Part 3

ED-5960 _ LON DEVICE DEVELOPMENT KIT NEW
ED-5964 _ POWER LINE COMMUNICATION TRAINER NEW
ED-5965 _ HOME NETWORK DESIGN PLATFORM NEW
ED-5967 _ EMBEDDED BASED HOME NETWORK TRAINER NEW
ED-5968 _ HOME NETWORK TRAINER NEW
ED-3120 _ UBIQUITOUS SENSOR NETWORK TRAINER NEW
ED-3160 _ UBIQUITOUS SENSOR NETWORK TRAINER
ED-1450 _ PC BASED RFID TRAINER NEW
ED-3100 _ RFID APPLICATION TRAINER
ED-3710 _ RFID APPLICATION TRAINER NEW
ED-9600S _ RFID LOGISTICS AUTOMATION TRAINER NEW
ED-NET4-X_ NETWORK TRAINING SYSTEM SERIES NEW
ED-NET-3 _ LAN(LOCAL AREA NETWORK) TRAINING SYSTEM
ED-NET-2 _ ADSL(ASYMMETRIC DIGITAL SUBSCRIBER LINE) TRAINING SYSTEM
ED-2945 _ CDMA TRAINING KIT NEW

ED-1440 _ PC BASED DIGITAL COMMUNICATION TRAINER NEW
ED-1460 _ PC BASED ANALOG COMMUNICATION TRAINER NEW
ED-2920 _ PULSE / DIGITAL COMMUNICATION TRAINER
ED-2950 _ ELECTRONIC COMMUNICATION TRAINER
ED-2960 _ TELECOMMUNICATION TRAINER
ED-2970 _ DIGITAL COMMUNICATION TRAINER
ED-2980 _ OPTICAL COMMUNICATION TRAINER
ED-2990 _ MULTIPLEXED COMMUNICATION TRAINER
ED-3000 _ MICROWAVE TRAINER
ED-3200 _ ANTENNA TRAINER
ED-3300 _ MICROSTRIP LINE TRAINER
ED-3400 _ AM TRANSCEIVER TRAINER
ED-3600 _ FM(STEREO) TRANSCEIVER TRAINER
ED-IPSTB _ IPTV TRAINER KIT NEW
ED-8200E _ COLOR TV TRAINER

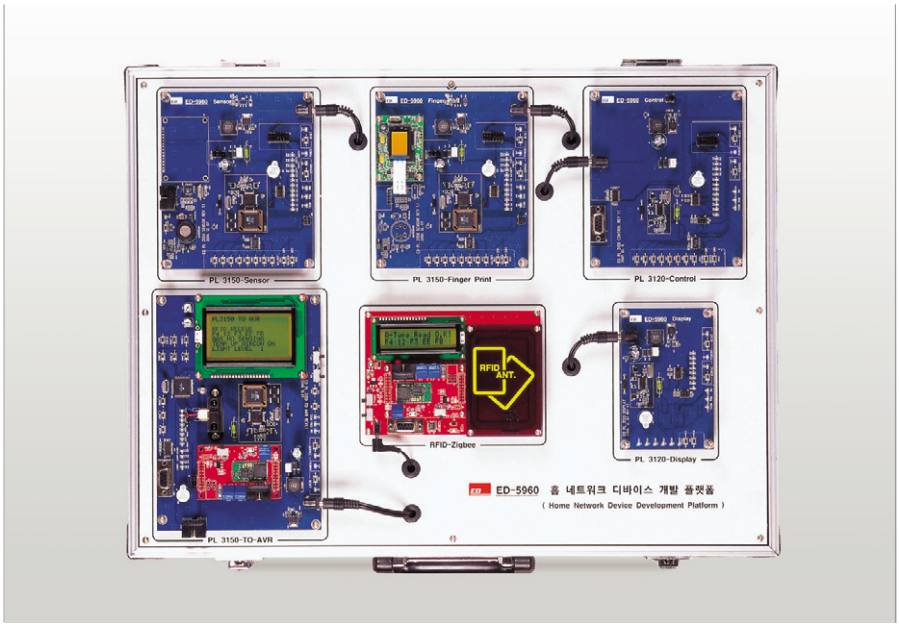
IT / Communication

New

LON DEVICE DEVELOPMENT KIT

ED-5960

- Home network based experiments suitable for ubiquitous computing
- Integrated ubiquitous device using ZigBee/RFID and finger print recognition
- Designed to help develop home network on the ground of Lon Protocol
- Equipped with each PLC module(Power Line Communication) for home network
- Related experiments through Neuron C and MICOM programming



> EXPERIMENTS

- Overall understanding of home network technology
- Programming for operations of each device
- Composition of home network scenarios
- Interoperable self installation
- Theories on the hardware/software related to home network Device
- Commissioning and network binding experiments using LonMaker

> SPECIFICATIONS

- **Common Feature(per module)**
  - » Interface : RS-232
  - » Operating System : Protocol Scheduler
  - » Communication : Power Line Communication
  - » Application Program : Neuron C
- **General Characteristics**
  - » Module Dimension : 575(W) x 225(H) x 460(D)mm
  - » Input Voltage : 220V

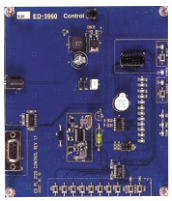
ACCESSORIES

- MiniEVK Compiler CD : 1ea
- Adaptor for Power Line Communication : 5ea
- User's Guide : 1 copy

LON DEVICE DEVELOPMENT KIT

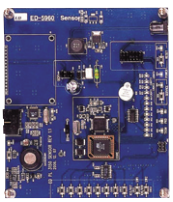
ED-5960

Experiments Module



ED-5960-1
PL3120 Control

- GAS, CDS and TEMP DATA output control
- Adjustment of actuator's range through control of the input data's level
- Processor : PL3120 Transceiver
- Memory : EEPROM 0.5kB, SRAM 2kB, external 64kB

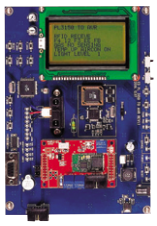


ED-5960-2
PL3150 Sensor

- Serves to read the GAS, CDS and LIGHT DATA through AVR, and send them to UART PL3150; and deliver them to each device through NV
- Processor : PL3150 Transceiver, ATMEGA8
- Memory : EEPROM 0.5kB, SRAM 2kB, external 64kB Flash

