**\* Chopper circuit**

\* Clamping circuit

\* Cascade Amplifier

\* Darlington Amplifier

\* Zener diode

\* Push-Pull amplifier

\* Variable regulated circuit

C. Digital Logic Circuits Experiments: DLC-101200A

\* TTL characteristic

\* CMOS characteristic

\* Inverter gate

\* Buffer gate

\* AND gate

**\* NAND gate**

\* OR gate \* NOR gate

\* EX-OR gate

\* AND-OR-INVERTER

\* Open-Collector Integrated circuit

\* Triac-Static gates

\* TTL to CMOS interface circuit

**\* Pulse Conditioning Circuit**

\* Transistor Oscillation Circuit

\* Non-Continuous Monostable Oscillation Circuit

\* Continuous Monostable Oscillation Circuit

\* CMOS to TTL interface circuits

\* B-S Flip-Flop

\* J-K Flip-Flop

**\* T Flip-Flop**

\* D Flip-Flop

\* Sequential logic circuits

\* Shift (Right/Left) registers

\* Binary counter

\* BCD counter

\* 7447 decoder

**\* Half adder**

\* Full adder

\* Half subtractor

\* Full subtractor

D. Linear Circuit Experiments: LCT-101300A

\* Inverting amplifier

\* Non-inverting amplifier

**\* Schmidt trigger**

\* D/A converter

\* A/D converter

\* V/F converter

\* F/V converter

\* Non-inverting amplifier

\* Voltage-Follower amplifier

**\* Comparator amplifier**

\* Differential input amplifier

\* Integrating circuit

\* Differential circuit

\* Astable oscillation circuit

\* 555 Bistable oscillation circuit

\* Transistor oscillation circuit

**E. Thyristor Circuit Experiments: TCE-101000**

\* UJT oscillation circuit

\* SCR trigger and phase control circuit

\* DIAC &amp; TRIAC AC phase control circuit

\* PUT oscillation circuit

\* PSC circuit

\* SSS circuit

**\* AC control circuit on DC motor**

\* DC control circuit on DC motor

\* AC power control circuit

\* DC motor speed control

\* Supper motor driver

\* Servo motor driver

**\* Rotary encoder (Displacement, angle, rotation, Speed)**

Sensing quarter circuit

**Digital Logic Lab: DLL-491003****Functions and Features**

\* Supported chips: Altera MAX7000S CPLD

(PLCC 84Pins).

\* Development software: (MAX+PLUS II V10.2)  
\* AHDL/ VHDL and graphic method can be used to develop circuits \* Clearly indicates the location of each circuit-constructed I/O pins, which can be used to control external circuits

\* Frequency source: crystal oscillator and 555 precision timer. The maximum frequency is up to 10MHz

\* Supply program download interface through printer port

\* Logic input units:

\* Pulse Generator 50 pcs

\* 8-pin Toggle Switch \*1 pc

\* Logic output units:

**LED \*16**

\* 7-segment LED display \*2 pcs

\* 8x8 dot matrix LED \*1 pc

\* Stepping motor driver interface \*1 pc

\* Carriage

1. Logic design and simulation:

\* Fundamental Logic

**\* Combination Logic**

\* Adder

\* Subtractor

\* Encoder

\* Decoder

\* Comparator

\* Multiplexer

**\* Demultiplexer**

2. Sequential logic circuit design and simulation

\* Flip-Flop

\* Shift register

\* Shift counter register

3. AHDL/ VHDL languages

4. CPU design

**Experiments:**

\* 8x8 dot matrix LED control

\* 7-segment display control

\* Digital clock

\* Counter

\* Stepper motor control

\* LED and DIP switch control

**\* VHDL/AHDL design**

\* Expansion ports applications

**Sensor Trainer: ST-101500A****Experiments:**

\* Linear Voltage Differential Transformer (LVDT)

\* Phase divider demodulator circuit (FET)

\* Phase divider demodulator circuit (amplifier switch)

\* Onset, Pass, Under selection circuits

\* Hall sensor

\* Vibration detection

\* Limit switch

\* Level switch

\* Mercury switch

\* Magnetic reed switch

\* Proximity switch

\* Photo-transistor

\* Photocoupler

\* Solid-state relay

\* Photo-interrupter

\* Photo-interrupt sensor for rotation detection

\* Rotary Encoder

\* Reflective photoelectric relay

\* Fiber optic transmission

\* Infrared thermal radiation detection

\* Photo resistor

\* Solar cell

- Instrument amplifier circuit
- Load cell
- Weight selection
- Thermocouple temperature sensing
- PT100 temperature sensing
- AD990 integrated circuit temperature sensing
- Thermistor sensing
- Bimetal temperature relay
- Temperature control
- Capacitance microphone sensing
- Dynamic microphone sensing
- Piezoelectric effect
- Electric pressure sensing
- Ultrasonic sensing

### CPLD/ FPGA/ ISP/ 8851 Labs CFI-891908



#### Specifications

- \* Supported chips: Altera ACEX 1K (10KFP 144pins) or Xilinx Spartan2 (10KFP 20Kpins) FPGA on sub-board (You can choose one or both). Use the soft ware-development tool provided by Altera or Xilinx to learn latest logic design.
- \* **AHDL/VHDL, and graphic method can be used to develop circuits.**
- \* Every I/O pin of ACEX chip has a logic status monitor
- \* Frequency generator: 1:10/100/1K/10K/1M/10M/20M Hz
- \* For CPLD/ FPGA, Printer port can be used for downloads.
- \* For 8051, COM1 or COM2 can be used for downloads.
- \* Input units:

- Push button with light display \*8 pcs
- 8-bit toggle switch input \*2 pcs
- Input bus generator button \*6 pcs
- (Positive edge trigger \*9 pcs)**
- (Negative edge trigger \*9 pcs)
- \*4 matrix keyboard
- Circular-ribbed I/O pins

- \* Output units:
- 8\*8 bi-color dot matrix LED \*1 pc
- 16 characters \*2 lines LED \*1 pc
- Stepping motor driver interface \*1 pc**
- 7-segment display \*6 pcs
- buzzer \*1 pc
- LED output \*10 pcs
- Diode led output \*2 pcs
- \* Linear experiment units:
- 8-bit D/A converter \*2 pcs
- 8-bit A/D converter \*1 pc**

#### Experiments

- \* Counter
- \* Traffic light control
- \* Racing light control
- \* Stepping motor control
- \* 7-segment display control
- \* **Digital clock control**
- \* Toggle switch control
- \* Push button control
- \* 8\*8 bi-color dot matrix LED control
- \* A/D experiment
- \* D/A experiment
- \* ISP single chip 8851 experiment
- \* **Audio frequency experiment**

- \* Temperature sensor

### Communication Lab: COM-10000



#### Features

9 module boards cover digital and analog communication circuits.

#### Experiments:

##### COM-10001

- \* Colpitts Oscillator
- \* Hartley Oscillator
- \* 2nd Order Low-Pass Filter
- \* 2nd Order High-Pass Filter
- \* 2nd Order Band-Pass Filter
- COM-10002

##### \* AM Modulator

- \* AM Demodulator
- \* AM Product Detection Circuit
- \* AM Diode Circuit

##### COM-10003

- \* FM Modulator
- \* MC1495 Modulator & LM566 VCO Modulator

##### \* FM Demodulator:

- LM565 Demodulator & FM to AM Demodulator

##### COM-10004

- \* 8-bit A/D Converter
- \* 8-bit D/A Converter
- \* 8-bit Unipolar Circuit
- \* 8-bit Bipolar Circuit

##### COM-10005

- \* PWM Modulator: uA741 PWM & LM555 PWM
- \* PWM Demodulator

##### COM-10006

- \* ASK Modulator
- \* ASK Demodulator

##### COM-10007

- \* **FSK Modulator**
- \* FSK Demodulator

##### COM-10008

- \* PSK Modulator
- \* PSK Demodulator

##### COM-10009

- \* 8:1 Splitter
- \* **QPSK Modulator**

- \* Signal Separator & Phase Lock Circuit

##### Optional Accessories:

- \* Function Generator & Power Supply Module
- \* Oscilloscope

### Analog Communication Lab: ACL-10200



#### Experiments:

##### ACL-10200

- Second Order Active Filters
- \* Second Order Active Low-pass Filter
- \* Second Order Active High-pass Filter

- \* Second Order Active Bandpass Filter

#### RF Oscillator Circuits

- \* Colpitts Oscillator Circuit
- \* Hartley Oscillator Circuit
- \* Crystal Oscillator Circuit
- \* Voltage Controlled Oscillator Circuit

##### ACL-10202

#### AM Modulator Design

- \* Transistor AM Modulator
- \* MC 1495 AM Modulator
- \* AM Demodulator Design

#### RF Oscillator Circuits

- \* AM Diode Detection Circuit
- \* **AM Product Detection Circuit**

##### ACL-10203

#### DSB-SC and SSB Modulator

- \* DSB-SC Modulator
- \* SSB Modulator

#### DSB-SC and SSB Demodulator

- \* DSB-SC Product Detector
- \* **SSB Product Detector**

##### ACL-10204

#### FM Modulator Circuit Design

- \* MC4046 FM Circuit
- \* LM566 FM Circuit

#### FM Demodulation Circuit Design

- \* MC4046 FM Demodulator
- \* **LM566 FM Demodulator**

##### ACL-10205

#### TDM Multiplexer

- \* Waveform Generator
- \* TDM Multiplexer

#### TDM Demultiplexer

- \* TDM Demultiplexer

##### ACL-10206

#### FDM Multiplexer

- \* FDM Signal Generator
- \* DSB-SC Modulated Signal Generator

#### FDM Demultiplexer

- \* FDM Demultiplexer

##### ACL-10207

#### Analog to Digital Converter Circuit Design

- \* ADC 0804 Analog-to-digital Converter Circuit
- \* ADC 0809 Analog-to-digital Converter Circuit

#### Digital to Analog Converter Circuit Design

- \* 8:20 Digital-to-analog Converter
- \* Unipolar DAC 0800 D/A Converter Circuit
- \* **Bipolar DAC 8000 D/A Converter Circuit**

##### ACL-10208

#### Frequency Converter

- \* Frequency Multiplier
- \* Up/Down Frequency Converter

#### Signal Recovery

- \* Carrier Signal Recovery Circuit

#### \* **Clock Recovery Circuit**

##### Optional Accessories:

- \* Function Generator & Power Supply Module
- \* Oscilloscope

### Digital Communication Lab: DCL-10300



#### Experiments:

##### DCL-10300

- Line Code Encoder
- \* Unipolar and Bipolar NRZ Signal Encoder
- \* Unipolar and Bipolar RZ Signal Encoder

- \* AMI Signal Encoder
- \* Manchester Signal Encoder
- Line Code Decoder
- \* Unipolar and Bipolar NRZ Signal Decoder
- \* Unipolar and Bipolar RZ Signal Decoder
- \* Signal Decoder

**\* Manchester Signal Encoder**

DCL-10302

**FSK Modulator**

- \* uC741 Pulse Width Modulator
- \* LM555 Pulse Width Modulator

**FSK Demodulator**

- \* Pulse Width Modulator

**DCL-10303**

- \* PCM Modulator
- \* PCM Demodulator

**DCL-10304**

- \* Delta Modulator
- \* Delta Demodulator

**DCL-10305**

- \* **Adaptive Delta Modulator**
- \* Adaptive Delta Demodulator

**DCL-10306**

- ASK Delta Modulator
- \* XR2206 ASK Modulator
- \* MC1496 ASK Modulator

**ASK Delta Demodulator****\* Asynchronous ASK Modulator (I)**

- (use XR2206 as the modulated ASK signal)
- \* Asynchronous ASK Modulator (II)

- (use MC1496 as the modulated ASK signal)
- \* Synchronous ASK Modulator

**DCL-10307****FSK Modulator**

- \* **XR2206 FSK Modulator**
- \* LM566 FSK Modulator

**FSK Demodulator**

- \* FSK Demodulator (I)

- (use XR2206 as the modulated FSK signal)
- \* FSK Demodulator (II)

- (use LM566 as the modulated FSK signal)

**DCL-10308****\* PSK Modulator**

- \* PSK Demodulator

**Optional Accessories:**

- \* Function Generator & Power Supply Module
- \* Oscilloscope

**Advanced Digital Communication Lab:****ADCL-10700****Experiments:**

ADCL-10701

- \* CVSD Modulator
- \* CVSD Demodulator

ADCL-10702

- \* QPSK Modulator

**\* QPSK Demodulator**

ADCL-10703

- \* QAM Modulator

- \* QAM Demodulator

ADCL-10704

**DSSS Encoder**

- \* Basic Spread Spectrum Encoder

- \* **64-bit Spread Spectrum Encoder**

**D685 Decoder**

- \* 64-bit Spread Spectrum Decoder

ADCL-10705

**BCH Encoder**

- \* 4-64 BCH Encoder

- \* 8-64 BCH Encoder

**BCH Decoder**

- \* 4-64 BCH Decoder

- \* 8-64 BCH Decoder

ADCL-10706

**Convolutional Code Encoder**

- \* (2,1,2) Convolutional Code Encoder

- \* (2,1,2) Convolutional Code Decoder

**Convolutional Code Decoder**

- \* Viterbi Decoder

ADCL-10707

- \* GMSK Modulator

- \* GMSK Demodulator

**Optional Accessories:**

- \* Function Generator & Power Supply Module
- \* Oscilloscope

**Communication Electronics Lab:****CEL-10400****Experiments:**

CEL-10401

- \* Passive Second Order Low-pass Filter

- \* Active Second Order Low-pass Filter

- \* Passive Second Order High-pass Filter

- \* Active Second Order High-pass Filter

- \* **Passive Second Order Band-pass Filter**

- \* Active Second Order Band-pass Filter

CEL-10402

- \* Wien Bridge Oscillator Circuit

- \* Phase-Shift Oscillator Circuit

- \* Colpitts Oscillator Circuit

- \* Hartley Oscillator Circuit

- \* **Colpitts Crystal Controlled Oscillator Circuit**

- \* Colpitts Voltage Controlled Oscillator Circuit

CEL-10403

- \* AM Transmitter Carrier Frequency: 1 MHz

- \* Variable Audio Signal Source

- \* Provided with microphone input and used as a walkie-talkie

- \* **1.5 time variable output power**

CEL-10404

- \* AM Receiver Carrier Freq: 565 kHz – 1065 kHz

- \* Receiver Intermediate Frequency: 455 kHz

- \* Heterodyne Mode

- \* Auto Volume Control Function

CEL-10405

- \* **FM Transmitter Carrier Frequency: 10.7 MHz**

- \* Crystal Oscillator Frequency: 3.58 MHz

- \* Frequency Deviation: 40 kHz

- \* Audio Amplifier with pre-emphasis

CEL-10406

- \* **FM Receiver Carrier Frequency: 88 kHz – 108 MHz**

- \* Receiver Intermediate Frequency: 10.7 MHz

- \* **Audio Amplifier with pre-emphasis**

- \* Auto Volume Control Function

CEL-10407

- \* Unlike DTMF to Produce Dial Signal

- \* Provided with LCD Dial Display

- \* Ringing Signal Voltage: 100 Vpp

- \* Memory: 5 Phone Numbers

- \* **Phone Line DC Power Supply Voltage: 48 V**

**CEL-10408**

- \* Controllable Household Appliances (Number of output: 3)

- \* Single Chip Microcontroller

- \* Switching for Short Long Distance Control

- \* DTMF Encoder (4 Bits LED Display)

- \* Number of Controllable Ringing Times: 3 – 6

CEL-10409

- \* ASK Transmitter Carrier Frequency: 1 MHz

- \* 1.5 Times Variable Output Power

- \* Data Transmitted Rate: 100 bps

- \* Spread Spectrum Digital Encoder

- \* Data Input Mode: 8 bits

- \* **Data Transmitted Display: 8 Bits LED Display**

- \* 256 Communication Channels

CEL-10410

- \* ASK Receiver Carrier Frequency: 1 MHz

- \* Sensitivity: -60 dBm

- \* Data Received Rate: 100 bps

- \* Spread Spectrum Digital Decoder

- \* **Data Received Display: 8 Bits LED Display**

- \* 256 Communication Channels

CEL-10411

- \* PSK Transmitter Carrier Frequency: 3.57 MHz

- \* Transmission Frequency: 10.7 MHz

- \* 1.5 Times Variable Output Power

- \* Data Transmitted Rate: 100 bps

- \* **Spread Spectrum Digital Encoder**

- \* Data Input Mode: 8 bits

- \* Data Transmitted Display: 8 Bits LED Display

- \* 256 Communication Channels

CEL-10412

- \* PSK Receiver Carrier Frequency: 10.7 MHz

- \* Sensitivity: -60 dBm

- \* **Data Received Rate: 100 bps**

- \* Spread Spectrum Digital Decoder

- \* Data Received Display: 8 Bits LED Display

- \* 256 Communication Channels

CEL-10413

- \* PSK Transmitter Carrier Frequency: 1 MHz

- \* **First Intermediate Frequency: 20 kHz**

- \* 1.5 Times Variable Output Power

- \* Data Transmitted Rate: 100 bps

- \* Spread Spectrum Digital Encoder

- \* Data Input Mode: 8 bits

- \* Data Transmitted Display: 8 Bits LED Display

- \* 256 Communication Channels

CEL-10414

- \* PSK Receiver Carrier Frequency: 1 MHz

- \* First Intermediate Frequency: 20 kHz

- \* Sensitivity: -60 dBm

- \* Data Received Rate: 100 bps

- \* Spread Spectrum Digital Decoder

- \* Data Received Display: 8 Bits LED Display

- \* **256 Communication Channels**

- \* Communication Channels Error Detection

**Optional Accessories:**

- \* Function Generator & Power Supply Module
- \* Oscilloscope

Our Full Selection of Oscilloscopes can be found on page 23.