ED-5960-3
PL3150 Finger Print

- Finger print recognition using the Finger Print Sensor module
- Indicates the status of finger print recognition's process
- Executes Access Control Program through finger print recognition
- Processor : PL3150 Transceiver, ATMEGA8
- Memory : EEPROM 0.5kB, SRAM 2kB, External 64kB Flash

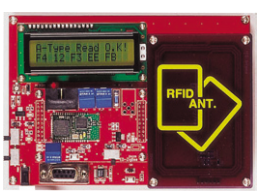


ED-5960-4
PL3150 TO-AVRM

- ATMEGA128 in use
- LCD DISPLAY IR Sensing by the changes in NV INPUT, NV_SW ON/OFF output by SW INPUT
- Executes Access Control Program by receiving RFID READ DATA through ZigBee
- Processor : PL3150 Transceiver, ATMEGA8
- Memory : EEPROM 0.5kB, SRAM 2kB, external 64kB Flash

ED-5960-5
PL3120 DISPLAY

- Displays the status of operation by GGAS, CDS, TEMP NV_SW ON/OFF
- Displays the status of operation by IR Sensing, SW NV_SW ON/OFF
- Displays Access Control SW ON/OFF by the data proceeded by RFID and finger print recognitions
- Processor : PL3120 Transceiver, ATMEGA8
- Memory : EEPROM 0.5kB, SRAM 2kB, external 64kB



ED-3120-ZB
RFID READ ZigBee

- Detects the RFID CARD and displays a proper code serial; then sends the data to PL3150 TO-AVR module through ZigBee
- 13.56MHz RFID Reader's sensing distance : 100mm
- ISO/IEC 14443 Type A, Type B
- Processor : AT89C51(8051), ZigBee module(CC 2420)

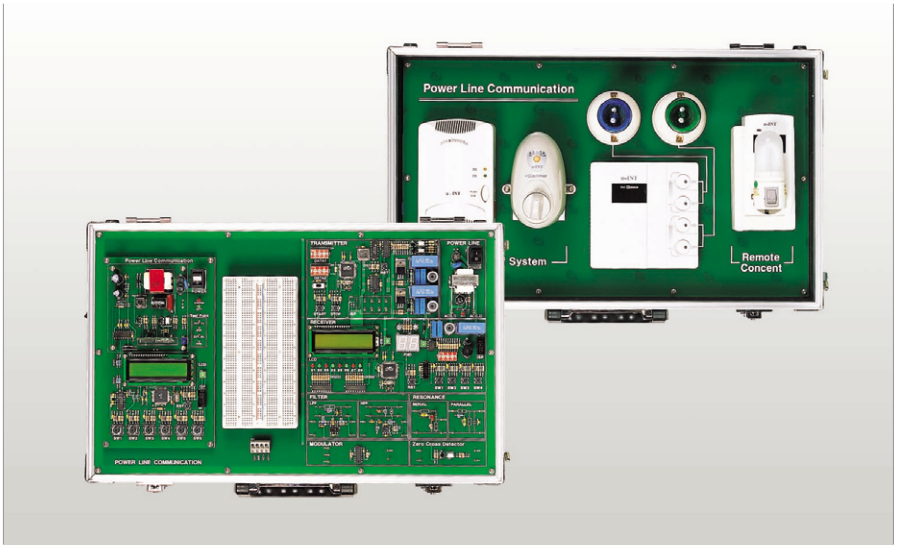
• Ubiquitous

POWER LINE COMMUNICATION TRAINER

New

ED-5964

- Learning experience for Power Line Communication using the network products
- PC Based Control(LabVIEW) using the external Power Line Communication modem
- Home appliance control using C Language
- Noise Blocking Filter for blocking incoming data from outside
- Anti collision
- C source for firmware experiments



> EXPERIMENTS

- Overview of Power Line Communication
- Training equipment for Power Line Communication
- Operation device using Power Line Communication
  - » Using Power Line Communication Modem
  - » Using PDA
- Power Line Interface
  - » Filter(LPF, HPF) / Resonance(Serial,Parallel) / Zero Cross Detector
- Modulation : ASK(Amplitude Shift Keying)
- Transmitter & Receiver
  - » Transmitter & Receiver
  - » Collision Detector
- Firmware Experiments
  - » Compiler & Programming
  - » Basic(LED, Tactile Switch, Dip Switch, FND)
  - » Protocol(X10, Z256)
- Application Program
  - » LabVIEW programming experiments

> SPECIFICATIONS

POWER LINE COMMUNICATION DEVICE

- **Frequency(Carrier)**
  - » Rated Voltage : AC 250V
  - » Cut Off Frequency : 120kHz
  - » Bandwidth : 110kHz~380kHz
  - » Distortion : -40dB
- **Gas Breaker Device by Remote Control**
  - » Rated Voltage : AC 220V(Controller), DC 12V(Breaker)
  - » Power Consumption : 2.2W
  - » Operation Method : Current control(Controller), Motor(Breaker)
  - » Frequency : 120kHz, Max. Communication Speed: 360bps
- **Remote Control Socket**
  - » Rated Voltage : AC 220V
  - » Power Consumption : 2.2W
  - » Operation Method : Relay operation
  - » Frequency : 120kHz, Max. Communication Speed : 360bps

POWER LINE COMMUNICATION MAIN

- **CPU :** AVR(ATMega128)
- **Line Coding :** Manchester
- **Modulation :** ASK(Amplitude Shift Keying)
- **Anti Collision Function**
- **Liquid Crystal Display(LCD) :** Display of received data frame
- **Dip Switch, Tactile Switch, LED, FND :** Data Set, Transmit, Display
- **Filter, Resonance, Modulator, Zero Cross Detector**
- **Power Line Communication :** Control of Home Network Products
- **Bread Board :** for designing and testing the circuit