**Fiber Optics Communication Lab****FOC-10500****Experiments:**

- FOC-10500: Transmitter Module
- \* 660 nm Analog Transmitted Circuit
- \* 820 nm Analog Transmitted Circuit
- \* Adjustable Audio Signal Generator
- \* Microphone Audio Signal Generator
- \* 660 nm Digital Transmitted Circuit
- \* 820 nm Digital Transmitted Circuit
- \* 1 MHz Data Generator

**FOC-10502: Receiver Module**

- \* 660 nm Analog Received Circuit
- \* 820 nm Analog Received Circuit
- \* Audio Signal Amplified Circuit
- \* 660 nm Digital Received Circuit
- \* 820 nm Digital Received Circuit

**FOC-10503: Computer Control Module**

- \* Numeric Display in LCD
- \* Alphabetic Display in LCD
- \* Numeric and Alphabetic Display in LCD
- \* Connection between Experiment board and PC

**\* Data Transmission From LCD to PC****FOC-10504: Analog & Digital Signal Modulation Module**

- \* AM Modulator
- \* ASK Modulator
- \* AM Demodulator
- \* ASK Demodulator
- \* **Fiber Optics Applications on AM Modulation and Demodulation**
- \* Fiber Optics Applications on ASK Modulation and Demodulation
- \* FM Modulator
- \* FSK Modulator
- \* FM Demodulator
- \* FSK Demodulator
- \* **Fiber Optics Applications on FM Modulation and Demodulation**
- \* Fiber Optics Applications on FSK Modulation and Demodulation
- FOC-10505 Digital Signal Processing Module
- \* CVSD Encoder
- \* CVSD Decoder
- \* **Fiber Optics Applications on CVSD Encoding and Decoding**
- \* Manchester Signal Encoder
- \* Manchester Signal Decoder
- \* **Fiber Optics Applications on Manchester Encoding and Decoding**

**Optional Accessories:**

- \* Function Generator & Power Supply Module
- \* Oscilloscope

**Wireless/ RF Communication Lab:****WCL-10100****Experiments:**

- WCL-10111
- PCB Relative Dielectric Constant Measurement
- \* Microstrip Line Resonator
- \* Microstrip Ring Resonator
- Match Network Design
- \* **Low-pass L-type Match Network**
- \* **High-pass L-type Match Network**
- \* **T-type Match Network**
- \* **T-type Match Network**

WCL-10112

- Two-Stage Low Noise Amplifier Design
- \* Common Emitter LNA
- \* **Common Emitter LNA with Inductor Series Feedback**
- Two-Stage Low Noise Amplifier Design
- \* Two-Stage Common Emitter LNA
- \* Two-Stage LNA with Cascade Inductor Series Feedback
- WCL-10113

**Pre-Amplifier Design**

- \* Two-Stage Pre-Amplifier
- \* Active Bias Pre-Amplifier
- Power Amplifier Design
- \* 500 mW Power Amplifier
- \* 2nd Harmonic-Rejection Filter

WCL-10114

**Colpits and Harley Oscillator Design**

- \* Common Base Colpits Voltage Controlled Oscillator
- \* Common Base Colpits Voltage Controlled Oscillator
- Common Collector Colpits Oscillator Design
- \* Common Collector Colpits Voltage Controlled Oscillator
- \* Common Collector Colpits Voltage Controlled Oscillator with Buffer Stage

WCL-10115

**Phase-Locked Loop Controller Design**

- \* Passive Ripple Filter
- \* Phase-Locked Loop Circuit

WCL-10116

**Diode Mixer Design**

- \* 90° Balanced Mixer Circuit
- \* 180° Balanced Mixer Circuit
- Transistor Mixer Design
- \* Dual Gate Mixer Circuit
- \* Power Adder Mixer Circuit

WCL-10117

**Low-Pass and High-Pass Filter Design**

- \* Butterworth LPF Circuit
- \* Chebyshev HPF Circuit
- Band-Stop and Band-Pass Filter Design
- \* Band-Pass Filter Circuit
- \* Band-Pass Filter Circuit

WCL-10118

**IF FM Demodulation Circuit**

- Audio Signal Process Circuit
- \* Audio Compression Circuit
- \* Audio Decompression Circuit
- Optional Accessories:
- \* Function Generator & Power Supply Module

**\* Oscilloscope**

- \* 3-band Signal Generator
- \* Spectrum Analyzer

 **Microwave Active Circuit Design:****MT-10600****Experiments:**

- MT-10601
- Microstrip Line Matching Circuit
- \* Measurement of  $\Gamma$  impedance Transformer
- Matching Network**
- \* Measurement of Signal

**and Balanced short Stubs**

- Matching Network Measurement of Signal, Balanced, and Radio Open Stub Matching Network
- \* Measurement of IS and I IS Open Stub Matching Network
- MT-10602

**Low Noise Amplifier**

- \* Measurement of Frequency Response
- \* Measurement of Noise Figure
- \* Measurement of 1 dB Compression Point
- Voltage Controlled Oscillator
- \* Measurement of Oscillation Frequency and Output Power
- \* **Measurement of Phase Noise**
- \* Measurement of Gain Factor and Tunable Bandwidth
- \* Measurement of Pushing Point

MT-10603

**Pre-Amplifier**

- \* Measurement of Frequency Response
- \* Measurement of 1 dB Compression Point
- \* **Measurement of 3rd Order Intercept Point**
- Power Amplifier
- \* Measurement of Gain Flattens
- \* Measurement of 1 dB Compression Point
- \* Measurement of 3rd Order Intercept Point
- \* Measurement of Ratio of Fundamental to Harmonics

MT-10604

**Phase Locked Loop Controller**

- \* LCD and Keypad Testing
- \* MB-15007 Control Signal Testing
- Phase Locked Loop
- \* Measurement of Frequency Response for Loop Filter
- \* Measurement of PLL and Phase Noise
- \* Measurement of PLL Locked Time

MT-10605

**Balanced Mixer**

- \* Measurement of Conversion Loss vs LO Power
- \* Measurement of Conversion Loss vs RF Power
- \* Measurement of 3rd Order Intercept Point
- \* Measurement of IF Bandwidth
- \* Measurement of Isolation

**Image-rejection Mixer**

- \* Measurement of Conversion Loss vs LO Power
- \* Measurement of Conversion Loss vs RF Power
- \* Measurement of 3rd Order Intercept Point
- \* Measurement of Isolation
- \* Measurement of Image-rejection Level

MT-10606

**IQ Modulator**

- \* Measurement of PSK Modulator
- \* Measurement of QPSK Modulator
- IQ Demodulator
- \* Measurement of PSK Demodulator
- \* Measurement of QPSK Demodulator

MT-10607

**Digital Wireless Transmitter**

- \* Measurement of Output Power
- \* Measurement of Harmonic Output Power
- \* Measurement of Modulation Signal

MT-10608

**Digital Wireless Receiver**

- \* Measurement of Sensitivity
- \* **Measurement of Demodulation Signal**
- \* Measurement of Image-rejection Ability

 **Microwave Trainer: MT-30124****Experiments:**

- \* Fundamental of frequency and wavelength
- \* Voltage to stand wave ratio
- Microwave power
- \* Characteristics of detector
- \* Measurement of impedance
- Microwave Tuner
- \* Directional coupler
- \* Series and shunt T coupling



- \* Horn antenna
- \* The Doppler Radar
- \* The use of coaxial cable

Specifications  
 \*Frequency: 16.5 GHz  
 \*Control Console

#### \*Variable Attenuator

- \*Stair-Step Taper
- \*Cavity Resonator
- \*Shield Tee

Series Tee/ Hybrid Tee

- \*Directional Coupler
- \*Waveguide/ coaxial adapter

#### \*Analog Transmitter

- \*Balunator (Thermistor type)
- \*Diode Detector (in waveguide section)
- \*Horn Antenna
- \*Signal Oscillator and Cable Assembly
- \*Shield Circuit Transmitter
- \*Probe Detector Assembly (Krausskopf)

#### \*Accessories

- \*Coaxial cables with BNC connector
- \*Coupling Plates
- \*Thermistors
- \*Support plates

#### Antenna System Demonstrator: ASD-30227

##### Experiments

- \*Transmitter & Modulator operations
- \*Basic theory of induction, radiating & non-radiating systems

#### \* Transmission Lines and

- \* Feeders
- \* Antenna Impedance and Lengths
- \* Physical layout and electrical characteristics
- \* V and I distribution graphs
- \* Impedance matching of antennas
- \* Directional antennas and radiation patterns
- \* Parasitic arrays and antenna gain

#### Specifications:

- \* Transmitter Unit:  
 Frequency: Fixed 167.2 MHz  
 RF Power Output: Variable 0, 5-5 watts  
 Output Impedance: 50 Ω  
 Power Input Requirements: AC 110/220 V ± 10%

#### \* Antenna Construction:

- \* Nickel plated brass rods in various shapes for several types of antennas

#### \* Skirted Antenna, Quad Loop Antenna

- \* Universal Matchbox: 38 Ω for balanced and unbalanced
- \* Voltage and Current Detector: Bar LED Display
- \* Radiation Detector: Dipole with amp/μF

#### Digital Signal Processing (DSP) Control Lab DSP-59000



#### Specifications:

- TMS320C5416 processor (5416 Module)
  - 4 MB Flash RAM
  - 256 K x 16bit SRAM
  - 2580 gate CPLD
  - Power converter
  - Bus driver
  - Bus protection chip
  - JTAG (Emulator or CCS to download program)

- TMS320C3407 processor (3407 Module)
  - 238K x 16bit SRAM
  - 2580 gate CPLD
  - Power converter
  - Bus driver
  - Bus protection chip

#### 1. Dual power design (Analog power & digital power)

- JTAG (Emulator or CCS to download program)
- JTAG Value Audio module:

a. High speed AD (TLC5510) 8 bits, max. sampling rate: 25MHz

b. High speed DA (TLC5602, 8 bits, max. conversion rate: 50 ns)

c. The audio module adopts TLC320AD99C voice processing chip (max. sampling rate: 22.85KHz, 16 bits)

d. The module can be used for audio I/O and video I/O

(4) MP3: Ethernet module

a. Audio module adopts the TLV320AIC23B chip (max. sampling rate: 96 KHz, Data bits 16, 20, 24, 32 are programmable)

b. MP3 module adopts the STA013T chip (max. transmission rate: 10 Mbps)

c. Ethernet adopts the RTL8019AS chip (Max. transmission rate: 10 Mbps)

d. Module can be used for audio I/O, Network TCP/IP, and MP3

(5). Keyboard and display module:

a. 128x84 dot matrix graphic LCD display

b. 8-digit LED display

c. 8 indicator lamps

d. 8 push button inputs

(6). RS-232 communication module:

a. The MAX311EC91 is used for the TMS320C3416 module to communicate with a PC (Transmission rate up to 238 Kbps)

(7). RS-485/ CAN communication module:

a. The 2487 module is equipped with RS-485 bus and CAN bus

(8). Temperature, Electrical Machinery control module

a. DC motor

b. Stepper motor (12V)

c. The thermometer adopts thermal sensor DS18B20, temperature range (-55C - 108C)

(9). Signal source module:

a. Two signal sources with frequency range of 1 Hz - 95 KHz

b. Frequency and amplitude of the sine wave are adjustable

c. A built-in circuit to combine signals from the two sources

(10). PWM frequency conversion module:

a. It provides PWM and CAP interface

b. It is the main interface of the 2487 module for frequency conversion control

(11). Second development module:

a. ARM7 board with Ethernet interface

b. Wireless control board with USB and IDE interface

#### Electrical Machinery Experiments EM-102750A



#### A. Transformer Experiments

- \* Polarity Test
- \* Open-Circuit test
- \* Short-Circuit test
- \* Temperature rise test
- \* Transformer Three-phase connections

Star-Star/ Delta-Delta/ Star-Delta/ Delta-Star/ V-V/ T-T/ Three-phase to double-phase/ Triangular

\* Three-Phase power measurement

\* Three-phase transformer open circuit test

\* Three-phase transformer short-circuit test

\* DC Motor and Generator Experiments

\* DC generator no-load characteristic test

\* DC separately excited generator load characteristics test

\* DC shunt generator load-characteristic test

\* DC series generator load-characteristic test

\* DC compound generator load-characteristic test

\* DC separately excited motor load-characteristic test

\* DC series motor load-characteristic test

C. AC Motor Experiments

\* Three-Phase induction motor no-load test

\* Three-Phase induction motor blocking test

\* Three-Phase induction motor load test

\* Characteristic test of single-phase induction motor

D. Synchronous Motor and Generator Experiments

\* Three-phase, synchronous generator no-load and short-circuit tests

\* Three-phase, synchronous generator load test

\* Three-Phase, synchronous generator parallel connection operation test

\* Synchronous motor load-characteristic test

\* Synchronous motor phase adjustment test

#### Automatic Control Trainer: ACT-109900A



#### Specifications

- \* Attenuator
- \* Phase Demodulator
- \* Potentiometer
- \* Input Potentiometer
- \* Output Potentiometer
- \* DC Servo Motor
- \* Synchro Transmitter
- \* Synchro Receiver
- \* Stepper Motor
- \* Binary Encoder, 80-pulse
- \* V/F Converter & Forward/Reverse Rotation Controller

#### \* Stepping Motor Driver

\* Keyboard and Display Console (optional)

\* PLC Controller (optional) FX2-32MR

\* PLC Output Extension Module (optional)

\* Pulse Generator Module FX-1PG

\* Digital Multimeter

\* Error & Proportional Controller

\* PID Controller

\* Variable Load Resistor

\* Connection Wires

#### Experiments

\* Introduction to basic elements modules

\* Operational Amplifier

\* DC Servo Motor

\* Analysis of Error Signals

\* PWM and PWM Speed Control

- \* Positioner Positioning Control System
- \* Dead Band, Transition, and steady State Response
- \* PID Controller
- \* Synchro
- \* Demodulator
- \* Control System of Synchro + DC Servo Motor
- \* **Basic Experiments of Stepper Motor**
- \* Control System of Synchro + Stepper Motor
- \* Control System of Positioner + Stepper Motor
- \* Rotary Encoder
- \* PLC Programming and Characterization
- \* PLC / CNC + Stepping Motor Open-Loop Control
- \* PLC / CNC + Stepping Motor Closed-Loop Control
- \* **AC Servo Motor Principle and Structure**
- \* Positioner Control System + AC Servo Motor

#### POWER TRANSMISSION AND DISTRIBUTION MODEL: PTD-2010



#### FEATURES

- Simulation of power transmission and distribution starting from a Power Plant → Primary Station ("Y"-T, and "Y"-S), and "M-d" Conversions) → Two transmission cables (with Fault Testing) → Secondary Station (with load output 220V-190V-110V) → Client → Parallel Operation with external power supply (Phase Sequence Test) → Client-site or On-pole substation (Transformer) → Load Input Test. Students learn to understand the process of power transfer.
- Protection relays can be individually connected for external test.
- Experiments include:
  - (1) Phase-B grounding through resistors.
  - (2) Two-phase short circuit.
  - (3) Two-phase grounding short circuit.
  - (4) Three-phase short circuit.
  - (5) Phases R, S, and T resistors ground test.
  - (6) Phase-R enhanced output (220V-190V-110V) tests.
  - (7) R, L, and C overload test.
  - (8) Short, Medium, and Long surge transmission test on two-wire cable.
  - (9) T and C tests on long range transmission.
  - (10) Power parallel operation.
  - (11) Power factor adjustment/correction experiment
  - (12) Two-phase power wave observation.
- Graphic software control monitors the power system status. (Online monitoring may be wired or wireless mode).

#### MODELS

1. Overcurrent Protection Relay (OCR), 2 pieces
2. Reverse Power Protection Relays (RPR), 2 pieces
3. Under-Voltage Protection Relays (UVRL), 1 piece
4. Over-Voltage Protection Relays (OVR), 2 pieces
5. Transducer, 1 piece
6. The Multifunction Meter, 6 pieces
7. Switches of Over-Current Breaker (OCB) Simulation, 8 pieces
8. Waveform Monitor, 1 piece
9. Load Group (R, L, C), a set
10. Simulation of Power Plant and Standby Power System Block Diagram, 1 set

#### ACCESSORIES

1. Connection wires.
2. Instructional Experiment Manual.

#### Power Electronic Trainer: PET-101700



#### Experiments

- \* Single-phase, half-wave rectifier circuit
- \* Single-phase, full-wave rectifier circuit
- \* Single-phase, half-wave controlled bridge rectifier
- \* **Single-phase, full-wave controllable rectifier**
- \* 1  $\Phi$ , full-wave AC regulation circuit
- \* 2  $\Phi$ , half-wave rectifier circuit
- \* 2  $\Phi$ , full-wave rectifier circuit
- \* 3  $\Phi$ , half-wave controllable rectifier
- \* 3  $\Phi$ , full-wave, half-cycle rectifier
- \* **3  $\Phi$ , full-wave, full-cycle rectifier**
- \* 3  $\Phi$ , half-cycle AC power supply regulation circuit
- \* 3  $\Phi$ , full-cycle AC power supply regulation circuit
- \* Automatic Voltage Regulation circuit
- \* Temperature control circuit
- \* DC wave chopping circuit
- \* Electromagnetic stove control circuit
- \* **Phase-locked control circuit**
- \* Voltage to Frequency (V/F) converter circuit
- \* Frequency to voltage (F/V) converter circuit
- \* Single-phase frequency converter circuit
- \* Uninterrupted Power Supply (UPS)
- \* 3 $\Phi$  induction motor control using frequency inverter
- \* **Motor speed motor circuit**
- \* Digital to analog (D/A) converter circuit
- \* Analog to digital (A/D) converter circuit
- \* Stepper motor control

#### Electrical Machinery Control: EM-N101700



#### Experiments

- \* Single-Phase, Half-Cycle control circuit
- \* Single-Phase, Full-Cycle control circuit
- \* DC motor characteristic experiment I-single-phase, half-cycle, fixed load, speed vs. phase angle (I)
- \* DC motor characteristic experiment II-single-phase, half-cycle, fixed phase angle (I), speed vs. load
- \* DC motor characteristic experiment I-single-phase, full-cycle, fixed load, speed vs. phase angle (I)
- \* DC motor characteristic experiment II-single-phase, full-cycle, fixed phase angle (I), speed vs. load
- \* **Three-Phase, Full-Cycle control circuit** \* DC motor characteristic experiment I- Three-phase, half-cycle, fixed load, speed vs. phase angle (I)
- \* DC motor characteristic experiment II- Three-phase, full-cycle, fixed phase angle (I), speed vs. load
- \* Frequency converter circuit
- \* AC motor characteristic experiment I
- \* **Fixed load, speed vs. frequency**
- \* AC motor characteristic experiment II
- \* Fixed frequency, speed vs. load
- \* Pulsed Width Modulated (PWM) Servomotor control circuit
- \* Servomotor characteristic experiment I-load vs. speed
- \* **Servomotor characteristic experiment II**

- load vs. PWM
- \* Stepper motor driving circuit
- \* CNC open-loop positioning control circuit
- \* CNC closed-loop positioning control
- \* AC motor speed control
- \* AC motor variable speed control device
- \* **AC motor PWM frequency speed control device**
- \* AC motor PWM frequency speed control device
- \* Servomotor PWM control device
- \* CNC interactive drill device
- \* Digital precision torque converter
- \* Digital precision vibration tester
- \* General motor characteristic test device

#### PLC Control Lab (I): PLC-1032LM

#### Experiments

- Sequential Function Charts (SFC)
  - \* PLC programming
  - \* Operation modes
  - \* Reading SFC charts
  - \* Introduction to SFC & STL
  - \* Basic sequence instruction
  - \* SFC chart construction principle
- PLC Relays and Timers
  - \* Introduction to PLC
  - \* PLC instruction sets
  - \* Program examples
- C-PLC Applied Instructions
  - \* **Digital Data Conversion**
  - \* Move and Compare
  - \* Arithmetic and Logical Operations
  - \* Timers & Counter
  - \* High Speed Processing
  - \* Data Operation
  - \* Program Examples



#### PLC Control Lab (II):

#### PLC-1032LM



#### Experiments

- \* Motor priority control
- \* Motor Y-d start control
- \* Delay timer relay circuit
- \* Counter circuits
- \* Motor start, stop, and overload control
- \* **Motor control in two places.**
- \* 3 $\Phi$  Motor forward / reverse control
- \* Motor continuous and pulse operation control
- \* Motor auxiliary start / stop control
- \* Motor overload warning circuit
- \* Motor forward / reverse with Y-d start control
- \* Automatic water pump with auxiliary control
- \* **Automatic starting control of a standby motor**
- \* Motor start / stop interruption memory \* Counter circuits
- \* Count down / up-counter circuits
- \* Counter and timer extension circuits
- \* Car wash control circuits
- \* Emergency stop and power interruption protection
- \* **Light Control (I)**
- \* Light Control (II)
- \* Light Control (III)
- \* Light Control (IV)
- \* Light Control (V)
- \* Light Control (VI)
- \* Traffic Light Control (I)
- \* Traffic Light Control (II)
- \* **Pneumatic Cylinder with Magnetic Reed Switch**
- \* Pneumatic Cylinder with limit switch
- \* Pneumatic Cylinder with proximity switch

- \* Photostop/stop & Counter Control (I)
- \* Photostop/stop & Counter Control (II)
- \* Rotary Encoder and Motor Control
- \* 2-floor Elevator Control (I)
- \* 2-floor Elevator Control (II)
- \* 3-floor Elevator Control (I)
- \* **3-floor Elevator Control (II)**
- \* 4-floor Elevator Control (I)
- \* 4-floor Elevator Control (II)
- \* 5-floor Elevator Control (I)
- \* 5-floor Elevator Control (II)
- \* Rotary Encoder & Motor Speed Detection Control

**PLC Control Case Unit: PLC-1010****Specifications:**

PLC: FX3G-4M1T

Power Supply: 100-240VAC, 2A Fuse Protection

Input Interface: 16 inputs, dual insulated binding posts and toggle switches. Light coupling protection interface.

Output Interface: 16 outputs, dual insulated binding posts, solid state transistor and relay switching. Fuse short circuit protection.

Display: 64K, full color 7" LCD touch screen.

LED Backlight: 70,000 Hours

RAM: 128 MB Flash Memory

Communication Ports:

- a. COM1: RS-232C/485
- b. COM2: RS-232C/485
- c. COM3: RS-232
- d. USB: USB Host
- e. USB: USB Slave

**PLC Control Load Unit: PLC-1011****Specifications:**

Power Supply: 100-240 VAC, 2A Fuse Protection

Positioning Control Mechanism:

1) Servo Motor:

- a. Capacity: 180W
- b. Encoder Accuracy: 2500PPR
- c. Feedback Accuracy: 10,000PPR
- d. Input Bandwidth: 2KHz/20KHz
- e. Open Collector: 200KPPS

Communication: RS-232C/485

2) Mechanism:

- a. Acrylic structure
- b. Attached position scale
- c. Left and right limit and origin signal
- d. Uniaxial/industrial control or Manual limit control

Inverter Motor System:

1) Inverter:

- a. Single-phase, 220V, 0.5hp
- b. 0.1 ~ 65Hz Output Frequency

Communication: RS-232C/485

2) Inverter Motor:

- a. Three-phase AC220V, 1800RPM with rotating inductor.

3) Transformer:

- a. 1 ~ 9999RPM Converter
- b. Built-in RS485 communication

**Multifunctional PLC Interface Trainer: PLC-1008****Specifications:**

Power Supply: 100-240VAC, 2A Fuse protection.

PLC: FX3U-32MT

Input Interface: 16 inputs, dual insulated binding posts and toggle switches. Light coupling protection interface.

Output Interface: 16 outputs, dual insulated binding posts, solid state transistor and relay switching. Fuse short circuit protection.

Applications:

- 1) Traffic Light Module: Red, yellow, green, three-color LED 4 for each color.
- 2) Stepper Motor Module: Pulse (PLS) Direct (DIR) drive control, attached a 60-pulse-per-rotation rotary encoder, can do multiple-point positioning control.
- 3) DC Motor Module: Reversible DC motor, with a single-point positioning mechanism.
- Display: 16-gray-scale 5.7" LCD touch screen
- Resolution: (XGA) 320 X 240

ROM: 1MB Internal Memory.

Communication Ports:

- a. COM: RS-232
- b. COM2: RS-422
- c. USB: USB Client

**PLC Analog Temperature Control Trainer: PLC-1007****Features:**

- \* Portable: Aluminum trimmed carrying case with detachable upper and lower lids.
- \* Insulated input switch: two-stage, with push button and switch function.
- \* **14-channel digital input: Dual insulated binding posts and toggle switches. Light coupling protection interface.**
- \* 16-channel digital output: Dual insulated binding posts, solid state transistor or relay switching. Fuse short circuit protection.
- \* **16-bit Analog Input/Output Module: with 2-channel 14-bit analog output, as well as 4-channel 14 or 12-bit analog input.**
- \* Temperature Expansion Module: 6-point, PT-100 or PT-1000, temperature sensing input.
- \* Communication Expansion Module: Ethernet, RS-232, and RS-485 ports.

**Applications:**

- \* Marquee / traffic light module.
- \* 4-digit thumb switch input module.
- \* 4-digit display module, with BCD decoding circuit.
- \* Keyboard switch input module.
- \* Stepper motor module, with 200 pulses per rotation encoder output.

**Optional Items:**

Temperature Control Module: PLC 10A10

**Features:**

- \* Thermocouple temperature sensing element directly contact the heater. The highest accuracy measurement is obtained without intermediate interface.
- \* **Corresponding thermocouple temperature transmitter: 4 ~ 20mA output, can be used with various control modules.**
- \* Solid state single-phase power regulator: 5000Hz, full output power of up to 100%.
- \* Overheat protection switch makes operation safer.
- \* 4mm L-type copper connector terminal block.
- \* Compatible module size with 35mm aluminum rails for convenient storage and setup.

**Self User Interface Unit: SUI-1001****Features:**

- \* Stand alone steel frame/case, chassis on/1230".
- \* Power Supply: AC100 ~ 240V, fuse protection.
- \* 64K, full color 10.1" LCD touch screen.
- \* ARM9-based CPU@ 200MHz and 128MB flash memory.



- \* Supports RS-232, RS-485, RS-422 and Ethernet communication ports.
- \* Built-in USB Host and USB Client serial port.
- \* Memory card interface.

**Home Automation System: HAS-10777****FEATURE:**

- \* Model frame contains three sets of feature lights, at adjustable brightness, and an electric curtain, which are computer controlled via a wireless broadband router.
- \* Control Panel consists of a single-key touch control, a dual-key touch control, a single-key touch-dimmer switch, a five-channel remote sense controller, a dome infrared-diffuse camera (including surveillance camera), an electrical curtain controller, an intelligent scene control host.
- \* Includes IPCamera/doorbell program, a Video Server to help quickly set up the environment.
- \* Aluminum trolley for convenient operation and storage.

**Educational Kits****PCI Digital I/O Card****PCI-492010****Specifications**

- \* 48-bit I/O, 8 bits a group, can be arranged in 6 groups of I/O
- \* PCI interface with PNP function
- \* **8 address cards can share 8 cards** can work on a computer at the same time without conflicts.
- \* CPLD makes it small, and high stability
- \* Self Functionality test
- \* Sample programs written in VB and LabView included.

**Printer 8255 Card****PCI-492014****Specifications**

- \* 2 8255A & 6 I/O ports (48 bits)
- \* Connects to PC parallel port. Don't need to open the computer case.
- \* 8 LED and 8 switches for testing purpose
- \* Supported by WIN 95/98/nc/2000/XP.
- \* **Suitable for assembly language, Visual BASIC, Visual C++, Borland C++ Builder, LabVIEW** and other high level programming language development kits
- \* Sample programs written in VB and LabVIEW

**PCI AD/DA Card****PCI-492011****Specifications**

- \* **8 A/D channels**, 2 D/A channels
- \* PCI interface with PNP
- \* Self Functionality test
- \* Sample programs written in VB and LabVIEW
- \* An AD/DA writing board included
- A to D **Range 0 - 5V** Resolution: 8 bits
- D to A **Range 0 - 12V** Resolution: 8 bits

**8851 Universal Card****PCI-491221****Specifications**

- \* LED 8 pcs
- \* 7-segment display
- \* **8-bit Dip switch**
- \* LCD module
- \* Relay circuit
- \* Buzzer and 8 control buttons
- \* RS-232 circuit to communicate with a PC
- \* RS-485 circuit allows connections to up to 255 devices for multiprocessor and communication experiments.
- \* **Ideal for LabVIEW/GenDAQ control experiments**

**Stepper Motor Control Card****SMIC-490420****Features**

- \* 2 six-line stepper motor drivers
- \* Forward and backward controls
- \* **Three inductive modes (one phase, two phase, and one/zero phase)**
- \* Controlled by a PC or a single chip
- \* Use the PT7374, rated 1800V/A.
- \* Motor speed controlled by pulse frequency
- \* Stepper motor, rated 5V/1A included

**Electronics & Measurement Circuit Lab****Key Features:**

- \* Integrated 3 types of measured objects: DC motor, heating plate and weighing platform with Resistance strain gauge
- \* Configured 12 integrated circuit module of sensor
- \* Electronic components and parts package
- \* **USB Speed I/O plug-and-play connectivity**
- \* Various test points for convenient connection of oscilloscope probe
- DC 5V, +/- 12V, 24V power

**Educational Robot Kit for C Programming:****RA-78004****Key Features:**

- \* Learning to program your robot's AT89C52 Brain with C language
- \* Keil a Visual Studio for C program edit, compiling and linking
- \* Download program by AVR-Figstar software
- \* Calibrating the robot's continuous rotation servo motors
- \* Using lights and speakers for status indication

**Kit Contents:**

- \* C51-AVR educational board
- \* The cart with two parallel continuous rotation servos
- \* USBASP download manager
- \* Components package of basic sensor

**Educational Robot Kit, Embedded Systems****RA-78005**

Using a **DIY** and "learning by doing approach", this educational robot equipped with step-by-step explanation, students can learn the STM32 chip peripheral pin properties, internal structures and principles, on-chip peripheral resources, design methods and application software programming. This is an innovation of the traditional teaching methods and teaching system, and an innovative solution of the embedded system course which is abstract and difficult to beginners.

**Kit Contents:**

- \* ARM Cortex M3 educational board with STM32 chip
- \* The cart with two parallel continuous rotation servos
- \* J-Link download manager
- \* Components package of basic sensor

**Basicduino Apple Board****RA-78003**

This board is designed to be compatible with BASIC Stamp 2 module, reducing **breadboard and 32 LEDs** and 1 speaker driver, with the purpose of increasing entries interest for children. The Board includes a BASIC Stamp 2 module so you will not need to purchase one separately.

**Key Features:**

- \* All 16 Digital I/O pins are free to use, allowing you to fully utilize the capabilities of the BASIC Stamp.
- \* Compatible with extend project board, for ease of prototyping sensor systems.
- \* Integrated Serial Communication LEDs for a visual

**confirmation of data transfer.**

- \* Integrated 32 LEDs for a visual light wave
- \* Integrated a speaker amplifier for playing music
- \* 5V/1A power supply
- \* 5V/1A regulator
- \* Serial communication through USB port
- \* Dimensions: 125mm x 123 mm (length x width)
- Related Products:
  - \* 5VDC 2 Amp Power Supply
  - \* Extend Project Board

**Robotic Arm Control: RA-495801****Features****\* Structures are made of PC boards.**

- \* The lower deck is a power control unit which supplies power for the upper deck.
- \* The upper deck is a control unit including a servo motor control card, capable of controlling up to 16 servo motors.
- \* 4 servo motors for waist, upper arm, forearm, & gripper rotations, respectively are included.
- \* User friendly graphic control software for real time on-line control from your PC.
- \* The software is capable of controlling 16 servo motors.
- \* Design your own motion sequence and download it from PC to the robot through a COM port.
- \* Users have a hand-on opportunity to build up this robotic arm from scratch. (Assembling instructions included)
- \* Enclosed motion design examples help users to develop their own control programs.
- \* Users will have an opportunity to learn not only servo motor control but also mechanism training.
- \* The software and servo motor control card can be used for different applications. (Control up to 16 motors)
- \* AC Adapter included
- \* **DC power input pins are available for battery input.**
- \* It is one of the best project kits to inspire students' learning motivation.

**Specifications:**

1. Servo Motor Control Unit
2. Power Control Unit
3. Robotic Arm Structure Components
4. 4 Servo Motors
5. RS-232 Communication Cable
6. Robotic Arm Graphic Control Software
7. User's Manual
8. AC Adapter
9. Accessories (nuts, bolts, power cord, signal cord)

**2DOF Quadruped Robot****RA-78002****Key Features:**

- \* Ultra strong "C" channel center chassis design
- \* Integrated "pin nuts" which makes adding hardware and electronics a breeze
- \* Accepts any standard size servo
- \* Fully adjustable (vertically and horizontally) circuit board holders
- \* Legs can accommodate (2) different walking hardware configurations
- \* (2) integrated fiducial points for heavy payload capacities
- \* 6+ pound payload capacity
- \* Leg angles can adjust to a fixed 45 to 135 degrees

**Technical Specifications**

- \* Over 36 sq. inches (36 sq. cm) of total prototyping space is available on the Quadruped body
- \* Overall dimensions - 13" (33cm) X 13" (33cm) to leg
- \* Height - Standing 6.25" (15.8cm)
- \* Ground Clearance 2.75" (7cm)

**\*Payload Capacity 2 lbs.**

- \* Weight - 2.4 lbs. (1.09kg) with servos
- \* Leg movement: 2 degrees of freedom (vertical and horizontal) for the standard kit.

**\* Controller Operation:**

- \* Servos
- \* Corded Metal Brush Motor
- \* **Top/Brain Flashing Beeping**
- \* 8x1 Torque at 4.8V; 45.83 oz-in. (3.3kg/cm)
- \* 8x1 Torque at 6.0V; 36.83 oz-in. (4.1kg/cm)
- \* Speed at 4.8V: 8.21 sec/90 degrees at no-load
- \* Speed at 6.0V: 8.16sec/90 degrees at no-load
- \* Current Drain (4.8V): 80mA/Idle and 180mA no load operating
- \* **Current Drain (6.0V): 8.8mA/Idle and 158mA no load operating**
- \* Dimensions: 1.59" x 0.77" x 1.44" (40.6 x 19.8 x 36.6mm)
- \* Weight: 1.6oz (45.5g)

**Small Scale Service Robot****RA-79001****Key Features:**

- \* Mobile platform and the manipulator are controlled by the same controller.
- \* The robot arm is driven by dual-motor.
- \* A variety of mounting holes on the mobile platform's mechanical parts is easy for expansion to install a variety of sensors.
- \* The mobile platform is driven by two Panamatic continuous servo motors, and the manipulator driven by high torque metal gear position servo
- \* High-power rechargeable lithium battery, long running time.
- \* Support the USB cable to the integrated development environment, debugging and downloading programs.
- \* With a 3-Box module expansion interface.

**Technical Specifications**

- \* The manipulator has four joints, and a clamping joint, the maximum payload is about 100 grams
- \* The manipulator unfolded length is about 150mm (from the center of the joint of the big arm to the gripper center)
- \* Power requirements: 4 ~ 6VDC.
- \* Controller Dimension: 1.56mm x 1.21mm
- \* Operating temp range -40 ~ 85 °C
- \* Support a variety of interactive programs, such as: Flash, MAX, Map, VSNV, PID, C, Processing
- \* Support a variety of programming environments, such as: Arduino IDE, Eclipse, AVRProjectIDE, etc.

**Servo Robot: RA-4903010**

- \* 17 servo motors
- \* 2 servo motor control cards
- \* Aluminum frame
- \* Battery pack & charger
- \* RS-232 interface
- \* Software for robot motion design
- \* **Example programs include walk, pushy, flip, and play Tag!**

**AI-Motor Robot: RA-4903002**

Available as a Kit or Assembled. Programmed in C.

**Includes:**

- \* 17 AI motors
- \* 8651 Controller Board
- \* Metal brackets and hardware
- \* Battery pack, 7.2 V 2300 mAh
- \* Power supply/adaptor: 100-240 VAC/1.8A, 7.5
- \* RS232 controller cable
- \* **May be connected to PC, developing environment, such as: VB, VC, LabView.**



AI-motor is a smart servo, including many functions for hobby robotics.

- \* A simple serial bus interface controller board, 4 wires control up to 31 motors.
- \* Wide 3/2 degree range movement.
- \* **Full rotation mode, software controlled**
- \* Built-in position encoder
- \* Mechanism includes center axle, side axle and body mounting points

**AI-Motor Dog Robot: RA-4930003**

Available as a kit or assembled. Programmed in C.

**Includes:**

- \* 14 AI motors
- \* brackets and hardware
- \* 9851 controller board
- \* Battery pack, 7.2 V 2300 mAh
- \* Power supply/adaptor: 100 ~ 240 VAC/1.8A, 7.5 DCV/A
- \* **RS232 controller cable**
- \* **May be connected to PC, developing environment, such as: VB, VC, LabView.**

**Basic Telephone Kit: BTK-27045**

This kit is ideal for learning basic phone theory

**Features:**

- \* Pulse Tone switchable
- \* **HF Lo range setting**
- \* Flash/Redial

**Wireless Door Alert Kit: WDA-27032**

- \* Suitable for shops, offices, and residences
- \* Highly audible siren tone alerts hosts when visitors are present
- \* Call counter as an entry alert for offices
- \* Door alert also helps to keep your children safe while you are not watching them.
- \* More receivers can be installed if necessary

**IC Shortwave Receiver Kit****ICS-27020**

- \* Very easy to build, yet uses a modern CMOS IC to provide sufficient amplification to drive a speaker.



Can be used it to listen to short wave broadcasts from other countries, to listen in on radio amateurs, and to learn Morse codes from slow Morse transmissions.

**Sound Activated Recorder Switch****SAR-27023**

This kit is capable of turning on a tape recorder when sound is detected. It includes a high sensitivity microphone, 3.5 mm plug, and all necessary components.

Two "AA" batteries are required for operation.

**Fuzzy Inverter Intercom: FIH-27065**

The caller only has to use the push-to-talk button to call the other receiver. Both sides can hear the caller's voice at the same time.

The other person can hear the caller's voice without pressing any button.

**Wireless A/V Transmitter Kit****WAV-27060**

The wireless A/V transmitter sends signals through the air to the receiving TV within a range of 100 ft. It eliminates having to strain or re-connect cables.

To transmit live video pictures, just plug it into any standard video camera, and they can be viewed on any TV tuned to the indicated channel.

**Stereo Amplifier: SA-27051**

- \* Stereo and Mono modes
- \* 6 ft output
- \* Nice compact case make it a convenient and easy amplifier kit to use.

**Touch Sensor With Control Delay****TS-27057**

This sensor kit can detect human touch and alternately activate a relay in response. A touch of your finger can activate any 120V AC rated Relay up to 300W.

A 9V battery is required for operation.

**Wireless A/V Sync. Transmitter Kit****WAV-27060A**

This kit combines the functions of WAV-27060 & RPS-27063. With the built-in AC/DC adapter, you can directly plug it into a power socket.



Check out our complete selection of Soldering Irons and Replacement Tips on pages 27 & 28!



## Breadboards &amp; Jumper Wires

## Breadboards

## BB-344 Series



Part Number	Terminal Strips	Distribution Strips	Vcc Points
BB-344020	1	2	840
BB-344040	2	4	1680
BB-344060	3	5	2430
BB-344080	4	7	3260

Dimensions (L x W x H in mm)

BB-344020	165	54	8.5
BB-344040	215	138	9.7
BB-344060	230	175	9.7
BB-344080	240	210	9.7

## BB-271 Series



Part Number	Terminal Strips	Bus Strips	Contact Points
BB-272010	1	0	750
BB-272030	1	2	850
BB-272040	2	4	1660
BB-272041	2	3	1560
BB-272060	3	5	2390
BB-272080	4	7	3220

Dimensions (L x W x H in mm)

BB-272010	166	45	11
BB-272020	166	54.5	11
BB-272040	215	138	31
BB-272041	215	128	31
BB-272060	230	175	31
BB-272080	240	210	31

## Powered Breadboard: PBD-4060

- Input Power: 110V AC or 230VAC @ 58-60Hz ± 10%, International 120/220 VAC switchable.
- Triple-Output Power Supply: Fixed +5V @ 1A, Continuously adjustable 0 - +16V @ 300mA and 0 - -16V @ 300mA, Accuracy @1: 5%.
- Overload and short circuit protection.
- Fuse protection.
- Solderless breadboard with 2420 tie points.
- Power switch with light.
- Size: 10 1/4" x 8 3/4" x 3 1/4"
- Weight: 6 lbs.



## Jumper Wires

Jumper wire sets include 14 different lengths (0.1", 0.2", 0.3", ..., 1", 2", 3", 4", 5"). There are two packaging (polybag and plastic box) to select from.

JW-2760P: 350 pcs (14 different lengths, polybag)  
 JW-2760B: 350 pcs (14 different lengths, box)  
 JW-2770P: 140 pcs (14 different lengths, polybag)  
 JW-2770B: 140 pcs (14 different lengths, box)



## IC EPROM Programmers

## Pocket Universal Programmer EDP-17056



\* Portable mini size only 130mm(L) x 90mm(W) x 20mm(H), USB powered up to additional power supply needed.

\* Provides DUT 75MHz bandwidth and <math>\leq 2.5\mu s</math> signal skew. In addition to the high processing speed, you can verify whether the ICs processing frequency meets specification.

\* Via USB HUB, you can connect multiple units to do gung programming, making development and mass production efficient.

\* Provide with DUT device pin checking and memory components ID verification. Ensure the best yield rate of programming.