ACCESSORIES

- Connection Cable : 1 set
- Program CD : 1 set
- User's Guide : 1ea

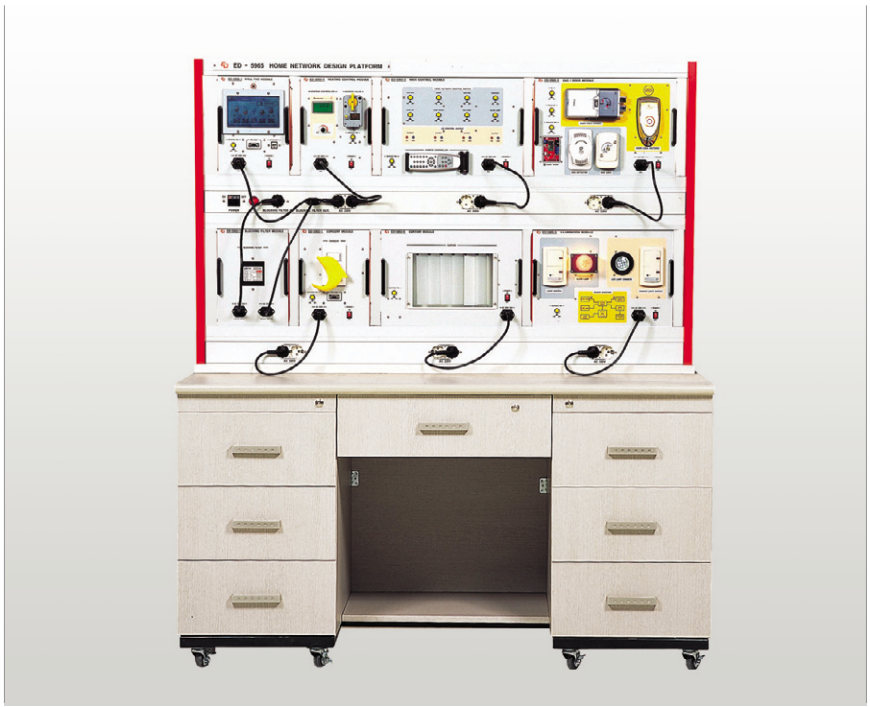
• Ubiquitous

New

ED-5965

HOME NETWORK DESIGN PLATFORM

- Home network based experiments suitable for ubiquitous computing
- Designed to help develop network devices on the basis of Lon Protocol
- Control of each device installed in the field through power line communication
- Related experiments through Neuron C and MICOM programming
- Home network control in utilization of LabVIEW
- Modular structure with a rack for convenient wiring
- Home network device control through the Internet(Home Gateway)



ACCESSORIES

- MiniEVKComiler
- LonMaker 3.1
- Experimental Rack
  - » Single Unit Power Source Rack
  - » Built-in 15A Circuit Breaker
  - » Built-in Indication Lamp
  - » Dimension: 1490(W) x 918(H) x 320(D)mm
- Connection Cables
- AC Power Cord
- User's Guide Manual

OPTIONS

- Experimental Table
  - » MDF Material, Wheel type With Drawers
  - » 1490(W) x 800(D) x 846(H)mm

> EXPERIMENTS

- Overview of Home Network technology
- Principles on Home Network device related hardware and software
- Understanding of Home Network scenarios
- Programming for each device's operation
- Commissioning and network binding Using LonMaker
- Control of each device
- Interoperable self installation

Wall Pad Module

- 7″ touch LCD and similar functions as offered by the Wall Pad at home
- Control of door using C-MOS Camera
- Home gateway experiments
- Control of ED-5965 model through Internet in utilization of PDA and PC

IO Switch Control Module

- Control by power line communication
- Remote control through each module's switch
- F/W programming with Neuron C

Heating Control Module

- Control by power line communication
- Control by the remote controller
- Control through IO_SWITCH
- F/W programming with Neuron C

Blinds Control Module

- Control by power line communication
- Control by the remote controller
- Control through IO_SWITCH
- F/W programming with Neuron C

Electric Outlet Module

- Control by power line communication
- Control by the remote controller
- Control through IO_SWITCH
- External control interface through UART
- F/W programming with Neuron C

Illumination Module

- Control by power line communication
- Control by the remote controller
- Control through IO_SWITCH
- IR(remote controller) reception F/W experiments
- F/W programming with Neuron C

Gas/Door Control Module

- Control by power line communication
- Control by the remote controller
- Control through IO_SWITCH
- F/W programming With Neuron C

HOME NETWORK DESIGN PLATFORM

ED-5965

Experiments Module

ED-5965-1 Wall Pad Module

- Icons for the module components on 7″ touch LCD for control
- C-MOS Camera
- Monitoring and door control
- Processor : PX270 ARM CORE/PL3120 Transceiver
- Display : 7″ touch LCD
- Communication : Ethernet , Power Line Communication

ED-5965-2 Heating Control Module

- Temperature control device for heating valve control
- Encoder Switch for temperature control
- Control of the valve through Main Control module
- Control by LabVIEW program
- Control by the Remote Controller(Integrated type)
- Control through Wall Pad

ED-5965-3 Main Control Module

- Modular control through the switches
- Remote Controller for controlling each module
- External output terminal for customized experiments
- Processor : PL3120 Transceiver
- 12V Relay, 24V Relay OUT Terminal
- Total of 8 input switches
- Infrared(IR) communication in utilization of the Remote Controller

ED-5965-4 Gas/Door Control Module

- GAS Detector for gas valve control
- Main Control module for door control
- Control By LabVIEW program
- Control through Wall Pad
- ZigBee/RFID for door control
- Processor : PL3120 Transceiver
- Digital door lock
- Gas detector, DC 12V gas valve
- CC2420 ZigBee module

ED-5965-5 Blocking Filter Module

- Isolates the equipment from its surrounding and blocks Communication once power line communication goes through this filter
- Rated Voltage : 220/110V
- Rated Current : 50A
- Operating Temperature : -10C~+40C
- Distortion : above 40dB
- Bandwidth : 110kHz ~ 140kHz

HOME NETWORK DESIGN PLATFORM

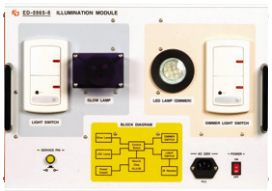
ED-5965

ED-5965-6
Electric Outlet Module

- Electric outlet control
- Control by LabVIEW program using RS-232 Interface
- Processor : PL3120 Transceiver
- RS-232 monitoring

ED-5965-7
Blinds Control Module

- Control of blinds through Main Control module
- Control by LabVIEW program
- Control by the Remote Controller(Integrated type)
- Control through Wall Pad
- Processor : PL3120 Transceiver
- DC 24V Motor Control(Power Line Communication)



ED-5965-8
Illumination Control / IR Module

- ON/OFF Switch for Lamp control
- Main Control module for Lamp control
- Control By LabVIEW Program
- Control by the Remote Controller(Integrated Type)
- Control through Wall Pad
- Processor : PL3120 Transceiver
- AC 220V Glow Lamp, DC 12V LED Lamp
- Combined Infrared Switch

Experiments Module

RFID/ZigBee Access Control Module

- Control through power line communication
- Door control using RFID and ZigBee
- RFID, ZigBee, PLC (Power Line Communication) Access
- F/W programming through Neuron C
- 13.56MHz RFID Reader
- Sensing Distance: 100mm
- ISO/IEC 14443 Type A, Type B
- Processor : AT89C51(8051)
- ZigBee module(CC 2420)

Software

Each device's control is possible through each Icon of the integrated HMI that enables controlling illumination, heating, blinds, electric outlet, dimmer and indoor temperature

SYSTEM CHARACTERISTICS

- **Memory :** ROM 24kB, EEPROM 4kB, SRAM 2kB
- **Interface :** RS-232
- **Operating System :** Protocol Scheduler
- **Communication Channel :** PLC
- **Dimension :** 420(W) x 300(H) x 95(D)mm
- **Input Voltage :** 220V

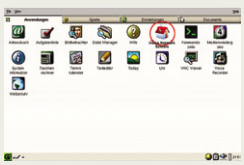
• Ubiquitous

EMBEDDED BASED HOME NETWORK TRAINER

New

ED-5967

- Home network control in liaison with Embedded PXA 255/270/272/320
- Power line communication and ZigBee modules with Multi Port in use together
- Embedded
  - » System design using PXA270
  - » System upgrade simply by replacement of Embedded PXA255/270/272/320
  - » Embedded based LINUX porting and Device Driver
  - » Enhances GUI (Graphical User Interface) program coding abilities
  - » C-MOS Image Sensor
- Home Network
  - » Understanding of Home Network System and LonWorks System
  - » Design and experiments on power line communication
  - » Device control and binding Experiments using LonMaker (LonWorks Protocol)



• QT Program (Embedded GUI)

• Initial Operation Screen (Communication Port)

• Equipment Control Screen

> EXPERIMENTS

Embedded

- Introduction
- LINUX
- CDK(Cross Development Kit)
- JTAG(Joint Test Action Group)
- Boot loader(u-boot)
- Embedded Linux booting
- Embedded Linux porting
- Device Driver
- GPIO LED Device Driver
- LED Device Driver
- Network Program
- QT Installation
- QT Program Application

Home Network

- Home Network System
- Protocol
- LonWorks System
- LonWorks Device
- Definition of Device Interface
- Neuron C
- Commissioning
- Device Hardware Design
- Network Program
- MiniEVK Compiler
- Device F/W Programming
- LonMaker for Windows in utilization

ZigBee (Option)

- Overview of USN
- Software Installation
- Ad-hoc Network and Application
- TinyOS Installation and Folder Structure
- NessC
- LED Control using Task and Timer
- Radio Communication
- Wireless Communication
- Control of Home Network System

EMBEDDED BASED HOME NETWORK TRAINER

ED-5967

> SPECIFICATIONS

EMBEDDED PXA255/270/272/320

- **CPU :** INTEL PXA255/270/272/320(520MHz)
- **Memory**
  - » SDRAM 128MByte(32bit width)
  - » FLASH _ PXA255 : 32MByte , PXA270 : 32MByte
    _ PXA272 : 64MByte , PXA320 : 128MByte
  - » SDRAM 1 MByte(32bit width)
- **Serial Communication**
  - » FF UART 1Port
  - » Standard UART 1Port
  - » Bluetooth 1Port
- **Ethernet**
  - » 10/100Base-T 1Port(LAN91C11)
  - » 10Base-T 1Port(CS8900)
- **Display**
  - » TFT-LCD, 7″ wide
  - » Touch Screen
- **Card Slot**
  - » CF(Compact Flash) Card 1Slot
  - » SD/MMC Card 1Slot
- **RTC :** RTC4513
- **USB**
  - » Host 1Port
  - » Client 1Port
- **C-MOS Image Sensor**
  - » Hynix HYCA3(1/4) Camera module
- **LED :** 8ea
- **Buzzer :** 1ea
- **Software :** Qtopia, Linux, QT

HOME NETWORK

- **Gas Leak Alarm**
  - » Gas Detection : LNG, LPG
  - » Voltage : DC 12V
  - » Output Type : On/Off
  - » Alert beep sounds at the time of detecting gas
- **Heater**
  - » Open/Close : Electronic Valve Control
  - » Voltage : 12V
  - » Displays the valve's current status
- **Lighting**
  - » On/Off function
  - » Lighting control by PWM Method(0~9steps)
- **Power Control**
  - » On/Off function
  - » Control using TRIAC and Photo Coupler

PLC(POWER LINE COMMUNICATION)

- **Processor**
  - » PL3120 Transceiver
- **Communication Channel**
  - » Power line communication
- **PL3120 F/W programming through LonMaker**

ZIGBEE(OPTION)

- **Processor**
  - » ATmega128L, 8bit RISC
- **Memory**
  - » 128k Program Flash, 4k EEPROM
- **Operating System**
  - » F8W, TinyOS
- **Multi Channel Radio**
  - » 2.4/2.4835GHz
- **Data Rate :** 250kBaud
- **RF Chip :** CC 2420(IEEE 802.15.4)
- **Power :** 3.0~3.3V
- **Interface**
  - » RS-232, GPIO Port
- **Program Download :** J TAG

GENERAL CHARACTERISTICS

- **Dimension :** 680(W) x 90(H) x 480(D)mm
- **Power**
  - » Input Voltage : AC220V
  - » Embedded Board : DC +3V, DC +5V
  - » Power Line Communication : AC220V, DC +12V

ACCESSORIES

- SW CD (Program Source, Circuit Diagram, DataSheet)
- Serial Cable
- Power Cord
- Ethernet Cross Cable
- LPT Cable
- JTAG Downloader Cable
- User Manual

OPTIONS

- ZigBee Module : 4ea

New

HOME NETWORK TRAINER

ED-5968

- Home network control in liaison with Embedded PXA 255/270/272/320
- Power line communication and ZigBee modules with Multi Port in use together
- Home Network
  - » Understanding of Home Network System and LonWorks System
  - » Design and experiments on Power Line Communication
  - » Device control and binding experiments using LonMaker (LonWorks Protocol)

> CONFIGURATION

- Home Network
- PLC(Power Line Communication)
- Embedded PXA255/270/272/320(Option)
- ZigBee(Option)

※Please refer to Page 95 on ED-5967 Model

> EXPERIMENTS

Embedded (Option)