## Specifications:

## Device power signal:

Logic signal level: 1.5V-6.0V, 10mA  
 IOL, IOH current: 10mA  
 Logic signal frequency: 75MHz (3-5V), 60MHz (2.5V), 45MHz (1.8V), 25MHz (1.5V)  
 Signal skew: <math>\leq 2.6\mu s</math> (3-5V)  
 Clock frequency: 0Hz - 75MHz  
 VDD, VDD level: 1.5V-6.2V, 10mA  
 IDD, IDO frequency: 400mA  
 VPP, VBIH level: 1.5V-15.5V, 20mA  
 IPP, IDIH frequency: 150mA

## Power consumption: 4W

Pin driver: 48 Pin Universal Pin Driver

DUT socket: DIP 48 ZIF

Dimension: 126(L) x 90(W) x 20(H) mm

Weight: 28g

## Digital IC Tester: DIC-17061

- \* Small, portable, & power saving
- \* Average search time: 0.8 sec
- \* Display: 16 characters in 1 line
- \* Test pins: 14 x 24
- \* Powered by AC adapter or battery
- \* Supported device: 74 40 45 41 44 serial



## Linear IC Tester: LIC-17062

- Features:
- Easy operation IC tester.
  - Small, portable, light, and power-saving design.
  - 0.8 sec average search time.
  - Display: 16 characters in 1 line.
  - Test pins: 8 - 16 pins.
  - Test voltage: <math>\pm 5V</math>
  - Equipped with empty-load test and auto power off function.
  - Supported device: OP, Comparator, OPFO, RGL, Transistor array.
- Specifications:
- Dimensions: 18 x 11 x 4.5 (cm)
  - Weight: 0.34 kg

- Temperature: +5A, AC to +45A, AC
  - Humidity: to 90% noncondensing
  - Altitude: to 3000 m
- Standard Accessories:
- Main unit.
  - DC 9V/300mA power adapter.
  - Operation manual.



## Portable EPROM Eraser

## ERE-17121A

- \* Capacity: 12 pcs 24-gate x 8"
- \* I-V rate: GL-4
- \* Wavelength: 2537A
- \* Tube Life: 1000 hrs
- \* Board Size: 55 x 135 mm
- \* Eraser Time: Pre-set up to 60 min
- \* Size & Weight: 240 x 85 x 85 mm, 1.2 kg



## Universal IC Programmer: UDP-17048

## Features:

- \* High performance, low cost, light, portable and professional design.
- \* USB interface
- \* Support low voltage components up to 2.5V.
- \* User-selectable verify Vcc with one or two-pass verify voltage
- \* Support FLASH/EPROM device speedy programming function. It takes 30 seconds to process one piece of 16M bits FLASH memory.
- \* Easy to operate software with automatic process function
- \* Automatic detect the device pin insertion and contact check

## Specifications:

## Device Socket:

48-Pin ZIF (zero insertion force)

socket accepts both 208 - 600

mil DIP devices up to 48 pins

## Communication Interface:

USB Version 1.1

## DC/AC Characteristics

- \* Signal voltage: 2.5V - 5.0V
- \* Vcc Voltage: 1.8V - 10.0V/300mA
- \* Vpp, Vbi Voltage: 1.8V - 23.5V/500mA
- \* Clock Frequency: 3 - 60 MHz
- \* Automatic Powerdown
- \* Project: Automatically record the brand names, numbers, files, processing procedures of these commonly used ICs.

- \* Functions: Select type, Load, Erase, Check, Program, Verify, Security.
- \* Supported data file format: JEDIC, binary, Intel 9885 Hex Motorola Hex, Tektronix Hex.

## Supported devices:

EPROMs, EEPROMs, FLASH EPROM Serial E/EPROMs, NV RAMs, Microcontrollers, DSPs and PLDs

## System requirements:

- \* Pentium II or higher, 32MB RAM minimum, 50MB free disk space.
- \* Windows 98/ ME/ 2000/ XP operating systems.

## Stand-alone Universal &amp; Gang Programmer UGP-17320

## Features:

- \* Provides with DUT 75MHz bandwidth and <math>\leq 2.5\mu s</math> signal skew.
- \* Provides the stand-alone mode operation. Just use 5 keys and 20x4 LCD, you can select a project and start to program.

\*Portable and compact design allow you to use everywhere.  
 \*Provides IC insertion test and contact check before programming. Under the AUTO mode, just insert the IC, UGP-17520 will start the processes automatically.  
 \*Provides a high-expansion flexibility in modular design. It can be used as single-side universal programmer or SPI gang programmer.

\*Provides mass-production-oriented software. A project file is used to control and to minimize operator errors. Moreover, the file helps production management.



#### Specifications:

- Power Signal
  - Logic Signal Level: 1.5V-8.0V,18mA
  - HOLD/IC Current: 10mA
  - Logic Signal Frequency: 75MHz (3-5V), 60MHz (2.5V), 45MHz (1.8V), 25MHz (1.5V)
  - Signal Slope:  $\sim 2.5\text{ns}$  (3-5V)
  - Clock: 0Hz-75MHz
  - VDD & VIO Level: 1.5V-6.5V,18mA
  - I/O & IO Current: 400mA
  - VPP & VIH Level: 1.5V-15.5V,20mA
  - I/PP & I/O Current: 150mA
- Display: 20x4 Character LCD, WORK & PASS LED
- Button: Direction key x 4, START key with light x 1
- Embedded Memory: 3.20Mbytes FLASH
- Module Dimension: 120mm(L) x 75mm(W)
- UGP-17520 Dimension: 240mm(L) x 115mm(W) x 60mm(H)
- Weight: 3.0kg
- Support Device: NOR FLASH, SPI EPROM, EPROM, MELCUL, CPLD, NV-RAM
- Support File Format: Binary/Machine Code, Intel HEX, TEK HEX Motorola HEX

#### Universal Gang 4 Programmer:

UGP-17456

#### Features:

- \* Four independent universal programming pin-driver in one unit.
- \* Provides DUT 75MHz.
- \* bandwidth and  $\sim 42.5\text{ns}$  signal slew. In addition to the high processing speed, you can verify whether the device working frequency meets their specifications.
- \* Provides Hands-Free Operation. The asynchronous and concurrent operation allows a chip to be programmed immediately upon insertion. The operator just removes the finished chip and inserts a new one.
- \* Provides mass-production-oriented software. This is used a Project file to control UGP-17456 to minimize the operator error. Moreover, it provides programming history and yield statistic for needs of production management.
- \* Performs insertion test and contact check before programming.
- \* A General adapter can be used as LP-456, saving money and increasing convenience.



#### Specifications:

- Power Signal
  - Logic Signal Level: 1.5V-6.0V,30mA
  - IOE & IOH Current: 10mA
  - Logic Signal Frequency: 75MHz (3-5V), 60MHz (2.5V), 45MHz (1.8V), 25MHz (1.5V)
  - Signal Slope:  $\sim 2.5\text{ns}$  (3-5V)
  - Clock: 0Hz-75MHz
  - VDD & VIO Level: 1.5V-6.5V,10mA
  - I/O & IO Current: 400mA
  - VPP & VIH Level: 1.5V-15.5V,20mA
  - I/PP & I/O Current: 130mA
- Pin Drivers: 48 Pin Universal Pin-Driver x4
- Pin Drivers: DP-48 Pin (Zero Insertion Force) x 4
- Dimension: 372mm(L) x 205mm(W) x 45mm(H)
- Weight: 2.1kg
- Supported Device: NOR FLASH, SPI EPROM, EPROM, MPU, MCU, CPLD, NV-RAM, ...
- Supported File Format: Binary/Machine Code, Intel HEX, TEK HEX Motorola HEX

### PCB Prototype Machines

#### PCB Prototype Machine: PCB-532005Q



#### Features:

- \* Stand-alone requiring no-PC connection
- \* Compact and easy to setup
- \* Acoustic cabinet is included
- \* A perfect PCB prototyping machine to fit any budget
- \* **Monochrome control panel with an LED display**
- \* Tools and PCAS software are included

#### Specifications:

- \* Working Area: 7.875" x 6"
- \* Min. Hole Size: 12 mil (0.3mm)
- \* Min. Trace width: 6 mil (0.15mm)
- \* X/Y travel Speed: 1.17"/sec
- \* **Repetition Accuracy: 0.2 mil (0.005mm)**
- \* Tool Holder: 1.8" Collar
- \* X/Y/Z Driver: Sapper motor
- \* Size (Width/Dr): 15.5"x17"x14.75"
- \* Weight: 44 lbs (20 kg)

#### PCB Prototype Machine:

PCB-532006 Series



#### Features:

- \* Surface and Tool Length Detection: PCB-532006 series are equipped with Z-axis detection to collect the height distribution on the copper board and automatically to adjust the height while cutting the copper board.
- \* Z axis is driven by a stepper motor which will be more controlable and will last longer than electromagnetic driver.
- \* User friendly PCAS software for all Windows Operating Systems.

#### Specifications:

	PCB-532005	PCB-532006	PCB-532006	PCB-532006
Working Area	15.5"x17"	15.5"x17"	16.7"x17.4"	15.5"x17.4"
Resolution	0.2	0.2	0.2	0.2
X/Y/Z Motor	Sapper	Sapper	Sapper	Sapper
Min. Prototyping Speed (mm/min)	3	3.4	3	3.4
Max. Working Speed (mm/min)	0.79	1.2	0.79	1.2
Min. Hole (mm/inch)	3	3	3	3
Min. Hole (mm/inch)	12	9	12	9
Tooling Capacity (Collar mm)	90	90	90	90
Min. Spindle Speed (mm)	10,000	60,000	31,000	60,000
Max. Hole	15.625x17.0	15.625x17.4	16.625x17	15.625x17.4
Weight (mm)	60	60	60	60

### Test & Measuring Equipment

#### Audio Generator/ Counter: AG-2603AD

#### Generator:

- \* Frequency Range: 10Hz - 1 MHz, 5 bands
- \* Output Impedance: 600  $\Omega$ , unbalance
- \* Wave Form: Sine/ Square
- \* Output Level: Sine: 0Vrms Square: 15 Vpp or more
- \* Attenuator: 0, -20, -40 dB & a fine adjuster

#### Counter:

- \* Frequency Range: 10Hz - 150MHz
- \* Gate Time: 1s, 0.1s
- \* Accuracy:  $\pm 1$  count
- \* Input Impedance: HF: 1M $\Omega$  VHF: 50 $\Omega$
- \* Dimension: 9.875" (L) x 8.57" (W) x 4.35" (H)
- \* Weight: 7 lbs



#### Audio Generator: AG-2601A

- \* Frequency Range: 10Hz - 1 MHz, 5 bands
- \* Output Impedance: 600  $\Omega$ , unbalance
- \* Output Control: 0 dB - 20 dB - 40 dB, and a fine adjuster
- \* Waveform: Sine, Square
- \* Output Level: Sine: 0Vrms, Square: 15 Vpp
- \* Dimensions: 9.875" (L) x 8.17" (W) x 6" (H)
- \* Weight: 7 lbs



#### Millivolt Meter: MV-3100A / MV-3201B

- \* MV-3100A: 1 CH Millivolt Meter
- \* MV-3201B: 2 CH Millivolt Meter
- \* Voltage Range: 0.3 mV - 100 V in 12 ranges
- \* dB Range: -70 - 40 dB in 12 ranges
- \* Accuracy:  $\pm 3\%$  of full scale at 1 kHz or 400 Hz
- \* Frequency Response: 10 Hz - 1 MHz
- \* Size & Weight: 215 x 152 x 200 mm 2kg/ 3.5kg



**NTSC/PAL Pattern Generator  
CPG-1366A/CPG-1367A**

- Frequency Range: CPG-1366A: 45.75, 175.25, 187.25 MHz; CPG-1367A: 38.8, 55.25, 175.25 MHz
- RF Output: 100W, 75Ω
- Video Output: 1 V<sub>p-p</sub>
- Impedance: 75 Ω

**Modulation Meter: MM-47020****RF Input:**

- Frequency Range: 1.5 MHz – 2.0 GHz
- Impedance: 50 Ω

**FM Measurement:**

- Deviation Range: 1.5 kHz – 100 kHz in 8 ranges
- Modulation Rate: 50 Hz – 30 kHz ± 0.5 dB

**AM Measurement:**

- Depth Range: 5% – 100% in 6 ranges
- Modulation Rate: 50 Hz – 30 kHz ± 0.5 dB

**Signal Output:**

- RF output: 430 kHz, 600Ω impedance
- AF output: 1V <sub>rms</sub> meter reading, 600Ω impedance
- DC output: 1V ± 0.5 dB, 100Ω impedance
- AF Filter: Band-pass filter, 30 Hz – 30 kHz (3 range)

**RF Signal Generator/Counter  
SG-4162AD****Generator**

- Frequency Range: 100K – 1.58 MHz in 6 ranges
- RF Output: 100m W rms
- Modulation: Int. 1 kHz
- Ext. 50 Hz – 20 kHz
- Audio Output: 1 kHz, Min. 2V rms
- Crystal Oscillator: 1 – 15 MHz (HC-6L) holder not included

**Frequency Counter**

- Frequency Range: 10 Hz – 150 MHz
- Gate Time: 15, 0.15
- Accuracy: ±1 count
- Sensitivity: 20mV–50mV (30 – 150 MHz)
- Input Impedance: 50 Ω
- HF: 1MHz, VHF: 500
- Size (WxDxH): 8.5" x 4.75" x 6.66"
- Weight: 4 lbs.

**RF Signal Generator: SG-4168B****Generator**

- Frequency Range: 100K – 1.58 MHz in 6 ranges
- RF Output: 100m W rms
- Accuracy: ±3%
- Modulation: Int. 1 kHz
- Ext. 50 Hz – 20 kHz
- Crystal Oscillator: 1 – 15 MHz (HC-6L)
- Attenuator: HI – LO (20dB)
- Size: 6" x 10" x 5.25"
- Weight: 3.3 lbs.

**AM/FM Standard Signal Generator  
SG-4110A**

- Frequency Range: 100K – 1.58 MHz
- Display: 6-digit LED
- Resolution: 100 Hz (100K – 34.999 MHz); 1 kHz (25 MHz – 110 MHz)
- Accuracy: ±(5 + 0.5) ± 1 count
- Output Range: -19 dBm – 99 dBm ± 0.5 dB step



- Spurious: -50 dB or less
- Frequency Deviation: 0 – 100 kHz
- Meter Range: 0 – 100 kHz of full scale
- Internal Modulation:
- Frequency: 400 Hz or 1 kHz, width ± 1%

**Signal Tracer/Injector: SE-6100****Tracer Portion**

- Gain: Max. 60 dB at 1 kHz
- Attenuator: 0.20-40-60 dB
- Input Impedance: 100k Ω
- Meter: VU 300μA
- Output Impedance:

**External Speaker: 8 Ω**

- Output: 600 Ω (Unbalanced)
- Speaker: 2.25"
- Power Supply: 9 V battery or AC adapter
- Injector Portion:
- Frequency: 1 kHz
- Output Level: Max. 4.5 V<sub>p-p</sub>

**Wow-Flutter Meter****WF-3103A/ WF-3105A**

- Frequency Range: 30 Hz ± 10% JSCCTR; 3.15 kHz ± 10% DIN
- Input Voltage: 1.5V<sub>rms</sub> – 30V rms
- Input Impedance: 300 kΩ (Unbalanced)
- Measurement Range: 0.03/0.1/0.3/1.0 full scale in 5 ranges
- Accuracy: ± 5% of full scale
- Signal Source: 7.0, 3.15 kHz ± 0.05%
- Dual Measurement: (WF-3103A) ± 2% to ± 10% in 3 ranges
- Prog. Counter: (WF-3105A) 10 Hz – 9.99 MHz
- Gate Time: (WF-3105A) 0.1 s, 1 s

**SWR/RF Power Meter  
32B/330**

- Frequency Range: 32B: 130 – 520 MHz; 330: 1.8 – 520 MHz
- Measurable Power Range: 0 – 200 W
- Power Range: 4W/ 20W/ 200W
- Power Measurement Accuracy: 4W Range: ± 10% of full scale; 20W Range: ± 5% of full scale; 200W Range: ± 5% of full scale
- Min. Power for SWR Measurement: 4W
- SWR Measurement: 1 – ∞
- Insertion Loss: Less than 0.2 dB
- Input / Output Impedance: 50 Ω
- Input / Output Connection Plugs: SO-239

**mW RF Power Meter: 340**

- Freq. Range: 1.8–500 MHz
- RF Power: 20mW (200mW/2W)
- Impedance: 50 Ω
- VSWR: ± 1.15
- Accuracy: ± 10% of full scale
- Connector: Input N Type; Monitor out BNC Type

**SWR/ANT. Field Strength Indicator/  
RF Power Meter: SWR-3P**

- SWR: 1:1 to 1:3
- Impedance: 50 Ω
- Meter Sensitivity: 200 nA
- Accuracy: SWR: ± 5%, Power: ± 10%
- RF Power: 0.5–10 W & 0.5 – 100 W
- Frequency Range: 1.7 – 150 MHz

**Digital MHz/Hz Meter: DOM-03001**

- Remote Adjustment Knob
- 4 terminal inputs
- Sampling Time: 0.4 Seconds
- 0.7" LCD Max. display 9999
- AC Power Input
- Built-in Overvoltage Indicator
- Range: 200m/2000u/20/200/2000 Ω
- Resolution: 0.1mV/1mV/10mV/0.1/1 Ω
- Power Input: AC 110V or AC 220V
- Size: 8.25" x 4.75" x 3.25"
- Weight: 1.5 lbs.

**Dip Meter: DM-4061A**

- Frequency Range: 1.5 MHz – 250 MHz in 6 bands
- Modulation: 2 kHz sine wave
- A rod and socket can be used to connect to a Crystal Oscillator (not included)
- An audio signal output socket
- Powered by 9V DC battery
- Size: 8.875" x 3.5" x 2"

**Distortion Meter****DM-3104B (1 CH) / DM-3204 (2 CH)**

- Range: 0.01% to 10%
- 0.1/0.3/1.0/3.0/10/30% of full scale
- Frequency range: 400 Hz ± 0.05%, 1.00 kHz ± 0.05% (REF.)
- Optional: 351Hz filter for third harmonic distortion (HDP); 351Hz filter for total harmonic distortion (HTP).
- Input level range: 3mV to 100V.
- Ratio measure range: 20dB.
- Automatic switching range of frequency: Fundamental frequency (50) ± 10%; Fundamental rejection: > -60dB at 5 ± 5%, > -70dB at 5 ± 1%.
- Harmonic accuracy: ± 0.5dB between 1.8 to and 200 kHz.
- Accuracy: ± 5% of full scale.
- Monitor output: 1V rms (at full scale).

**Level measurement**

- Measurement range: 0 to 100V.
- 0.02/0.1/0.3/1.0/3.0/10V of full scale.
- Frequency response: ±0.5dB between 20 to 50 kHz; ±1dB between 20 to 100 kHz.
- Input impedance: 100kΩ ± 5% (Unbalance) ± 70pF.
- Accuracy: ± 3% of full scale.
- Power supply: AC 115 / 230V ± 10% 50 / 60 Hz approx. 4VA.
- Size & weight: 420 (W) x 200 (H) x 2.680 (D) mm.
- Approx. 5 lbs.