- Introduction
- LINUX
- CDK(Cross Development Kit)
- JTAG(Joint Test Action Group)
- Boot loader(u-boot)
- Embedded Linux booting
- Embedded Linux porting
- Device Driver
- GPIO LED Device Driver
- LED Device Driver
- Network Program
- QT Installation
- QT Program Application

Home Network

- Home Network System
- Protocol
- LonWorks System
- LonWorks Device
- Definition of Device Interface
- Neuron C
- Commissioning
- Device Hardware Design
- Network Program
- MiniEVK Compiler
- Device F/W Programming
- LonMaker for Windows

ZigBee (Option)

- Overview of USN
- Software Installation
- Ubiquitous Senser Network
- Ad-hoc Network and Application
- TinyOS Installation and Folder Structure
- NessC
- LED Control using Task and Timer
- Radio Communication
- Wireless Communication
- Control of Home Network System

> SPECIFICATIONS

GENERAL CHARACTERISTICS

- **Dimension**
  - » 160(W) x 90(H) x 480(D)mm
- **Voltage**
  - » AC220V, DC +12V

ACCESSORIES

- Software CD(Program Source, Circuit Diagram, Datasheet)
- Serial Cable • Power Cable
- User Manual

OPTIONS

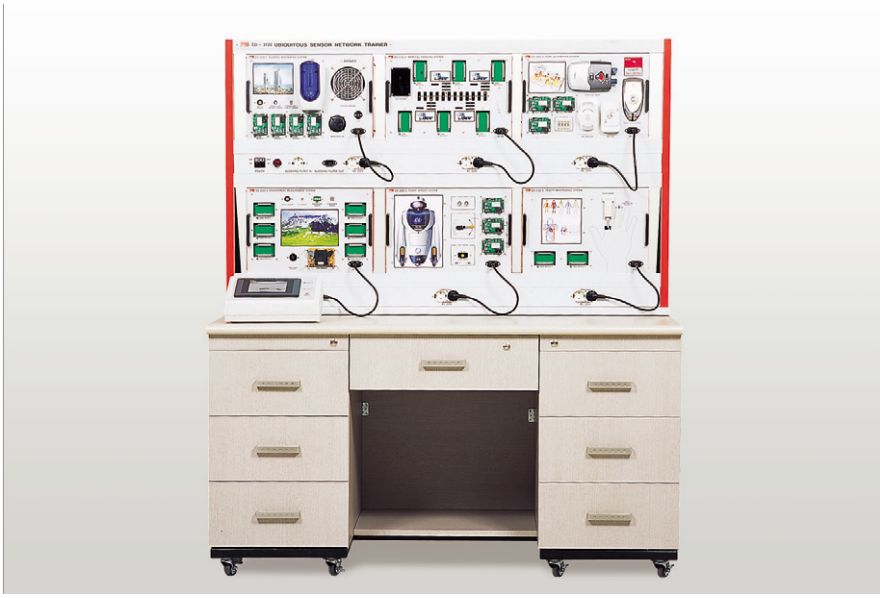
- ZigBee Module : 4ea

• USN / RFID System

UBIQUITOUS SENSOR NETWORK TRAINER

New

ED-3120



> FEATURE

- Fundamental and concept of the Ubiquitous Sensor Network, ZigBee(IEEE 802.15.4) System
- TinyOS and various types of sensors(Illumination, Temperature, Humidity, Gas, Ultrasonic Wave, Pyroelectric)
- Total solutions needed for Sensor Network System training and development
- Various application fields(OS, network, security, robot, H/W development, sensor application)
- Mobile SMS reception(through PC) of a warning information on fire or gas leakage, which was accepted by PAN Coordinator
- Standard shipped components are the total of seven modules including PAN Coordinator(Sink Node) & SMS Transmitter Which is a main module
  [PAN Coordinator(Sink Node) & SMS Transmitter, Building Automation System, Materials Handling System, Home Automation System, Environment Measurement System, Robot Sensor System, Health Maintenance Module]
- ZigBee modules to communicate one another and also with the main module
- PC interface and monitoring on Touch Panel
- Consists of the sensors widely being used for the management of building, home automation, environment, robot and health

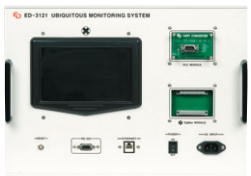
> EXPERIMENTS

- **U-Building(Building Automation System)**
  - » Remote light control using Illumination Sensor by ZigBee communication
  - » Remote management/alarm for intruders using Human Body Sensor
  - » Refrigeration and air conditioning using Temperature/Humidity Sensor by ZigBee communication
  - » Fire alarm using Fire Detection Sensor by ZigBee communication
- **U-Logistics(Material Handling System)**
  - » Logistics automation using RFID by ZigBee communication
  - » Logistics transfer by RFID data using a virtual conveyor by ZigBee communication
  - » Load capacity control for each warehouse using ZigBee communication
- **U-Home(Home Network System)**
  - » Remote gas detection by ZigBee communication
  - » Remote door OPEN/CLOSE, monitoring and management by ZigBee communication
  - » Gas valve breaker through remote gas alarm by ZigBee communication
- **U-Environment(Environment Measurement System)**
  - » Environmental monitoring through various densors by ZigBee communication
- **U-Robot(Robot Sensor System)**
  - » Object detection through Ultrasonic Sensor by ZigBee communication
  - » Gradient measurement using Gradient Sensor by ZigBee communication
  - » Calculation of the robot's rotation Speed Using Gyro Sensor by ZigBee communication
- **U-Health(Health Maintenance Module)**
  - » Pulse measurement using SpO_2 Sensor by ZigBee communication
  - » Body temperature detection using Body Temperature Sensor by ZigBee communication

UBIQUITOUS SENSOR NETWORK TRAINER

ED-3120

Main Module



ED-3121
U-sensor Network Monitoring System

- **Touch Panel**
  - » 7″ wide TFT LCD(640 x 480 resolution)
  - » Analog Touch
  - » 32bit RISC CPU
- **ZigBee Module**
  - » Performing as PAN Coordinator(1ea)
- **PC Interface :** RS-232C
- **Power Source :** AC 220V
- **Feature**
  - » Capable of data analysis and control using Touch Panel
- **Dimension :** 300(W) x 142(H) x 284(D)mm

u-Building

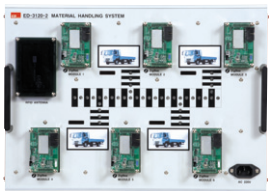
ED-3120-1
Building Automation System

- **ZigBee Module :** Node(4ea)
- **Illumination Sensor(1ea)**
  - » Measuring Range : 0~25000Lux
  - » DC 5V
  - » Output type : Current(μA)
- **Human Body Detection Sensor(1ea)**
  - » Pyroelectric detection
  - » DC 5V
  - » Output type : Digital output
- **Temperature/Humidity Sensor(1ea)**
  - » Measuring Range : 0~110°C, 0~100%
  - » DC 5V
  - » Output type : Voltage(V)
- **Fire(Smoke) Detection Sensor(1ea)**
  - » Smoke detection using infrared rays
  - » DC 12V
  - » Output type : On/Off
- **Application Components**
  - » Alarm, ø10 LED, AC
  - » FAN(Cold/Warm wind)
- **Power Source :** AC 220V
- **Dimension :** 420(W) x 300(H) x 137(D)mm

UBIQUITOUS SENSOR NETWORK TRAINER

ED-3120

u-Logistics



ED-3120-2
Material Handling System

- **ZigBee Module :** Node(6ea)
- **RFID Reader**
  - » 13.56MHz RFID Reader, low electric power design
  - » Detection Distance : Min. 100mm
  - » ISO/IEC 14443 Type A, Type B Read, ISO 15693 Read
  - » Alarm for gas detection
- **Virtual Conveyor**
  - » ø3 high brightness Blue LED(40ea)
  - » Easy to trace logistics(IN/OUT)
- **Load Capacity Indication**
  - » Red 10 Bar LED
  - » Indication by unit of 10%
  - » Easy to find out the current status of each warehouse
- **Zyro Sensor**
  - » Measuring Range : ±70deg/sec
  - » DC 5V
  - » Output type : Voltage(V)
  - » Resolution : 0.1 degree
  - » Response Time : 0.5Sec
- **Power Source :** AC 220V
- **Dimension :** 420(W) x 300(H) x 80(D)mm

u-Home Network System

ED-3120-3
Materials Handling System

- **ZigBee Module :** Node(3ea)
- **Gas Leakage Alarm**
  - » Detection : Gas(LNG, LPG)
  - » DC 12V
  - » Output type : On/Off
  - » Alarm for detection of gas
- **Gas Valve Breaker**
  - » OPEN/Close using DC motor
  - » DC 12V
  - » Indicates the current valve status
- **Virtual Gas Meter**
  - » 4-digit digital switch
  - » Range : 0~9999
- **Digital Door-Lock**
  - » OPEN/CLOSE Method : password, electronic tag
  - » DC 6V(battery x 4)
  - » Automatic Lockup, Lock

UBIQUITOUS SENSOR NETWORK TRAINER

ED-3120

u-Environment

ED-3120-4
Environment Measurement System

- **ZigBee Module :** Node(6ea)
- **Illumination Sensor**
  - » Measuring Range : 0~25000Lux
  - » DC 5V
  - » Output type : Current(μA)
- **O_3 Sensor**
  - » Smoke detection using infrared rays
  - » DC 12V
  - » Output type : On/Off
- **Atmospheric Pressure Sensor**
  - » Red 10 Bar LED
  - » Indication by unit of 10%
  - » Easy to find out the current status of each warehouse
- **Earthquake Detection Sensor**
  - » Measuring Range : ±2~±1000G
  - » DC 5V
  - » Output type : Voltage(V)
- **Wind Velocity Sensor**
  - » Measuring Range : 3~60m/s
  - » DC 5V
  - » Output type : 1 rotation/clock
- **Minute Dust Sensor**
  - » Measuring Range : 0~30000pcs/liter
  - » DC 5V
  - » Output type : Voltage(V)
- **Power Source :** AC 220V
- **Dimension :** 420(W) x 300(H) x 80(D)mm

u-Robot

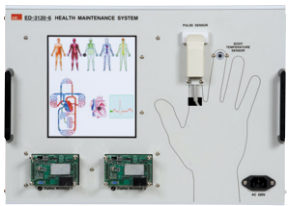
ED-3120-5
Robot Sensor System

- **ZigBee Module :** Node(3ea)
- **Ultrasonic Wave Sensor**
  - » Measuring Range : 3~200cm
  - » DC 5V
  - » Output type : Pulse width
- **Gradient Detection Sensor**
  - » Measuring Range : Single Axis ±60°
  - »DC 5V
  - »Output type : Voltage(V)
  - »Resolution : 0.1 degrees
  - »Response Time : 0.5 second
- **Input Voltage :** AC 220V
- **Dimension :** 420(W) x 300(H) x 80(D)mm

UBIQUITOUS SENSOR NETWORK TRAINER

ED-3120

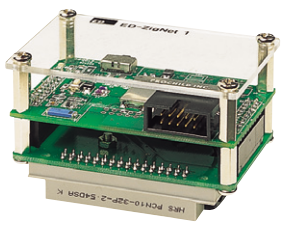
u-Health



ED-3120-6 Health Maintenance System

- **ZigBee Module :** Node(2ea)
- **SpO_2 Sensor**
  - »Pulse detection using infrared rays
  - »DC 12V
  - »Output type : Pulse
  - »Finger Probe type
- **Body Temperature Detection Sensor**
  - »Measuring Range : 0~110˚C
  - »DC 5V
  - »Output type : Voltage(V)
  - »Resolution : 10.0mV/˚C
- **Input Voltage :** AC 220V
- **Dimension :** 420(W) x 300(H) x 80(D)mm

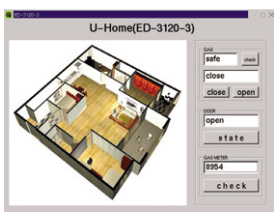
ZigBee Module(25ea)



Cluster Header

- **Interface :** RS-232C, GPIO Port
- **Program Downloader :** JTAG
- **Processor :** Atmega 128, 8bit RISC
- **Memory :** 128k Program Flash
- **OS :** TinyOS, F8W(Z-Stack)
- **Multi Channel Radio :** 2.4/2.4835GHz
- **Data Rate :** 250kBaud
- **RF Chip :** CC2420(IEEE 802.15.4)
- **Power :** 2.7V~3.6V

Software and Development Environment



Monitoring Software

- F8W, TinyOS, Multi-Hop, Ad-hoc Routing Protocol
- Sensor Library, Network Monitor Program, Application Program