**AC Clamp-On Meter****ACM-0300W ACM-0337S ACM-1340**

- ACA: 10/30/100/200/1000A (ACM13000); 6/15/60/150/300A (ACM-1337S); 6/30/60/300/600A (ACM-1340)
- ACV: 150/300/750V (ACM-13000); 300/600V (ACM-1337S)





- 150, 200, 600 V (ACM-1360B)  
 \* Resistance: 2M $\Omega$ , center reading at 2K $\Omega$   
 \* Accuracy:  $\pm 3\%$  of the full-scale value  
 \* Weight: 1 lb

**Digital Clamp-on Meter: CLM-01660**

- \* DCV/ACV: 1KW/150V  
 \* ACA: 600A  
 \* Resistance: 10K $\Omega$   
 \* Contrast: Data Hold  
 \* Display: 10000  
 \* Air Size: 35mm  
 \* Accuracy: 1.8%  
 \* Size: 9" x 3.25" x 1.375"  
 \* Weight: 2 lbs

**Digital Clamp-On Meter CLM-01665C/CLM-01665F**

- Features**  
 \* Data Hold Function  
 \* Peak Hold Function  
 \* Low battery indicator  
**LCD display**  
 \* Overload protection  
 \* Heavy duty, Max. 2000A for DMC or ACA by the inductive Conductor

**Specifications**

- \* ACA: DCA: 200A - 1000A  
 \* ACV: 200V - 750V  
 \* DCV: 200V - 1000V  
 \* Temp: -40C - 750C (CLM-01665C)  
 \* -40F - 1400F (CLM-01665F)  
 \* Resistance: 2000  $\Omega$   
 \* Size: 9.1" x 2.8" x 1.4"  
 \* Weight: 0.9 lb  
 \* Frequency: 300Hz - 600KHz  
 \* Diode and Continuity tone

**Digital Capacitance Meter DC36-01128**

- \* 3000 Counts Static Reading Function  
 \* Tolerance Mode  
 \* Setting Hi/Lo Limit  
 \* 1% Basic Accuracy  
 \* Auto Power Off  
 \* Full Auto-Ranging  
 \* Full Push Button Operation  
 \* Wide Range with 0.1 pF Resolution  
 \* Large LCD Display  
 \* Range: 500 pF - 50nF

**Frequency Counter: FC-5256C/FC-5270A**

- \* Frequency Range:  
 FC-5256C: 10 Hz - 280 MHz  
 FC-5270A: 10 Hz - 1.2 GHz  
 \* Gate Time: 0.1s, 1s  
 \* Accuracy: 31 count  
 \* Max. Input: 10 Vpp  
 \* Input Sensitivity: 300V, 10 - 200M Hz (FC-5256C)  
 500V, 10 - 1200M Hz (FC-5270A)

**Frequency Counter: FC-032700**

- \* Frequency Range:  
 10 MHz, 500 MHz, 2700 MHz  
 \* Data Hold, Frequency  
**Memory (Max., Avg., Min.)**, Period, Relative  
 \* RS-232, TCXO (temperature compensated crystal oscillator) time base, high stability & accuracy  
 \* 8-digit LCD  
 \* Size/Weight: 11" x 8.5" x 3.5" / 8.27 lb

**Portable Frequency Counter: FC-03250**

- \* Range: 10, 500, 2500 MHz  
 \* Freq., Period, Hold, Average, Relative, Max., and Min.  
 \* Accuracy:  $\pm 1$  PPM (1 $\sigma$ )  
 \* 8-digit LCD display  
 \* Size: 6.8" x 3.1" x 1.4"  
 \* Weight: 0.75 lb

**Function Generator: FG-2106A**

- \* Frequency Range:  
 0.1 Hz - 2 MHz  
 \* Accuracy:  $\pm 5\%$   
 \* Impedance: 50  $\Omega$   $\pm 10\%$   
 \* Rise Time: 100 ns  
 \* Waveform: Sine, Square, Pulse, Ramp  
 \* Output: 50 Vpp  $\pm$  20% (p output)  
 \* Attenuator: 0 dB, -20 dB  
 \* DC offset: -10 V to +10 V  
 \* Symmetry: 20% - 80%  $\pm 1\%$   
 \* Sync Output: 3 Vpp  
 \* VCF: 0 - 10 V control Freq. to 1000 : 1  
 \* Size: 8.5" x 4.25" x 9"  
 \* Weight: 7 lbs

**Function Generator: FG-2102AD**

- \* Frequency:  
 0.2 Hz - 2 MHz in 7 ranges  
 \* Accuracy:  $\pm 1$  count  
 \* Impedance: 50  $\Omega$   $\pm 10\%$   
 \* Gate Time: 0.1 S, 1 S, 10 S  
 \* Waveform: Sine, Square, Pulse, Triangle, Ramp  
 \* Output: 50 Vpp  $\pm$  20% (p output)  
 \* Attenuator: 0 dB, -20 dB  
 \* DC offset: -10 V to +10 V  
 \* Symmetry: 20% - 80%  
 \* Rise Time: 100 ns  
 \* Distortion:  $\pm 1\%$   
 \* Sync Output: 3 Vpp  
 \* TTL & CMOS Output  
 \* VCF: 0 - 10 V control Freq. to 1000 : 1  
 \* Display: 4 digits with Hz, KHz  
 \* Size: 8.5" x 4.25" x 10.75"  
 \* Weight: 8 lbs

**Function Generator: FG-22030/FG-22032**

- \* Frequency: 0.5 Hz - 3 MHz in 6 ranges  
 \* Impedance: 50  $\Omega$   $\pm 2\%$   
 \* Attenuator: 0, -20dB  
 \* Waveform: Sine, Square, and Triangle, Ramp,  $\pm$  Pulse, and  $\pm$  Pulse  
 \* Amplitude: 20 Vpp open circuit, 10 Vpp 50  $\Omega$  load  
 \* DC offset: -10 V to +10 V  
 \* Rise/Fall Time: 60 ns  
 \* Distortion:  $< 1\%$  when  $f < 100$  KHz  
 \* Sync Output  
 \* Rise Time:  $< 40$  ns  
 \* Level:  $\pm 3$  Vpp (output)  
 \* Waveform: Square, Pulse  
 \* Sweep  
 \* Mode: Linear/Log Sweep  
 \* Width:  $\pm 100$ : 1 continuously variable  
 \* Sweep Output: 10 Vpp (p output)  
 \* Output Impedance: 100  $\Omega$   
 \* Counter: 0G-22032 only  
 \* Display: 5 digit Red LED display with Autorange  
 \* Frequency Range: 0.2 Hz - 60 MHz

**Function Generator: FG-22050/FG-22052**

- \* Frequency: 0.5 Hz - 5 MHz in 8 ranges  
 \* Impedance: 50  $\Omega$   $\pm 2\%$   
 \* Attenuator: 0, -20dB  
 \* Waveform: Sine, Square, Triangle, DC  
 \* Amplitude: 20 Vpp open circuit, 10 Vpp 50  $\Omega$  load  
 \* DC offset: -10 V to +10 V  
 \* Rise/Fall Time: 60 ns  
 \* Distortion:  $< 1\%$  when  $f < 100$  KHz  
 \* Sync Output  
 \* Rise Time:  $< 40$  ns  
 \* Level:  $\pm 3$  Vpp (output)  
 \* Waveform: Square, Pulse  
 \* Sweep  
 \* Mode: Linear/Log Sweep  
 \* Width:  $\pm 100$ : 1 continuously variable  
 \* Sweep Output: 10 Vpp (p output)  
 \* Output Impedance: 100  $\Omega$   $\pm 2\%$   
 \* Counter: 0G-22052 only  
 \* Display: 5 digit Red LED display with Autorange  
 \* Frequency Range: 0.2 Hz - 60 MHz

**Function Generator: FG-4562B/FG-4562C**

- Main output**  
 \* Frequency:  
 FG-4562B: 0.2 Hz - 10 MHz  
 FG-4562C: 0.2 Hz - 20 MHz  
 \* Impedance: 50  $\Omega$   $\pm 10\%$   
 \* Attenuator: 0, 20, 40, 60 dB  
 \* Waveform: Sine, square, Triangle, Ramp, Pulse, TTL, CMOS  
 \* Amplitude: 20 Vpp (IML), 10 Vpp 50  $\Omega$  load  
 \* DC offset: -10 V to +10 V (IML), -5V - +5V (50  $\Omega$ )  
**See Wave**  
 \* Distortion:  $\pm 0.8\%$  when  $f < 100$  KHz  
**Square Wave**  
 \* Rise/Fall Time:  $< 28$  ns  
**Triangle Wave**  
 \* Linear: 90%  
 \* TTL output: Low = 0.5V, High = 1.5V  
**CMOS output: 3Vpp - 15 Vpp adjustable (VCF)**



- \* Input voltage: 8V - 2V  
 \* Input impedance: 100K $\Omega$   $\pm 10\%$   
**Sweep**  
 \* Mode: Linear/Log  
 \* Width: 100:1 adjustable  
 \* Time: 100-500 nS  
**Amplitude Modulation:**  
 \* Depth: 0 - 100%  
 \* MOD freq: 1 KHz  
 \* Ext. Impedance: 100K $\Omega$   
 \* Ext. sensitivity: 0V - 2V  
 \* Deviation: 0 - 5%

**Freq. Modulation**

- \* MOD freq: 1 KHz  
 \* Ext. Impedance: 100K $\Omega$   
 \* Ext. sensitivity: 0V - 2V  
 \* Display: 5 digit (INT.), 8 digit (EXT.)  
**Counter**  
 \* Freq. Range: 0.2 Hz - 3000 Hz (EXT.)  
 10 MHz (FG-4562B)  
 20 MHz (FG-4562C)  
 \* Input Impedance: 50  $\Omega$   $\pm 30\%$   
 \* True Size: 16.8H  
 \* Size (WxDxH): 9.7" x 5.13" x 6.67"  
 \* Weight: 4 lbs

**LCR Meter LCR-40500**

- \* Auto LCR check
- \* 100/120/180/Hz
- \* 20,000/2,000 Counts Display
- \* Backlit
- \* L<sub>r</sub>/L<sub>p</sub>/C<sub>r</sub>/C<sub>p</sub>/R<sub>p</sub>/R<sub>s</sub>/DCR with d
- \* Q/WZR Measurement
- \* Relative Mode
- \* Series/Parallel Modes
- \* Components sorting function
- Selectable tolerance:  $\pm 0.25\%$ ,  $\pm 0.5\%$ ,  $\pm 1\%$ ,  $\pm 2\%$ ,  $\pm 3\%$ ,  $\pm 10\%$ ,  $\pm 20\%$ ,  $\pm 30\%$ ,  $\pm 40\%$

**\*Low Battery Indicator**

\*Optional IR to USB link (optional)

**LCR Meter LCR-41130/ LCR-01131**

- \* Auto Ranging/ Auto Power-off
- Max/Min/Avg (LCR-41131 only)
- \* 2000/9999 counts
- \* **Basic Accuracy: 0.5% / 0.7%**
- \* Test Frequency: 30Hz/120Hz
- \* Inductance: 200nH - 200H (LCR-41130)  
1mH - 10kH (LCR-41131)
- \* Capacitance: 200 pF - 2000 nF (LCR-41130)  
1000 pF - 10 nF (LCR-41131)
- \* Resistance: 20  $\Omega$  - 20 M $\Omega$  (LCR-01130)  
10  $\Omega$  - 10 M $\Omega$  (LCR-01131)
- \* 999 counts for D/Q display (LCR-41131 only)



**Mini LCR Meter: LCR-43063**

- \* Inductance: 3 Range, 2 nH - 20 H
- Resolution: 1 nH - 10 nH**
- \* Capacitance: 6 Range, 2 pF - 200 nF
- Resolution: 1 pF - 100 nF
- \* Resistance: 6 Range: 200 $\Omega$  - 20 M $\Omega$   
Resolution: 0.01 - 10k $\Omega$
- \* Size: 4.75" x 2.75" x 1.5"



**Bench Top LCR Meter: LCR-40163**



- \* Dual display, Dual-Parameter Measurements
- \* 200/400 Selectable Measurement Modes
- \* Basic Accuracy: 0.3%
- \* Inductance: 10nH to 10000H
- \* **Capacitance: 100pF to 100nF**
- Resistance: 10 $\Omega$  to 10M $\Omega$
- \* Test Frequency: 30Hz/120Hz
- \* Auto Manual Ranging, Parallel & Series Modes
- \* Measuring Rate: 1 time/sec
- \* Tolerance Mode: 1%, 5%, 10%
- \* Auto Protective Fuse Check
- \* **Size: 8.1" x 10.25" x 2.75"**
- \* Weight: 3.6 lbs

**True RMS Digital Multimeter**

**DMM-84288A**

- \* LCD Display: 8700 Counts
- \* Max Response to AC Bandwidth: 10kHz
- \* Peak Response time approx 0.5sec
- \* **Min/Max/Avg hold in Real Time**
- \* Blue Backlight
- \* Zero set for capacitance
- \* Auto hold/Data hold
- \* Auto Power-off
- \* Auto-range and Manual range
- \* Bar Graph Display

\* Simultaneous display of measured and meter interior temperature.

\* Sampling rate: approximately 4 times per second.

\* Overload protection with audible alarm

**Bench Top Digital Multimeter**  
**DMM-52803**



Function	Range	Accuracy
V <sub>AC</sub>	10mV to 200V	$\pm 0.05\%$
V <sub>DC</sub>	100uV to 200V	$\pm 0.05\%$
I <sub>AC</sub>	100uA to 10A	$\pm 0.5\%$
I <sub>DC</sub>	100nA to 10A	$\pm 0.5\%$
R	10 $\Omega$ to 10M $\Omega$	$\pm 0.5\%$
C	10pF to 1000nF	$\pm 0.5\%$
L	100nH to 100H	$\pm 0.5\%$
Temp	0 to 1000°C	$\pm 0.5\%$
Capacitance	10pF to 1000nF	$\pm 0.5\%$
Inductance	100nH to 100H	$\pm 0.5\%$
Resistance	10 $\Omega$ to 10M $\Omega$	$\pm 0.5\%$
Frequency	10Hz to 1MHz	$\pm 0.5\%$
Period	100ns to 100ms	$\pm 0.5\%$
Duty Cycle	10% to 90%	$\pm 0.5\%$
Capacitance	10pF to 1000nF	$\pm 0.5\%$
Inductance	100nH to 100H	$\pm 0.5\%$
Resistance	10 $\Omega$ to 10M $\Omega$	$\pm 0.5\%$
Frequency	10Hz to 1MHz	$\pm 0.5\%$
Period	100ns to 100ms	$\pm 0.5\%$
Duty Cycle	10% to 90%	$\pm 0.5\%$

**Digital Auto-ranging Multimeter:**  
**DMM-51804**



**Features:**

- \* Conformance to IEC61010-1 CAT III 1000V/CAT III 600V
- \* 22000 Counts and 44 Bargraph Display
- \* True RMS for AC voltage and current
- \* RS232 Interface
- \* Data Hold, MAX/MIN, Relative Measurement
- \* AC Voltage / Current with 1kHz LOW PASS FILTER
- \* AC Voltage / Current Peak Value Measurement
- \* Logic frequency: Linear frequency / Duty cycle measurement
- \* Diode, Continuity Test
- \* Temperature Measurement
- \* Resistance Measurement
- \* Capacitance Measurement
- \* Clamp Measurement
- \* Full Overload Protection
- \* Power: 220V/110V AC or DC 9V

**Specifications:**

Function	Range	Accuracy
V <sub>AC</sub>	10mV to 200V	$\pm 0.25\%$
V <sub>DC</sub>	100uV to 200V	$\pm 0.25\%$
I <sub>AC</sub>	100uA to 10A	$\pm 0.5\%$
I <sub>DC</sub>	100nA to 10A	$\pm 0.5\%$
R	10 $\Omega$ to 10M $\Omega$	$\pm 0.5\%$
C	10pF to 1000nF	$\pm 0.5\%$
L	100nH to 100H	$\pm 0.5\%$
Temp	0 to 1000°C	$\pm 0.5\%$
Capacitance	10pF to 1000nF	$\pm 0.5\%$
Inductance	100nH to 100H	$\pm 0.5\%$
Resistance	10 $\Omega$ to 10M $\Omega$	$\pm 0.5\%$
Frequency	10Hz to 1MHz	$\pm 0.5\%$
Period	100ns to 100ms	$\pm 0.5\%$
Duty Cycle	10% to 90%	$\pm 0.5\%$

**Analog Multimeter**

**15360TR/ 15960TR**

- \* DC Voltage: 0 - 1kV, 0 - 1.2kV (AMM-1330T) Accuracy:  $\pm 3\%$  of full scale
- \* AC Voltage: 0 - 1kV 0 - 1.2kV (AMM-1330T) Accuracy:  $\pm 5\%$  (AMM-15360TR), others:  $\pm 4\%$
- \* DC Current: 0 - 12A (AMM-1330TR) 0 - 500mA (AMM-15360TR) 0 - 500mA and 2.5 A (AMM-15960TR) Accuracy:  $\pm 5\%$  of the full scale
- \* Resistance: 2k $\Omega$  - 20 M $\Omega$  (AMM-1330TR) 0, R<sub>1</sub>, R<sub>10</sub>, R<sub>1k</sub>, R<sub>10k</sub>, R<sub>100</sub> Accuracy:  $\pm 3\%$  of the full scale
- \* Battery Test: 1.5, 9V (AMM-15660TR)
- \* **Access: 150mA, 15mA, 150mA (AMM-1330TR) 15mA, 1.5, 15, 150mA (AMM-15960TR)**
- \* **Size: 4.8" tall**



**Digital Multimeter**

**DMM-1220 / -1230 / -1240 / -1250**

- \* Diode, MTC, Continuity, Data Hold
- 3 1/2 digit LCD Display
- \* **DMM-1220: Func + Battery Test**
- \* DMM-1230: Func + Cap.
- \* DMM-1240: Func + Cap. + Battery + Logic
- \* DMM-1250: Func + Cap. + Battery + Temp.



- \* (Type K Sensor Probes included)
- \* **AC/DC: 10 ranges with 10A fuse protection**
- \* DCV: 200mV, 2, 20, 200, 1000 V
- \* ACV: 200mV, 2, 20, 200, 750 V
- \* DCA/ACA: 200mA, 2mA, 20mA, 200mA, 10A
- \* Resistance: 200, 2k, 20k, 200k, 2M, 20M  $\Omega$
- \* Frequency: 2k, 20k, 200k, 2M, 20M Hz
- \* Capacitance: (DMM-1230 N/A) 2nF, 20nF, 200nF, 2uF, 20uF
- \* Protective Hobbler - Test Leads included
- \* Battery Life: 150 hrs
- \* Size: 6" x 3" x 1.75"
- \* Weight: 0.75 lb

**Mini Digital Multimeter**

**DMM-15800**

- \* **DCV: 200mV, 2V, 20V, 200V, 500V**
- \* ACV: 200V, 500V
- \* DCA: 2, 20, 200 mA
- \* Ohm: 20k, 200k, 20k, 200k, 2M  $\Omega$
- \* Continuity, Transistor, Diode Test
- \* **Size/ Weight: 300 x 50 x 23 mm / 68 g**



**Single Output DC Power Supply- By Model Number:**

- \* DC Voltage Output:
- PS-40300-10V
- PS-40300-15V
- PS-40300-20V
- PS-40300-24V
- PS-40300-28V
- PS-40300-30V
- PS-40300-36V
- PS-40300-48V
- PS-40300-60V
- PS-40300-68V
- \* Current Output:
- PS-40300-1A
- PS-40300-5A
- PS-40300-10A
- PS-40300-15A
- PS-40300-20A
- PS-40300-30A
- PS-40300-5A
- PS-40300-5A



PS-49003: 5A  
 \* Output ON/OFF  
 \* CC & CV variable  
 \* LED Display  
 \* Ripple/Sho-1MHz CV pp / CV rms / CC rms  
 All:  $50\mu\text{V} / <2\mu\text{V} / <2\mu\text{A}$

**PS-49003: 240W / 250W / 250A**

\* Size: 6.1 x 5.3 x 10.6in.