ACCESSORIES

- Experiment Rack
  - » Power source single unit type
  - » Built-in 15A power source circuit breaker
  - » Easy to mount and demount modules
  - » Built-in power source indication lamp
  - » Dimension : 1490(W) x 918(H) x 320(D)mm
- Application Program : 1Copy
- AC Power Cord : 1Set
- User Manual

OPTIONS

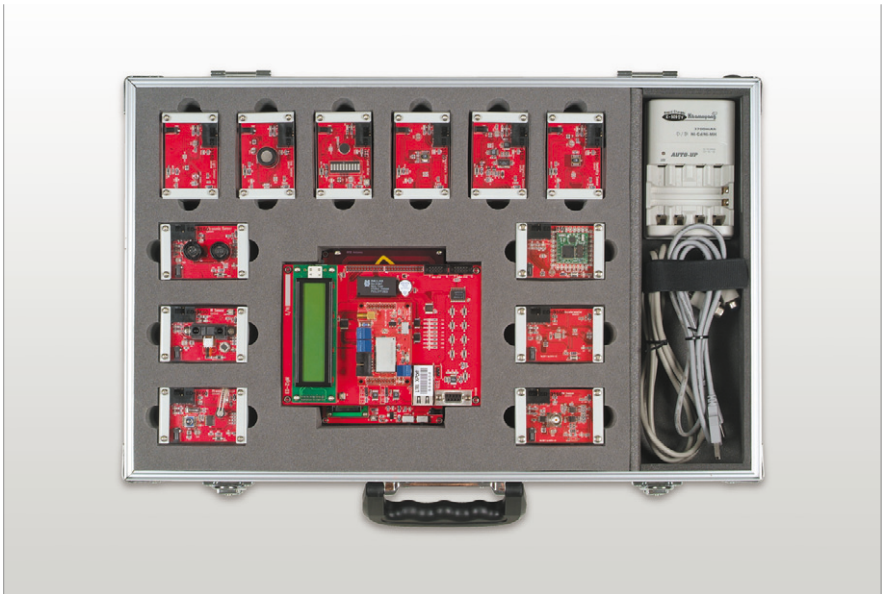
- Work Table
  - » Material : MDF
  - » Trolley type for easy mobility
  - » Drawers
  - » Dimension : 1490(W) x 846(H) x 800(D)mm
- ED-ZigM(Main ZigBee Module)

• USN / RFID System

UBIQUITOUS SENSOR NETWORK TRAINER

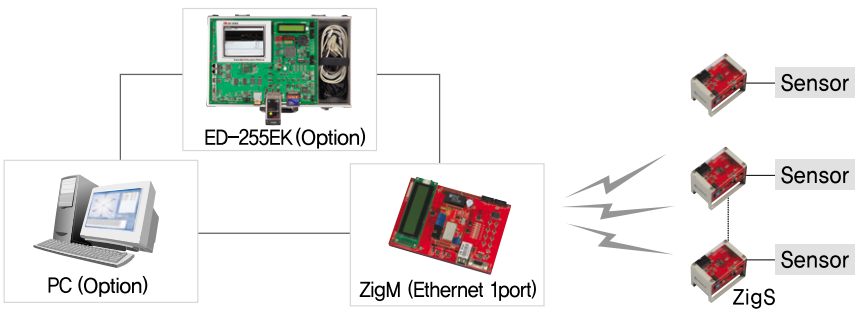
ED-3160

- The optional Embedded System(ED-255EK) can be linked as a gateway
- ZigBee network can be built using TinyOS, F8WOS
- Capable of control and monitor through Ethernet
- The RFID Card Reader is supplied as a standard shipped component for applied experiments on security, home automation and robot
- The Mote Expansion enables easy build of the USN Control System
- 10 types of basic sensors(standard shipped components) & additional 7 types of sensors(Options)



> EXPERIMENTS

- Overview of the sensor network
- Understanding of the sensor network hardware
- Sensor network development environment build
- Sensor network configuration method
- Data transmission among ZigBee modules using the sensor network
- Description of each sensor supplied in the equipment
- Zigbee module and programming of the sensor control program
- Sensor data collection using the sensor network
- Usage and programming knowledge of the PC monitoring software
- Sensor control using the PC monitoring software



UBIQUITOUS SENSOR NETWORK TRAINER

ED-3160

> SPECIFICATIONS

ED-ZigM

- **Interface :** RS-232, TCP/IP, GPIO Port
- **JTAG**
- **Processor :** Atmega128L, 8bit RISC
- **Memory :** 128k Program Flash, 64k SRAM
- **Operating System :** F8W, TinyOS
- **Multi Channel Radio :** 2.4/2.4835GHz
- **Data Rate :** 250kBaud
- **RF Chip :** CC2420(IEEE 802.15.4)
- **RTC :** DS1307
- **Network :** 10/100 Auto Detect
- **Power :** 3.0~3.3V

ED-ZigS

- **Interface :** RS-232, GPIO Port
- **JTAG**
- **Processor :** Atmega128L, 8bit RISC
- **Memory :** 128k Program Flash
- **Operating System :** F8W, TinyOS
- **Multi Channel Radio :** 2.4/2.4835GHz
- **Data Rate :** 250kBaud
- **RF Chip :** CC2420(IEEE 802.15.4)
- **Power :** 3.0~3.3V

ED-255EK(GATEWAY)(OPTION)

- **Processor :** PXA255 400MHz
- **Memory**
  - » FLASH : 32MByte
  - » SDRAM : 128MByte
  - » SRAM : 1MByte
- **Ethernet :** 10/100Mbps 2Port
- **Serial :** UART FF UART, ST UART, BT UART
- **USB :** Host, Client
- 6.4″ TFT LCD/Touch Screen, Multi Media Card, PCMCIA, CF, MMC PS2, IIC, IrDA, RTC, Sound(AC'97 Codec)
- **OS :** Linux-2.4.19, WinCE 4.2

※Detail Specification : refer to ED-255EK product specification

ACCESSORIES

- Serial Cable
- PC Program
- DC 5V Adapter
- JTAG
- Ethernet Cable

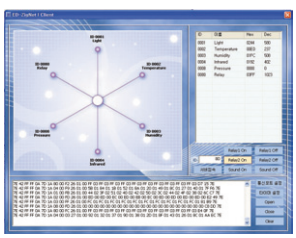
OPTIONS

- Optional Sensor Modules(7ea)
  - » Acceleration Sensor
  - » GPS Sensor
  - » Interface Module
  - » PH Sensor
  - » Finger Print Sensor
  - » Azimuth Sensor
  - » Relay Module