\* Weight:

PS-49100: 8.9lbs  
 PS-49200: 12lbs  
 PS-49300: 12lbs  
 PS-49400: 8.9lbs  
 PS-49500: 12lbs

**\*\*110 and 220 input voltage selectable\*\*****Single Output DC Power Supply:****PS# 485030/48620/486030/486010/488020**

\* DC Voltage Output:

PS-485030: 30V

PS-48620: 60V

PS-486030: 60V

PS-488010: 80V

PS-48820: 80V

\* Current Output:

PS-485030: 30A

PS-48620: 20A

PS-486030: 30A

\* Output ON/OFF

\* CC & CV variable

\* LED Display

\* Auto Off at 120 degree C

\* Ripple/Sho-1MHz CV pp / CV rms / CC rms

PS-485030:  $24\mu\text{V} / <2\mu\text{V} / <2\mu\text{A}$

PS-48620:  $21\mu\text{V} / <2\mu\text{V} / <2\mu\text{A}$

PS-486030:  $21\mu\text{V} / <2\mu\text{V} / <2\mu\text{A}$

PS-488010 and PS-48820:  $21\mu\text{V} / <2\mu\text{V} / <2\mu\text{A}$

\* Size: 7.9 x 15.8 x 14.3in.

\* Weight:

PS-485030: 54lbs  
 PS-48620: 54lbs  
 PS-486030: 70lbs

**\*\*110 and 220 input voltage selectable\*\*****Varied Output DC Power Supply-****By Model Number**

\* DC Voltage Output:

PS-49003D: 30V x 2

PS-49003D: 60V x 2

PS-49003T: 30V x 2.5V

PS-49003T: 30V x 2.5V

PS-49010: 30V

PS-49005: 60V

PS-49100: 100V

PS-49200: 30V

PS-49010: 60V

PS-49100: 100V

\* Current Output:

PS-49003D: 3A x 2  
 PS-49003D: 3A x 2

PS-49003T: 3A x 2.5A  
 PS-49003T: 3A x 2.5A

PS-49010: 16A  
 PS-49100: 16A

\* Dual Output: PS-49003D, PS-49003D

\* Triple Output: PS-49003T, PS-49003T

\* Single Output: PS-49010, PS-49005, PS-49100

PS-49200, PS-49010, PS-49100

\* Output ON/OFF

\* CC & CV variable

\* LED Display

\* Independent/Serial/Parallel Modes in Models

PS-49003D, PS-49003D, PS-49003D, PS-49003T

\* Ripple/Sho-1MHz CV pp / CV rms / CC rms

PS-49003D:  $24\mu\text{V} / <2\mu\text{V} / <2\mu\text{A}$

All others:  $24\mu\text{V} / <2\mu\text{V} / <2\mu\text{A}$

\* Weight:

PS-49003D: 17lbs

PS-49003D: 23lbs

PS-49003T: 17lbs

PS-49003T: 23lbs

PS-49100: 21lbs

PS-49200: 21lbs

PS-49005: 20lbs

PS-49100: 21lbs

PS-49200: 30lbs

PS-49003: 30lbs

PS-49100: 30lbs

\*\*110 and 220 input voltage selectable\*\*

**Single Output DC Power Supply:****PS# 486050/486060/488050/488060/486100/486100**

\* DC Voltage Output:

PS-486050: 60V

PS-486060: 60V

PS-488050: 80V

PS-488060: 80V

PS-486100: 60V

PS-486000: 60V

\* Current Output:

PS-486050: 50A

PS-486060: 60A

PS-488050: 30A

PS-488060: 30A

\* Output ON/OFF

\* CC & CV variable

\* LED Display

\* Auto Off at 120 degree C

\* Ripple/Sho-1MHz CV pp / CV rms / CC rms

PS-486050 and PS-486060:  $21\mu\text{V} / <2\mu\text{V} / <2\mu\text{A}$

PS-488050:  $21\mu\text{V} / <2\mu\text{V} / <2\mu\text{A}$

PS-488060:  $21\mu\text{V} / <2\mu\text{V} / <2\mu\text{A}$

PS-486100:  $21\mu\text{V} / <2\mu\text{V} / <2\mu\text{A}$

PS-486000:  $21\mu\text{V} / <2\mu\text{V} / <2\mu\text{A}$

\* Weight:

PS-486050: 135lbs

PS-486060: 135lbs

PS-488050: 132lbs

PS-488060: 136lbs

\*\*110 and 220 input voltage selectable\*\*

**Oscilloscope (10 MHz):****OS-49010 CRT**

\* Type: 7" round, Green

\* Display Area: 8 x 10

DIV (DIV=6cm)

Vertical System:

\* Sensitivity: 5mV/DIV - 5V/DIV + 3%

\* Bandwidth: (MHz)

DC: 8 - 10 MHz, AC: 10Hz - 10 MHz

\* Input Impedance: 1M $\Omega$

\* Input Coupling: DC, GND, AC

\* Max. Input Voltage: 400V (DC + AC peak)

Horizontal System:

\* Sweep Time

0.1  $\mu\text{s}$  / DIV - 0.1 ms / DIV + 3%

Trigger System:

\* Mode: AUTO, NORM, TV

\* Source: Int, Line, Ext

\* Polarity: Positive or Negative

\* Trigger Sensitivity:

Int: 1 DIV, Ext: 0.3V, TV: 2 DIV

X/Y Operation:

\* Deflection Factor: X:0.5V/DIV + 3%

\* Bandwidth:

DC: 8 - 1 MHz, AC: 10 Hz - 1 MHz

\* Phase Error: < 3 Degree and Weight

22000x27000x3kg

**Oscilloscope (20 MHz):****OS-49020 CRT**

Type: 7" rectangular type with internal graphics

Display Area: 8.10 DIV (1 DIV = 1 cm)

**Vertical System:**

\* Sensitivity:

mV - 20V DIV, + 3%

IntV - 1V/DIV, + 3%

\* Bandwidth:

DC - 20MHz (MHz)

\* Rise Time: 17.5 ns

\* Input Impedance: 1M $\Omega$

\* CH1 Output Signal: 25mV/DIV (max 50V)

Horizontal System:

\* Sweep Time

0.2ms - 0.2s/DIV + 3%

\* Trigger Mode: AUTO, NORM

**X-Y Operation:**

\* Sensitivity: 5mV/DIV - 5 V/DIV + 4%

\* Bandwidth: DC - 500 kHz

Z-Axis:

\* Input Impedance: 20 - 10 k $\Omega$

Calibration:

1 MHz 0.5 Vpp square wave

Size/Weight:

335 x 122 x 430 mm / 7.8 kg

**Oscilloscope (25 MHz):****OS-22250 OS-22250**

Vertical System:

\* Bandwidth: DC - 25 MHz

\* Rise Time: 14 ns

\* Input Impedance: 1M $\Omega$

\* Trig. Response:

5mV-5Vdc, DC-25 MHz

IntVdc: DC - 12 MHz

\* Sensitivity:

5mV/DIV - 5V/DIV + 3% (x1 Mode)

IntV - 1V/DIV + 5% (x5 Mode)

\* Operating Modes: CH1, CH2, ALT, CHOP, ADD

\* Polarity: Reversal - CH2 only

Horizontal System:

\* X-Y Mode:

\* Sensitivity: same as vertical channel 2

Accuracy: X-Axis:  $\pm$  8%, Y-Axis:  $\pm$  3%

\* Frequency Response: DC to 1 MHz

\* X-Y Phase Difference: 7 $^\circ$  at 50 kHz

Sweep System:

\* Speed: 0.1ms - 6.2s/DIV in 1-2-5 sequence

\* Accuracy:  $\pm$  3%

\* Sweep Magnification: 10x,  $\pm$  6%

Triggering:

\* Trigger Mode: AUTO, NORM

\* Source: CH1, CH2, ALT, EXT, LINE

\* Max. Ext. Trigger Voltage: 300V DC

\* CRT: 6" rectangular, 8 x 10 div

\* Component Tester: OS-22251

\* Size/Weight: 32.8" x 5.2" x 15.8" / 16.7 lbs

**Oscilloscope (40 MHz):****OS-22400 OS-22400 OS-45040**

Vertical System:

\* Sensitivity:

5mV/DIV - 5V/DIV

$\pm$  3% (x1 Mode)

IntV - 1V/div  $\pm$  5%

(x 5 Model)

OS-45040: 5mV - 20V/DIV,  $\pm$  3%

IntV - 1V/DIV,  $\pm$  3%

1 Rise Time: 8.8 ns

2 Input Impedance: 1M $\Omega$   $\pm$  2%, ( $\pm$  3% for OS-45040)

3 Operating Modes: CH1, CH2, ALT, CHOP, ADD

OS-45040: CH1, CH2, DUAL, ADD, CHOP, Intere

4 Polarity: Reversal; CH2 only

5 Max. Input Voltage: 400V DC + AC peak

Horizontal System:

\* X-Y Mode:

\* Sensitivity: same as vertical channel 2

Accuracy: X-Axis:  $\pm$  6%, Y-Axis:  $\pm$  3%



7. Frequency Response: DC to 1 MHz  
 Sweep System (OS-22400/OS-22405)  
 8. Speed: 0.1ms - 8.2s DIV in 1-2-5 sequence  
 9. Accuracy:  $\pm 5\%$   
 10. Sweep Magnification: 10x,  $\pm 10\%$   
 Triggering:  
 11. **Trigger Modes: AUTO, NORM**  
     (OS-4500) AUTO, NORM, TV, TV-H  
 12. Source: CH1, CH2, ALT, EXT, LINE  
 13. Max. Ext. Trigger Voltage:  
     (OS-22400) 300V DC, OS-4500: 400V DC  
 Calibration:  
 1kHz square wave, 2Vpp,  $\pm 3\%$   
 50kHz square wave, 8.5 Vpp (OS-4500)  
 CRT: 8 x 10 in  
 Component Test and Delay Sweep (OS-22405)  
 Size/Weight  
 OS-22400: 12.8" x 5.2" x 13.6" 17.2 lbs  
 OS-4500: 12.5" x 5.2" x 16.2" 17.2 lbs

**Oscilloscope (80 MHz): OS-22600/ OS-22605****Vertical System**

- Sensitivity:  
     2mVdiv - 3V/div,  $\pm 3\%$   
     1mV - 1V/div,  $\pm 5\%$
- Bandwidth: DC - 60 MHz ( $\pm 3\text{dB}$ )
- Rise Time: 3.8 ns
- Input Impedance: 1M $\Omega$   $\pm 2\%$
- Operating Modes: CH1, CH2, ADD, ALT, CHOP
- Polarity Reversal: CH1 only
- Max. Input Voltage: 400V DC + AC peak

**Horizontal System:**

- X-Y Mode:  
     Sensitivity: same as vertical channel 2
- Accuracy: X-Axis  $\pm 6\%$ , Y-Axis  $\pm 3\%$
- Frequency Response: DC to 1 MHz
- X-Y Phase Difference: 3° at 50 kHz
- Sweep System:  
     Speed: 8.1ms - 0.56s/div in 1-2-5 sequence  
     Accuracy:  $\pm 3\%$   
     Sweep Magnification: 10x,  $\pm 10\%$

**Triggering:**

- Trigger Modes: AUTO, NORM
- Source: CH1, CH2, ALT, EXT, LINE
- Max. Ext. Trigger Voltage: 300V DC
- Component Test and Delay Sweep (OS-22605)
- Calibrator: 1 kHz Squarewave, 0.5 Vpp,  $\pm 3\%$
- CRT: 8 x 10 in
- Size & Weight: 12.8" x 5.2" x 15.6", 18.7 lbs

**Oscilloscope (100 MHz): OS-221000/ OS-221005****Vertical System**

- Sensitivity:  
     2mV - 3V/div,  $\pm 3\%$
- Input Voltage: 400V
- Coupling: AC, DC, GND
- Input Impedance: 1M $\Omega$   $\pm 2\%$  Approx., 25PF
- Bandwidth: DC - 100MHz ( $\pm 3\text{dB}$ )
- Rise Time:  $< 3.2$ ns, Overhoot Max. 1%
- Horizontal System  
     Mode: MAIN(A), ALT, DELAY(B)
- Sweep Time: (A) 50ns - 6.5s DIV  
     (B) 50ns - 50ns/ DIV

**Trigger System**

- Mode: AUTO or NORM
- Source: CH1, CH2, ALT, EXT, LINE
- Coupling: AC, DC, HFR, LFR
- CHT: 8 x 10 div
- Dual Trace, Dual Trigger, X-Y Operation
- Delay Sweep Function (OS-221005 only)
- Size & Weight: 12.35" x 5.2" x 15.8", 17.8 lbs

**Digital Storage Oscilloscope: DSO-3200C**

- Auto Setup
- Auto Vpp Capture
- DCV, ACV, DCA, ACA, Ohm, Diode Continuity
- RS232



- DSO + Logic Scope + DMM + Frog
- Dual CHs Bandwidth up to 20MHz
- Sensitivity: 5mV/div - 20mV/div
- Sweep Time: 5msec/div - 20s/div
- TTL/CMOS Level Selectable
- X Channel 20 MHz Logic Scope
- 1Hz - 20MHz Frequency Counter
- Frequency / Period Mode
- 10 ppm Time Base Accuracy
- 4000 Counts Auto Range DMM
- 528 X,240 Resolution
- 20 Screens Memory Storage and Recall

**Digital Oscilloscope:****DSO-51150C/ DSO-51250C****Features:**

	DSO-51150	DSO-51250
Analog		
Display	5.7" Color	5.7" Color
Bandwidth	150 MHz	250 MHz
Input Imped.	1M $\Omega$	1M $\Omega$
Channel	2	2
Traces	2	2
Scope	A	A
Sweep Rate	2ns/div	2ns/div
Resolvent Cursor	$\checkmark$	$\checkmark$
Digital		
Sampling Rate and Size	300MS/s	200MS/s
equivalent time	250fs	250fs
Equivalent BW	100MHz	250MHz
V. Resolution	8 bits	8 bits
V. Rising Time	2.5 ns	1.4 ns
Memory Length	32K/CH	32K/CH
Pre-trigger, Roll	$\checkmark$	$\checkmark$
Post-Pad, FFT	$\checkmark$	$\checkmark$
Save & Recall	10	10
RS-232, USB	$\checkmark$	$\checkmark$

**Vertical**

- Sensitivity: 2mV/div - 3V/div
- Input Impedance: 1M $\Omega$   $\pm$  Approx. 20pF
- Max. Input Voltage: 400 V (DC+AC Peak)
- Accuracy: 3%

**Input Coupling: DC, AC, GND****Math**

- ADD, Subtract, Inversion
- FFT
- Post-Pad

**Horizontal**

- Sweep Time: Equivalent: 2ns/div - 0.1s/div
- Real Time: 0.25ns/div - 0.1 s/div
- Roll Mode: 0.2s/div - 5s/div

- Resolution: 80 ps
- Accuracy: 0.01 %
- Magnification: Zoom In/Out
- Pre Trigger: Max. 10 div

**Trigger**

- Mode: AUTO, Normal, Single
- Coupling: DC, AC, LF Reject, HF Reject
- Type: Edge, TV
- Slope: Rising, Falling
- Source: CH1, CH2, EXT, LINE
- HOLD KEY: Auto Set, Run/Stop, Single, Hard copy
- Standard Accessories: 2 probes, power cord, manual
- Size/Weight: 12.8" x 13.3" x 9.9" / 13.2 lbs

**Digital Oscilloscope****DSO-55025C/DSO-5040C/DSO-55060C/ DSO-55100C/DSO-55150C/DSO-55200C****Features:**

- Real time sampling 300MS/s
- Equivalent sampling 10 GS/s (300MS/s)
- 5 CHs (6MHz)
- Vertical dual channels, individual ADC
- Master-slave dual time base sweep and time zoom
- Dual cursors to measure AV, AT, 1 AT
- Real time modes sampling switchable
- Normal/ Peak/Average/ Persistence display
- 16 waveform parameters with auto measurement
- Waveform math, FFT analysis
- RS-232 interface

**Specifications:****Vertical System:**

- Channel: CH1, CH2, Separate ADC
- Display: Mono 4.0
- Analog bandwidth:  
     25 MHz (DSO-55025C)  
     40 MHz (DSO-55040C)  
     60 MHz (DSO-55060C)  
     100 MHz (DSO-55100C)
- Single bandwidth: 25 MHz
- Selectable analog bandwidth: 20 MHz
- Calculator: A-B, A-B, A-B, A-B, FET
- Input Coupling: DC, AC, or GND
- Input Impedance: 1M $\Omega$   $\pm 2\%$
- Max. Input Voltage: 400V (DC+AC peak)  $\pm$  1kV
- Frog Response:  
     2mV/div 200MHz,  $\pm 6\text{dB}$   
     5mV/div 60MHz,  $\pm 6\text{dB}$  (DSO-55060C)  
     3mV/div 100MHz,  $\pm 6\text{dB}$  (DSO-55100C)

**Rising Time: 5.8ns (DSO-55060C),**

3.5ns (DSO-55100C)

Oversteering, Resistance (mV/div): 5%

Probe: 10 x Position (DSO-55060C),

1x Position (DSO-55100C)

Amplification rate: 10: 10DSO-55060C,

1: 1 (DSO-55100C)

**Horizontal System:****Acquiring mode:**

- Real-time: 300MS/s
- Equivalent: 5GS/s (DSO-55060C)
- 100GS/s (DSO-55100C)
- Storage depth: 256K/CH
- Sweep time base:  
     Rolling: 10-200ns/div
- Reference: 100ns - 50ns/div
- Normal: 20ns - 250ns/div
- Equivalent: 125ns-5ns/div (DSO-55060C)
- 125ns - 2.5ns/div (DSO-55100C)
- Equivalent time resolution: 100ps
- Sweep mode: Auto, Trigger and single

**Trigger:**

- Trigger mode: Edge, TV-H, TV-V
- Max. Set Voltage: 400V (DC+AC peak)  $\pm$  1kV
- Measurement: AV, AT, 1 AT
- See: (H/W/D): 200x320x145 mm
- Weight: 4.5kg

Questions? Call Us! We're here  
 Monday through Friday 8am-5pm PST.  
 Or if you prefer, email us:  
[info@satequipco.com](mailto:info@satequipco.com)

**Analog Insulation Tester****AIT-13500/ AIT-13504**

\* Rated Voltage/Resistance:  
AIT-13500:  
500V/1000 M $\Omega$ , 1000V/2000 M $\Omega$   
AIT-13504:  
250V/1000 M $\Omega$ ,  
500V/2000 M $\Omega$ , 1000V/4000 M $\Omega$

\* Insulation Resistance:  
Accuracy:  $\pm 5\%$  of full scale  
Voltage at full scale: 10.0%  
Open Circuit Voltage: 1200 V DC  
Short Circuit Current:  
AIT-13500: 1 mA; AIT-13504: 2 mA

\* AC Voltage:  
Voltage Range: 0 – 600 V  
Accuracy:  $\pm 5\%$  of full scale  
Internal Resistance: 8M $\Omega$   
Frequency Range: 40 Hz – 70 Hz  
Continuity: 0 – 3000  
Accuracy:  $\pm 5\%$  of full scale  
Open Circuit Voltage: 100 mV  
Short Circuit Current: 50 mA

**Analog Insulation Tester: AIT-13800**

\* AC Voltage:  
Range: 0 – 600 V  
Accuracy:  $\pm 5\%$  of full scale  
Line Freq. Range: 40Hz–1KHz  
\* Continuity:  
Range: 0 – 90Q  
Accuracy:  $\pm 5\%$  of full scale  
Open Circuit Terminal  
Voltage:  $\pm 600$  DC mV  
Short Circuit Terminal  
Current: 200 DC mA

\* Insulation Resistance:  
Mega Ohm: 0 – 50M $\Omega$ , 0 – 100M $\Omega$ , 0 – 200M $\Omega$   
Accuracy:  $\pm 5\%$  of full scale  
Short Circuit Terminal Current: 25C mA  
Power Consumption: 190 mA  
Size: 6.7" x 6.5" x 3.6"

\* Weight: 2.1 lb

**Digital Insulation Tester****DIT-13210/ DIT-13211/ DIT-13212**

\* Voltage Range:  
DIT-13210:  
500/1K/2.5K/5K V  
DIT-13211:  
1K/2.5K/5K/10K V  
DIT-13212: 0.5K – 18K V  
(500V increment steps)

\* Insulation Resistance:  
DIT-13210: 25/50/125/250 G $\Omega$   
DIT-13211: 50/125/250/500 G $\Omega$   
DIT-13212: 50/125/250/500 G $\Omega$

\* Accuracy:  $\pm (5\% \text{ rdg} + 3\text{dig})$   
\* Output Current Limit: 50 – 100mA (1W)  
\* Line Warning:  $> 500$  V AC

\* Powered by 8 AA batteries  
\* Size: 17" x 10.25" x 6.25"  
\* Weight: 8 lb

**Digital Insulation Tester****DIT-13800/ DIT-13803/ DIT-13804**

\* Insulation Voltage:  
250/500/1K V(DIT-13801)  
0.5/1/2.5/5 KV(DIT-13803)  
1/2.5/5/10 KV(DIT-13804)

\* Insulation Resistance:  
1000/2000/5000 M $\Omega$ (DIT-13801)  
25/50/125/250 G $\Omega$ (DIT-13803)  
50/125/250/500 G $\Omega$ (DIT-13804)



\* Accuracy:  
0 – 1.5 % of rdg.  $\pm 1$  dgt (13801)  
0 – 50 G $\Omega$ :  $\pm 3\%$  of reading (13803 & 13804)

**Digital Insulation Tester****DIT-13550/ DIT-13551**

\* Rated Voltage/Resistance:  
250V/20M/200M/2000M G $\Omega$   
500V/20M/200M/2000M G $\Omega$   
1KV/20M/200M/2000M G $\Omega$

\* 3 1/2 digit LCD display  
with maximum reading of 1999

\* Test Voltage: 250, 500, 1K VDC  
\* AC Voltage Range: 0 – 750 V  
\* Accuracy:  $\pm (1.5\% \text{ rdg} + 2 \text{ dgt})$   
\* Impedance: 10 M $\Omega$

\* Continuity:  
0 – 20 G $\Omega$   $\pm 2\%$  rdg + 4 dgt  
1.5% rdg + 2 dgt

160 – 2K $\Omega$   $\pm 1.5\%$  rdg + 2 dgt (DIT-13551 only)  
\* Short Circuit Current: 3 mA

**Electrical Network Analyzer****LPL-13826**

\* Loop Impedance Range:  
LE, LN: 0.03 – 2000G  
Accuracy: 4% rdg + 2 dgt

\* Test Current in each loop:  
1.78A at 230V/50Hz

\* Voltage Measurement L-N,  
L-L: 50 to 500 VAC (rms)  
\* Earth Wire/Neutral Wire Line Wire  
Resistance: 0.01 – 2000  $\Omega$   
Accuracy: 4% rdg + 2 dgt

\* IPSC Current (L-N, L-L) Max.: 6A at 230VAC  
Accuracy: 10% rdg + 5 dgt  
\* Operating Voltage: 230V/20 at 50Hz (rms)  
\* Power Source: 1.5V (AA) x 8 Batteries

**Analog Earth Resistance Tester:****AER-13845**

\* Earth resistance ranges:  
10/100/1000  $\Omega$  within 3%  
of full scale

\* Earth voltage ranges:  
30V AC  
\* Accuracy:  $\pm 3\%$  of full scale  
\* Powered by 6 AA batteries  
\* Size: 6.25" x 4" x 2"

**Digital Earth Resistance Tester:****DER-13820**

\* Earth Resistance Range:  
20/200/2000  $\Omega$  within  
 $\pm 2.5\%$  rdg + 2 dgt

\* Earth Voltage Ranges:  
0 – 200V AC, 40 – 500Vdc  
within  $\pm (1\% \text{ rdg} + 2 \text{ dgt})$   
\* Resistance: 0 – 20  $\Omega$  (0.01 $\Omega$ ), 0 – 200  $\Omega$  (0.1 $\Omega$ ),  
0 – 2000  $\Omega$  (1 $\Omega$ )

\* 3 1/2 digit LCD display  
\* Low battery, Over range, Open circuit indicators  
\* Size: 6.25" x 4" x 2"

**Digital ELCB Tester: DEL-13820**

\* TRIP Current Ranges:  
0 – 1A at 317V  $\pm 5\%$   
of (rdg  $\pm 1$  mA)

\* Resistance: 1mA  
\* Operating Voltage:  
100 – 450 V  $\pm (3\% \text{ rdg} + 1 \text{ dgt})$   
\* Power Angle Setting: 0–180° selectable  
\* Timer: Max. 100s  
\* Timer's resolution: 1 ms

\* Powered by 8 AA batteries



\* Size: 6.75" x 4.75" x 3.75"

\* Weight: 2 lbs

**Analog ELCB Tester: AEL-13810****ELCB:**

\* Voltage: 230V AC  $\pm 15\%$   
\* Current: 10 – 50 mA AC  
\* Frequency: 50/60 Hz

\* Two wires operation:  
L-E (ELCB), R-CCB (GFCI Tester)  
L-E (with wires operation)  
L-E-N (with wiring check)

\* Motor: Turn hand movement  
\* Protection: Fused, 100mA, 250V  
\* Size: 6.35" x 6.63" x 3.5"  
\* Weight: 2 lbs

**Linear Freq. Monitor: LFM-03423**

\* Range: 0.5 Hz – 500 Hz  
\* Resolution:  
0.01 Hz (0.5 – 99.99 Hz)  
0.1 Hz (100 – 300 Hz)

\* Input Voltage: 5 – 250 ACV  
\* Size: 7.5" x 2.8" x 1.5"  
\* Weight: 0.83 lb

**Accumeter: AM-03201**

\* Range: 0.4 to 30 m/s,  
\* Measurement: m/s, f, min, km/h, knots,  
\* 18 units ELCB, 3 1/2 digits

\* Low friction ball-bearing sensor  
\* Data hold  
\* Dimensions:  
6.25" x 3.15" x 1.25"  
Sensor head: 2.85" Dia

**Accum/ Humidity Meter:****AHM-03205**

\* Accum Meter: 0.4 to 25 m/s,  
\* Measurement: m/s, f, min, km/h, knots, Temp,  
\* Humidity Meter:  
10 – 99 % RH  
Temp.: 0 – 50°C  
Max., Min., RS-232, and Data Hold

\* Dimensions:  
7" x 2.8" x 1.25"  
Sensor head: 3.1" Dia.

**Humidity/Temp. Meter****HTM-03060/ HTM-03066**

\* 10 – 95% RH, 32 – 120°F,  
\* 10°F, Humidity Recovery  
\* Separate Probe, 18 mm LCD  
\* Precision thin film cap  
\* Thermistor: -50°F – 224°F  
(HTM-03066 only)

\* Size: Probe: 1" Dia. x 6.25"  
\* Main Instrument: 7" x 3.7" x 1.25"  
\* Optional type K temperature probe

**Light Meter: LM-03107**

\* 5K/20K/100K Lux, Data Hold  
\* Lux, Photometric, Max., Min, Zero  
\* Tangent, Fluorescent, Mercury,  
Sulfur

\* Size: 3.1" x 2.8" x 1.3"  
\* Weight: 0.77 lb

**Lux Meter: LUX-03101**

\* Range:  
0 – 2.0K – 20K/200K – 50K Lux  
\* Sampling Time: 0.5 S  
\* Power Supply: DC 9V battery  
\* Size: 3.2" x 2.7" x 0.7"

\* Weight: 0.36 lb



**Sound Level Meter: SLM-83011**

- \* A, C weighing, Max. Data Hold
- Time weighting (F, S), AD/DC output
- \* 30 - 139 dB in 3 mms
- \* Size: 245 x 80 x 35 mm

**Infrared Thermometer: TM-63266****The best thermometer in the world**

- \* 3 in 1 design: Infrared + Pt 100  $\pm$  Type K/R/E/T
- \* 51x32 mm size large LCD Display
- \* Functions: C,  $\mu$ , Data Hold, Relative, Memory (max. min)
- \* RS-232 data output interface
- \* **Infrared measurement range:** 14 F - 612 F
- \* Max. measurement range: 5992 F (with type K probe)
- \* Temperature probe: not optional
- \* Size: 2.8" x 2.7" x 1.2"
- \* Weight: 0.5 lb

**Precision Thermometer: PTM-63917****Max. Measurement Range:**

- 177F (Type K)
- \* Resolution: 0.01 $\mu$ , 0.1 $\mu$
- \* Memory: Max./Min.
- \* Sampling time: 0.4s
- \* RS-232 cable (optional)
- \* RS-232 interface
- \* **Computer software (optional)**
- \* Optional probes: type K; P/T/E
- \* Size: 7.1" x 2.8" x 1.3"
- \* Weight: 0.62 lb

**Digital Contact Tachometer****DTM-63235B**

- \* Range: 0.5 - 19,999 RPM
- Surface Speed: m/min, ft/min**
- \* Accuracy:  $\pm 0.05\%$  + 1 db
- \* Display: 5 digits, 0.47" LCD
- \* Size: 208 x 73 x 57 mm
- \* Weight: 0.62 lb

**Green Digital Photo Tachometer****DTM-6336G**

- \* Range: 5 to 99,999 RPM
- \* Measuring Distance: 50 to 150 mm
- \* Accuracy:  $\pm 0.05\%$  + 1 db
- \* Display: 3 digits, 0.47" LCD
- \* Size: 8.8 x 2.7 x 1.5 inch
- \* Weight: 0.85 lb
- \* Wind to Charge, no batteries needed

**Digital Watt Meter: DWM-63660**

- \* Watt Range: 2000 - 6000 W
- \* Accuracy:  $\pm (1.0\% \text{ rdg} + 1 \text{ dg})$
- \* AC Voltage Range: 208, 120 V
- \* Accuracy:  $\pm (0.8\% \text{ rdg} + 1 \text{ dg})$
- Impedance: 1 M $\Omega$
- \* **ACA/DCA** Range: 10A
- \* Accuracy:  $\pm (1\% \text{ rdg} + 1 \text{ dg})$
- DC Voltage Range: 208, 1800 V
- \* Accuracy:  $\pm (0.8\% \text{ rdg} + 1 \text{ dg})$
- Impedance: 1 M $\Omega$
- \* **Display: 0.57" LCD**
- \* Size: 7" x 3.58" x 1.5"
- \* Weight: 1.2 lb

**Power Analyzer: PA-63692/PA-63693**

- Specifications:
- \* Circuit: Custom one-chip of microprocessor L51

**Display:**

LCD Size: 81.4 X 61 mm ( 3.2 X 2.4 inch)

Dot Matrix (320 X 240 pixels) with back light.

**Measurement**

- \* ACV
- \* ACA
- \* AC WATT ( True Power )
- AC WATT Apparent Power )
- AC WATT Relative Power )
- \* Power factor
- \* Phase angle
- \* Frequency

Wire connection: 1P2W, 1P1W, 3P1W, 3P4W.

Voltage range: 10 ACV to 680 ACV, auto range.

Current probe input signal and range (PA-63693)

\* Current probe input signal voltage ( ACV ):

PFE - 1 PF1 + PF2 32

200W/300W/500W/1V12V/3V.

\* Current probe input current range ( ACA ):

0 - 1 phase angle

20 A/200A/2000A (1200 A)/30A/300A/3000A

\* Meter can cooperate with an universal current probe

Current ranges: (PA-63692)

0.2 ACA to 1200 ACA, auto range/semi auto range.

Safety standard: EC1018 CAT III 600 V.

ACV input impedance: 10 Mega ohms.

**Range select**

ACV Auto range.

ACA Auto range &amp; manual range

Clamp frequency response: 40 Hz to 1 KHz.

Spec. total frequency: 45 to 65 Hz.

Over load protection:

ACV 120 ACV rms

ACA 1300 ACA with clamp probe CP-1200

**Data Record: SD Card Record.**

Sampling Time: Approx. 1 second.

Real time

\* Real time data logger, saves the data into the SD

card and loads all the measured values with time information ( year/month/day/hour/minute/second ) into Excel

\* Integration time for data logger: 2 seconds to 7200

seconds

Data Output: USB/RS232

RS232 computer serial interface:

\* Connect the optional USB cable to USB-A1

\* Connect the optional RS232 cable to LPCB-A2

Weight

\* **Meter: 1046g ( includes batteries )**

\* Clamp: 522g

Dimension:

Meter: 225 X 125 X 64 mm

Clamp: 210 X 84 X 33mm

Clamp Jaw: 50 mm (2.0 inch)-outside

**Three Phase Power Analyzer: PA-63695****Specifications:**

\* Circuit: Custom one-chip

microprocessor L51

Display:

LCD Size: 81.4 X 61 mm

Dot Matrix (320 X 240 pixels)

with back light.

**Measurement**

\* V (phase to phase)

\* V (phase-to-ground)

\* A (phase-to-ground)

KW / KVA / KVAR / PF (phase)

KW / KVA / KVAR / PF (system)

\* Power factor

\* Phase angle

\* Frequency

\* Harmonics display.

Wire connection: 1P2W, 1P1W, 3P1W, 3P4W.

Voltage range: 10 ACV to 680 ACV, auto range.

**Current probe input signal and range:**

\* Current probe input signal voltage ( ACV ):

200W/300W/500W/1V12V/3V.

\* Current probe input current range ( ACA ):

20 A/200A/2000A (1200 A)/30A/300A/3000A

\* Meter can cooperate with an universal current probe

**Clamp frequency response: 40 Hz to 1 KHz.**

Spec. tested frequency: 45 to 65 Hz.

Over load protection:

ACV 120 ACV rms

ACA 1300 ACA with clamp probe CP-63201

Weight

\* Meter: 948g ( includes batteries )

\* Clamp: 467g

Dimension:

Meter: 225 X 125 X 64 mm

Clamp: 210 X 64 X 33mm

Clamp Jaw: 86 mm (3.4 inch)-outside

**Bench Top Power Analyzer: PA-63696A**

Specifications:

**Display:**

LCD Size: 93 mm x 52 mm

Multi-display unit: shows Volt, Amps,

Watt, Power factor or Hz at same time.

Measurement

\*WATT

\*VA

\*W $\mu$ 

\*Power factor

\*MVC

\*MCA

\*DCV

\*DCA

\*Hz

\*Notes

Zero Adjustment:

Watt: External adjustment by push button.

DCV, ACV, DCA, ACA: Automatic adjustment.

Polarity:

Automatic switching, "V" indicates reverse polarity.

Sampling Time:

W, VA, ACA, ACV, PF, Hz: Approx. 1.5 Sec.

DCV, DCA, OMM: Approx. 1 Sec.

Power Supply:

Battery power: DC 9V, 1.5 V AA (UM-3) battery (6).

AC power: AC to DC 9V adapter ( 500 mA ), optional.

Power Consumption:

DC: 50 mA

Dimension:

280 x 210 x 80 mm ( 11.0 x 8.3 x 3.1 inch ).

Weight: Approx. 1.6 kg ( 3.52 LB ).

**Power Controller Monitor: PCM-63665**

Specifications:

**Display:**

Large LED display, 4 digit LED

14 mm ( 0.55 inch ) digit height

8 indicators:

PV ( process value ) indicator

SV ( set value ) indicator

Control out indicator

Alarm out indicator

Warn indicator

RV indicator

Watt Measurement:

0-8000 W

\* True power

\* No PT, CT.

Input Signal:

ACV: 0 to 680 ACV, 40 to 480 Hz.

ACA: 0 to 10 A, 40 to 400 Hz.

Sampling Time: Approx. 0.8 Seconds

Over input: " - - - - " mark indication.

Zero Adjustment: Automatic Adjustment.



**Relay Output**

- Number: 2 relays
- Function: Relay 1 - Control relay.
- Relay 2 - High/Low alarm relay.
- Max. load: 0.5 A/CA/250 ACV
- 0.5 DCA/24 DCV

**Data Output: RS232 / USB PC Computer Interface:**

- \* Connect the optional RS232 cable to UPCH-02
- \* Connect the optional USB cable to USB-01
- Power Supply: 90 to 260 ACV, 50/60 Hz.
- Power Consumption: Approx. 3.3 VA/AC 110V
- Approx. 4.9 VA/AC 220V.

Weight: 261 g / 0.57 LB.

**Dimension (DN size) 96 x 48 mm.**

Panel cut size: 92 x 44 mm.

Depth: 110 mm.

**Auto Transformer (Various)**

- \* Input Voltage: 110VAC/220VAC
- \* Output Voltage: 0 ~ 250 VAC
- Model Max. Power Secondary Weight (kg)
- AT-40002 200VA/0.5kA 113x125x116 2.2
- AT-40005 500VA/2A 132x136x150 3.5
- AT-45010 0KVA/4A 182x158x207 6.0
- AT-45020 2KVA/8A 192x199x207 8.3
- AT-45030 3KVA/12A 230x198x235 11.0
- AT-45050 5KVA/20A 245x248x272 15.5
- AT-45160 10KVA/40A 328x262x350 27.0
- AT-45200 20KVA/80A 528x305x345 57.0
- AT-45300 30KVA/120A 528x330x359 85.5

**Probes/Test Leads: HP-9900**

- Attenuation Ratio 10 : 1
- \* Bandwidth: 60MHz
- \* Input Resistance: 10MΩ
- \* Input Capacitance: 18 pF
- \* Attenuation Ratio: 1 : 1
- \* Bandwidth: 6 MHz
- \* Input Resistance: 1MΩ
- \* Input Capacitance: 90pF
- \* Working Voltage: 600V Max. Cable Length: 4.6 ft

**Probes/Test Leads: HP-2100/HP-0100**

- Attenuation Ratio 10 : 1
- \* Bandwidth: 100MHz
- \* Input Resistance: 10 MΩ
- \* Input Capacitance: 18 pF
- \* Attenuation Ratio 1 : 1
- \* Bandwidth: 15 MHz (HP-2100), 6 MHz (HP-0100)
- \* Input Resistance: 1MΩ
- \* Input Capacitance: 46 pF (HP-2100), 90pF (HP-0100)
- \* Working Voltage: 600V Max. Cable Length: 4.6 ft

**Probes/Test Leads: HP-9250**

- Attenuation Ratio 10 : 1
- \* Bandwidth: 250MHz
- \* Input Resistance: 10 MΩ
- \* Input Capacitance: 14 pF
- \* Attenuation Ratio 1 : 1
- \* Bandwidth: 6 MHz
- \* Input Resistance: 1MΩ
- \* Input Capacitance: 90 pF
- \* Working Voltage: 600V Max. Cable Length: 4.6 ft

**Probes/Test Leads: HP-9258**

- Attenuation Ratio 100 : 1
- \* Bandwidth: 250MHz
- \* Input Resistance: 100 MΩ
- \* Input Capacitance: 6.3 pF
- \* Working Voltage: 1200V Max.
- \* Cable Length: 4.0 ft

**Logic Pulser: LR-02002**

- Logic Probe & Pulser: LPR-02001
- \* Max. Input Freq: 50 MHz
- \* Input Impedance: 120KΩ
- \* Output current up to 100mA
- \* Pulse Rate: 8.5/40 Hz
- \* Pulse Width: 10 ns

**Logic Probe: LP-02050**

- \* TTL, DTL, HTL, CMOS and MOS tests
- \* Displays pulse presence & logic state.
- \* Min. Detectable Pulse Width: 10 ns
- \* Max. Input Freq: 50 MHz

**Current Probe: CT-035000**

- \* Range: 30 A/300 A/3000 A
- \* Output sensitivity: 100 mV/A, 30 mV/A, 1 mV/A
- \* Output voltage: 3 ACV / 50 A, 300 A, 3000 A
- \* Flexible probe length: 600 mm / 23.6 inch
- \* Optional current probe for DPM-03090, DPM-45095.

**Measurement range:**

- 30 A/300 A/3000 A, 3 ranges, switch selectable
- 1st range value: 30 A
- 2nd range value: 300 A
- 3rd range value: 3000 A

**Output sensitivity:**

- 100 mV/A, 30 mV/A, 1 mV/A, AC coupled.

**High Voltage Probe: HVP-22015**

- \* Max. DC: 15/30 KV
- \* Max. AC: 10KV rms
- \* Input Impedance: 100 MΩ
- \* DCV Accuracy: < 1%
- \* Input Capacitance: 3.0 pF
- \* Division Ratio: 1000 : 1
- \* Bandwidth: 50 MHz
- \* Cable length: 2.0 M
- \* Size/Weight: 348 x 50 x 30 mm/ 300 g

**High Voltage Probe Meter**

- HVPM-22040A / HVPM-22040D
- HVPM-22040A:
- \* Impedance: 600 MΩ
- \* Positive polarity only
- \* Accuracy: 25 KV ± 2%, 40KV ± 3%
- \* Resolution: 1KV
- HVPM-22040D:
- \* Impedance: 2000 MΩ
- \* 3999 LCD display, Accuracy: 0.5% full range
- \* Range: 400V/40V/40KV
- \* Resolution: 0.1V/1V/10V
- \* Peak Hold, Auto power off
- \* Size & Weight: 420 L x 58 (mm) 560 g

**Voltage Tester: VT-1631A**

- \* Range: 12 ~ 480 V AC
- 12 ~ 500 V DC
- \* Display: 12-55-320-220-400 VAC
- 12-50-250-300-500 VDC
- Over range LED

**Live Circuit Detector/ Voltage Tester:**

- VT-16150
- \* Range: 18 ~ 400V AC
- \* No test leads required

**\* Bright LED Indicator**

- \* Applications: check for broken connections, blown fuses, burned-out fuse lamps, lost wires, defective grounds, and more.

**Phase Sequence Indicator****PSI-13850/ PSI-13860**

- \* 3 in 1 design: Open Phase, Phase Sequence and Motor Rotation Indication. (PSI-13860)
- \* 2 in 1 design: Open Phase and Phase Sequence (PSI-13850)
- \* Large Size Alligator Clips
- \* Input Voltage: 100V AC up to 600V AC
- \* Frequency Range: PSI-13850: 50 ~ 60 Hz
- PSI-13860: 45 ~ 70 Hz
- \* Weight: PSI-13850: 510g, PSI-13860: 102g

**Temperature Probes**

- \* TP-0001: -40°C ~ 250°C
- \* TP-0002: -50°C ~ 900°C
- \* TP-0003: -50°C ~ 1300°C
- \* TP-0004: -50°C ~ 400°C

**Automotive Equipment****Automotive Digital Multimeter****ADM-9830**

- \* DCV
- Range: 200V 2/20/200 1K V
- Accuracy: ± 0.05% rdg + 1 dgt
- \* ACV
- Range: 200V 2/20/200 750 V
- Accuracy: ± 1% rdg + 2 dgt
- \* Resistance
- Range: 200Ω 2K/20K/200K/2M/20MΩ
- Accuracy: ± (2 rdg % + 2 dgt)
- \* ACA / DCA
- Range: 10 A
- Accuracy: ± (1.5% rdg + 2 dgt) (DCA)
- ± (1.5% rdg + 3 dgt) (ACA)



- \* Diode Angle: 0 ~ 120°/90°/12.2°/60°/45°/0°
- 3/4/5/6/8 cylinders, ± (1.2 rdg % + 1 dgt)
- \* Temperature
- Range: -20° C to 150° C / 0° F to 1400° F
- Accuracy: ± (1 rdg + 2 dgt)
- \* Frequency Range: 200/2K/20K Hz
- Accuracy: ± (1 rdg + 2 dgt)
- \* Tach. Range: 500 ~ 18,000 RPM
- Accuracy: ± (2.2 rdg % + 1 dgt)

- \* Diode, Continuity Tests
- \* Inductive Pickup (IP-03097) & Type K temperature Probe (TP-03001) included
- \* Size & Weight: 7.5" x 5.4" x 1.5", 6.71lb

**Automotive Digital Multimeter****ADM-01200B**

- \* 5000 Counts 5.5 Segments
- \* Auto Power Off
- \* Data Hold
- \* Diode, Continuity Tests
- \* Auto/Manual Ranging
- \* Dynamic Recording (Max./Min./Avg.)
- \* Protection Holder



- \* Temp. (°F/C) Backlight
- \* FPD™ Fuel Injection
- \* Inductive RPM Pickup for conventional & DIS Ignition
- \* Adjustable Trigger Level
- \* 0.5% Basis Accuracy
- \* DCV: 500Ω/500mA/50/50W/500V/1000V
- \* ACV: 500Ω/500mA/50/50W/500V/1500V
- \* DCA: 500Ω/5mA/500Ω/500mA/5A/10A
- \* ACA: 500Ω/5mA/500Ω/500mA/5A/10A
- \* Resis: 10k/100k/1M/10k/100k/1M/10k/100k
- \* RPM: 60 - 12000RPM; 30 - 12000RPM (DIS)
- \* Temp: -40°C - 1572°C (-40°F - 2822°F)
- \* Dual Angle: 1/2/3/4/5/6/8/10/12 Cylinder
- \* Pulse Width: 0.02ms - 999ms
- \* Freq:
  - 100Hz/1KHz/10KHz/100KHz/1MHz/10MHz
- \* Capacitors: 50k/500k/5M/50k/500k/5M/50k
- \* Duty Cycle: 0.1% - 99.9%
- \* Inductive Pickup (IP-00007)
- \* Type K Temperature Probe (TP-45001) included
- \* Size & Weight: 7.6"X5.5"X3.1", 1.67 lbs.

#### Automotive Diagnostic Analyzer ADA-3290C

- Scope
- \* Resolvability: 20 MHz
- \* Sample Rate: 20 MS / S (200)
- \* Voltage Range: 5eV - 20 V / 4s
- \* Time Range: 50 ns - 20 s / div
- \* Screen Memory: 20
- \* Setup Memory: 10
- \* Accessories included:
  - DMM Test Leads**
  - Inductive Pickup, Capacitive Pickup, Alligator, High Voltage Test Leads, Test Probe Filter, Parallel Adapter, Protective Helixes, Nickel Rechargeable Battery, and AD adapter
  - \* DMM: DVC / ACV / Ohm / AMP / Continuity
  - Accuracy: 4000 counts ± 0.5%



#### Inductive Timing Light: TL-66210

- \* Powered by 2 "D" cell batteries.
- \* Bright flash at all speeds
- \* Accuracy up to 10K rpm.
- \* Durable and burst proof aluminum pickups.
- \* For all ignition systems with 2 or 4 cycle engines
- \* Protective sleeve withstands high temperature up to 1200°F.



#### Inductive Timing Light: TL-66220

- \* Inductive pick-up clips over spark plug wire, no adapters required
- \* Precision focused flash tube for concentrated brilliant light
- \* Removable / replaceable leads
- \* Designed for all 12 volt systems, reverse polarity protected
- \* Field replaceable flash tube
- \* Trigger switch package tube and circuit lines.



#### Advanced Inductive Pickup Timing Light: TL-66230A

- \* Rugged chrome plated metal case
- \* Linear Xenon flash tube & focused lens combine for concentrated combine for concentrated brilliant light



- \* Removable replaceable leads
- \* Measures ignition spark from 0/90°
- \* 12 volt DC operation - reverse polarity protected

#### Digital Advance Timing Light: DTL-663100

- Features:
  - \* **Rugged ABS housing.**
  - \* Large LED display for easy readings.
  - \* Works on gasoline engines with 12 volt battery.
  - \* Professional tool works on either conventional and Distributorless Ignition Systems (DIS).
  - \* Detachable inductive pick-up clips and leads.
  - \* **Bright green flash tube makes reading timing much easier.**

- Functions:
  - Advance Timing: 0 - 60° BTDC
  - Tachometer: 200 - 3000 RPM
  - Dwell: 8 - 93.9%
  - Volt: 0 - 16V



### Tools & Toolkits

#### 13-pc Electronic Tool Kit: TKE-13

- Contents:
  - Reversible T10 & T15 Torque Screwdriver
  - 2 pcs of Precision Aligner Tool
  - Reversible 1/8" Flat and
  - 8 Phillips mini Screwdriver
- Extra Parts Tube**
- Three Prong Holder
- Twosize
- IC Insertion-Extraction Clipper (for 14-48 pin ICs)
- Zipper Vinyl Case
- Bits include:
  - Phillips #1, #2
  - Flat: 3/16", 1/4"



#### 14-pc Electronic Tool Kit: TKE-14

- Contents:
  - 6-26 Pin DIP Chip Extractor
  - 6-26 Pin DIP Chip Insulator
  - 3 prong parts remover
  - Assembly Twosize
- Extra Parts Tube**
- 10 Phillips Screwdriver
- 1/8" Standard Screwdriver
- Universal Screwdriver Handle
- Five Sizes:
  - #1 Phillips
  - 3/16" Standard
  - T15
  - 1/4in NutDriver
  - 3/16in Nutdriver
- Final Plastic Case with cover



#### 19-pc PC Electronic Tool Kit: TKE-19

- Contents:
  - IC Inseter.
  - Extractor with Sockets & Bows.
  - 3-Prong Part Remover.
  - 8-0 Phillips screwdriver, 1
  - 8" Flat Screwdriver.
  - Self-Hold Twosize.
  - Extra Parts Tube.
  - Vinyl Zipper case.
- Bits included:
  - PH Bits: #1, # 2; Socket: 3/16"
  - Flat: 3/16", 1/4"; Tors: T8, T9, T15, T20, T25



#### IC Insertion/Extraction Tool kit TKC-ICS-08

- Contents:
  - 8 pin DIP

- 14/16 pin DIP.
- 18/20 pin DIP.
- 22 pin DIP.
- 24/26 pin DIP.
- and 36/40 pin DIP.
- Square IC Extractor.
- IC Extractor Twosize.
- Vinyl Zipper Case.



#### 15-pc Computer Tool kit: TKC-15

- Contents:
  - IC Inseter.
  - Extractor with sockets & Bows.
  - 3-prong part remover.
- IC Twosize.**
- 3/16" and 1/4" nut-drivers.
- 6, 8, # 1 Phillips screwdrivers.
- T-15 Star Screwdriver.
- 3/16" & 1/8" Torx screwdrivers.
- extra parts tube.
- Vinyl zipper case.

#### 1000V Insulated Electrician Tool kit TKE-IET-010

- Contents:
  - \* 5 1/2" Diagonal Cutter
  - \* 4" Needle Nose Pliers
  - \* 5 1/2" Wire Stripper
  - \* Screw Drivers:
    - Phillips #1, #2
    - Standard: 3/32", 5/32", 7/32"
  - \* 5 1/2" Circuit Tester
  - Screwdriver



#### 8-pc Precision Screwdriver Set TKE-PSD-08

- Shank:
  - 1.6mm, 2.0mm,
  - 2.4mm, 3.0mm
- Phillips:
  - #00, #0, #1
- Plastic Carrying Case.



#### 30-pc Universal Screwdriver set TKE-US30

- Molded Plastic Case.
- Driver.
- Bit Extension.
- 14" hex to 14" square adapter.
- Tors: T16, T15, T25, T27, T30, T40
- Shank: 1/8", 5/32", 3/16", 7/32", 1/4", 5/32"
- Phillips: #0, #1, #2, #3; Plus: #1, #2, #3
- Socket: #0, #2, #3, #5



#### Static Dissipative Field Service Kit TKE-SDK-01

- This kit includes an adjustable wrist strap, ground cord, and a static-dissipative work surface.



#### Ceramic Screwdrivers

- A: TKE-CS009 (0.4x0.9) mm
- TKE-CS015 (0.4x1.3) mm
- TKE-CS018 (0.4x1.8) mm
- TKE-CS025 (0.7x2.5) mm





- 8) TKE-CSD1021 - Double-End**  
 (0.4 x 1.3, 0.7 x 2.5)mm  
 \* Made from Zirconia fine ceramic  
 \* Ideal for RF coils, Potentiometer Trimmers, or any other application where nonconductive adjustments are required

### 6" Safety Wire Twister with Auto Return: TKM-SWT86

Tapeted nose twister with speedy auto return enables the operator to quickly and effectively attach safety wire in accordance with the strictest standards



### IC Extractor: TKE-ICX-01

A stainless steel construction for removing dual in-line packages.



### PLCC Extractor: TKE-PLCC

A spring assisted clip carrier extraction tool, specially designed for the safe removal of PLCC from sockets without damage to component parts.



### 5" Wire Stripper: TKE-WS-01

For use on all commonly used insulated wires. Adjustable stop on the gripping handle for wire size.



### 5" Long Nose Pliers: TKE-LNP-01

Drop forged, insulating cushioned handles, fully insulated jaws.



### 4" Diagonal Cutter: TKE-DC-01

Tool used with precision cutting jaws and insulating cushioned handles



### Tap & Die Set

#### TKM-TDS-41/TKM-TDS-44

TKM-TDS41 includes:  
 17 Hss dies in size 3mm-8.5 in (12mm-1.75), plug-style taps in the same sizes, adjustable die guide stock, adjustable tap wrench, two T-handle tap wrenches, screw pitch gauge, screwdriver, plastic carrying case.

TKM-TDS44 includes:

One Plug Tap and Die for the following 28 thread sizes, plus tools



- \* 1" Adjustable Round Die:  
 4-40 NC, 6-32 NC, 8-32 NC, 10-24 NC, 12-24 NC, 1/4-20 NC, 5/8-16 NC, 1/2-13 NC, 5/8-18 NC, 7/16-14 NC, 3/8-32 NF, 3/8-24 NF, 1/2-20 NF, 5/16-24 NF, 7/16-28 NF, 1/8-27 NPT  
 \* 1 1/2" Adjustable Round Die:  
 3/16-12 NC, 3/8-11 NC, 3/4-10 NC, 3/16-18 NF, 5/8-18 NF, 3/4-16 NF, 3/4-18 NPT Pipe die in solid round  
 \* 2" Adjustable Round Die:  
 3/8-8 NC, 1/8-8 NC, 3/8-14 NF, 1/4-14 NF  
 \* Threading Tools:  
 1", 1 1/2", 2" Adjustable Die Stocks  
 2" Adjustable Handle Tap Wrenches  
 T-Handle Tap Wrench  
 Screw Pitch Gauge  
 Screw Driver

## Soldering Stations

### Electronic Control Temperature Adjustable Soldering Stations



SL-30 CMC (SS-31800C) SL-20 CMC (SS-31020C) SR-976 ESD (SS-33776C)

Power 45W 45W 50W

Temp. (°C) 168 - 480 150 - 420 230 - 480

(°F) 328 - 900 300 - 790 470 - 900

Weight 1940 g 1900g 870g



201-3C 201-4C 201-1B 20-8C

Optional Tips: SR (0.5mm), D (0.5mm), DC (1.0mm), 3D (3.0mm), 3C (3.0mm), 4C (4.0mm)



SL-10 (SS-31810) SL-20 (SS-31820) SL-30 (SS-31830)

Power 65W 40W 45W

Temp. (°C) 150 - 450 150 - 420 180 - 480

(°F) 300 - 840 300 - 790 320 - 900

Weight (g) 1900 1800 1040



Optional Tips: 821(1/32"), 822(1/32"), 823(1/16"), 824(1/16"), 825(1/8"), 826(3/16"), 827(1/8")

### SR-998 (SS-31998)

Power 15 - 60W

Weight (g) 1032

### Optional Tips:



### Soldering & Desoldering Station

#### SR-916 (SS-33916)

#### SR-928 (SS-31928) (Desolder Only)



Power 50 W

Soldering Temp. (°C): 150 - 420 (°F): 300 - 790

Desoldering Temp. (°C): 210 - 480 (°F): 410 - 900

Weight (g) SL-916: 5360, SL-928: 3300

Vacuum Pump - 500mmHg 24V AC

### Optional Tips (Left to right)



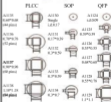
### Hot Air SMD Reflow Station

#### SR-975 (SS-31975)

Power: 275 W

Temp. (°C): 100 - 400,

(°F): 212 - 754



### Soldering Irons

SR-982A (SS-31982A): 15W

SR-971A (SS-31971A): 15W

SR-982B (SS-31982B): 20W

SR-971B (SS-31971B): 20W

SR-982C (SS-31982C): 25W

SR-471C (SI-31971C): 25W



Optional Tips

TD (3.0mm) 3C (3.0mm) 4C (4.8mm)  
SD (0.5mm) B (0.5mm) BC (1.0mm)

SR-803 (SI-31983): 40W



SH-815 (SI-31815): 40W



SR-805



SR-805 A (SI-31965 A), SR-815 A (SI-31815 A): 25W

SR-805 B (SI-31965 B), SH-815 B (SI-31815 B): 40W

Optional Tips: G1 (1.37"), G2 (1.64"), G3 (1.91"),  
G4 (1.18"), G5 (1.64")



SR-808 A (SI-31968 A), SR-808 B (SI-31808 B): 0W

SR-808 B (SI-31968 B), SR-808 A (SI-31808 A): 30W

Optional Tips: B-10 (1.37"), D-20 (1.03") B-07  
(1.04") D-30 (1.18") D-60 (1.18")



SH-812 (SI-31812 A): 100W



CS2-40 (SI-31840): 40W

Optional Tip:

SH-812: E1 (3.16"), E2 (1.87"), E3 (1.16")

CS-40: JLJ2



KB-30 230V 30W

KB-40 230V 40W

KB-60 230V 60W

KB-80 230V 80W

KB-100 230V 100W

KN-20 120V 20W

KN-30 120V 30W

KN-40 120V 40W

KN-60 120V 60W

KN-80 120V 80W

Desoldering Iron / Soldering Pot



SH-80



SH-601 (SI-31660) Weight: 530g  
20014 (SP-31014) Power: 150W  
Temp. (°C): 490 - 550, (°F): 942 - 1022

Tin Pumps



SH-517 (TP-31517)

SH-527 (TP-31527)

SH-613 (TP-31613)

SH-613 (TP-31613)

Weight

84g

71g

56g

50g

Soldering Stands

ST-600

SH-614

SH-614B



ST-800

ST-614

SH-614B

(ST-31800)

(ST-31814)

(ST-31814B)

## Alternative Energy Kits

**Solar Power Independent (Serial)**  
SPS-700050, SPS-700080, SPS700100,  
SPS-701000, SPS-701600

Component Specifications

PV Panel:

Rated Power Output (Prp): 200W

Operating voltage (V<sub>mp</sub>): 26.16VOperating current (I<sub>mp</sub>): 7.72AOpen circuit voltage (V<sub>oc</sub>): 33.62VShort circuit current (I<sub>sc</sub>): 8.27A

Safety certified: IEC61215, IEC61730

Standardize Solar Charge Control (r):

Rated Power Output: 1000W/1000W

Input voltage: 40-150Vdc

Input current: 15A

Output voltage: 48V

MPPT efficiency: 90%

Charge efficiency: 85%

Protection class: IP45

Charge method: CC, CV, Floating

DC Protection Box:

Surge absorber: 82Ω/5sec 20A

Protection class: IP45

Dimension: 300x400x180 mm

DC/AC Inverter:

Rated power output: 1500W

Input voltage: 42-60VDC

Output voltage: 110 or 220 VAC

Conversion efficiency: 98%

Over-load protection: 115% 500 sec 120% 10 sec

Solar Array Rack:

Modularized components: 40x40 mm square pipe

Materials: Aluminum

Finish: Anodic treatment-10μ

Acrylic baked varnish-10μ

Screw accessories: Stainless

Wind-pressure-resistant class: 17-class wind

Solar Power Parallel

SPP-702020, SPP-705660

PV Panel:

Rated power (Prp): 200W

Operating voltage (V<sub>mp</sub>): 26.12VOperating current (I<sub>mp</sub>): 7.72AOpen circuit voltage (V<sub>oc</sub>): 33.62VShort circuit current (I<sub>sc</sub>): 8.27A

Quality certified: IEC61215, IEC61730

Grid-tied PV Inverter

Rated power: 2000W/3000W/4000W

Input voltage: 150-500Vdc

Output current: 18A/18A

Output voltage: 220V/230V/240V

Conversion efficiency: 95%

Current distortion: &lt;4%

Protection class: IP45/IP65

Quality certified: VDE0326-1-1,  
EN50178, IEC62103