Software and Development Environment

- F8W, TinyOS
- Multi-Hop, Ad-hoc Routing Protocol
- Library of each sensor
- Network monitor program

Application Program



UBIQUITOUS SENSOR NETWORK TRAINER

ED-3160

Sensor (Basic : 10ea)

Illumination Sensor
Lux Meter and Photo Alarm Experiments

- Illumination measurement using Cds, Photo IC (AMS302)
- Designed for low electric power
- Temperature compensation function(Built-in)
- In the use of general-purpose ATMega8L
- RS-232 communication
- Measuring Range : 0.1~50,000LUX

Magnetic Sensor
Magnetic Flux Meter, Tachometer, Speed Meter Experiments

- 2-axis magnetic field intensity measurement
- Designed for low electric power
- Possible use as for a compass
- In the use of general-purpose ATMega8L
- RS-232 communication
- Measuring Range : -6.00~+6.00gauss

Temperature Sensor
Thermometer Experiments

- Precision measurement using Thermistor, IC
- Designed for low electric power
- Calculation of humidity and dew point
- In the use of general-purpose ATMega8L
- RS-232 communication
- Measuring Range : -40~123.8˚C
- Minimum Resolution : 0.1˚C

Humidity Sensor
Hygrometer Experiments

- Precision measurement using Thermistor, IC
- Designed for low electric power
- Capable of relative/absolute humidity measurement
- In the use of general-purpose ATMega8L
- RS-232 communication
- Measuring Range : 0~100%
- Minimum Resolution : 0.03%

Pyroelectric Sensor
Human Body Detection Sensor

- Distance measurement using infrared rays
- Entrance & exit monitoring by human body detection
- Infrared sensing
- In the use of general-purpose ATMega8L
- RS-232 communication
- Measuring Range : 10~80cm

UBIQUITOUS SENSOR NETWORK TRAINER

ED-3160

Ultrasonic Wave Sensor

- Distance measurement using ultrasonic waves
- Temperature compensation function
- In the use of general-purpose ATMega8L
- RS-232 communication
- Measuring Range : 50~200cm

Sound Sensor

Sound Detection

- Sound detection using microphone
- Display by Level Meter
- In the use of general-purpose ATMega8L
- RS-232 communication
- Frequency : 31.5Hz~8.5kHz
- Measuring Range : 35~130dB

Pressure Sensor

Atmospheric Pressure Measurement

- Atmospheric pressure measurement using Barometer
- Contact pressure measurement using FSR(Force Sensing Resistor)
- Possible measurement of temperature and altitude
- In the use of general-purpose ATMega8L
- RS-232 communication
- Measuring Range : 300~1100mbar(Barometer), 0.5~10kgf/cm²(FSR)

GAS Sensor

Gas Measurement

- Capable of measuring Carbon Monoxide, Methane, Ethanol, Propane, Isobutane, Hydrogen
- In the use of general-purpose ATMega8L
- RS-232 communication
- Measuring Range : 500~10000ppm

RFID

RF Card Reader

- 13.56MHz RFID Reader
- Designed for low electric power
- Detection Distance : 100mm
- ISO/IEC 14443 Type A, Type B Read
- ISO 15693 Read

Sensor (Optional : 7ea)

Acceleration Sensor(2-axis)

Motion Sensing

- Measurement of 2-axis Gradient
- Measurement of 2-directional acceleration of gravity
- Useful for measuring the target's motion
- In the use of general-purpose ATMega8L
- RS-232 communication
- Measuring Range : ±25°(Gradient)
- Minimum Resolution : 0.1°

UBIQUITOUS SENSOR NETWORK TRAINER

ED-3160

Azimuth Sensor
Direction Sensing

- Electronic compass sensor
- LED Display of the North Pole(10°)
- Designed for low electric power
- In the use of general-purpose ATMega8L
- SPI communication

PH Sensor
PH Density Measurement

- Sensor connection through BNC Cable
- Liquid pH sensing using the Probe
- Designed for low electric power
- In the use of general-purpose ATMega8L
- RS-232 communication
- Measuring Range : 0~14pH

GPS Sensor
Location Detection

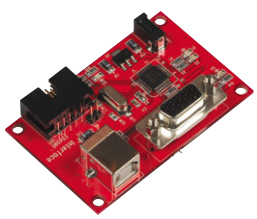
- Location detection using GPS module and antenna
- Altitude detection
- Designed for low electric power
- In the use of general-purpose ATMega8L
- RS-232 communication
- Latitude & longitude indication : 0.01 sec
- Target speed indication : 300m/sec(max)

Finger Print Sensor
Finger Print Sensing

- High speed finger print recognition using DSP
- Programmable
- Designed for low electric power
- Sensing Area 16 x 19mm
- In the use of capacitive sensor for excellent imaging quality
- 500dpi image resolution
- Low Avg EER

Relay Module

- Relay 2EA
- Buzzer 1EA
- Illumination measurement using Cds
- Temperature measurement using Thermistor
- Relay & Buzzer drive using the software



Interface Module

- Connection between Base Station and PC
- Serial communication for PC
- USB communication for PC
- USB 2.0 compatible
- Capable of using the power source of Mote or USB

PC BASED RFID TRAINER

New

ED-1450

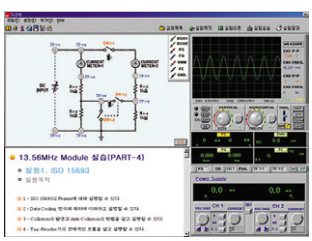
> FEATURE

- The PC based RFID Trainer ED-1450 is a complete training system of total 2 Experimental Modules for RFID basic principles and application experiments.
- Basically, ED-1450 model is designed for use by connecting to DS-1410 Docking Station(Option). PC connection through the Docking Station enables contact control on MMI(HMI) based software. It is also used together with CBIS-1400(Option) for real-time measurements on the computer screen.
- The electronic manual operable on PC comes with ED-1450 and e-learning is optimized by remote control of student's operating program and evaluation of student's online report in real time.
- Through DS-1410, it provides Variable Power Supply(VPS), Function Generator(FG), Analog Output, Digital Output needed for experiments.
- ISO/IEC 14443/15693/18000-3
- Operating Range : 125kHz(within 70mm), 13.56MHz(within 70mm)
- Anti Collision function
- Tag : 125kHz(Read Only Tag), 13.56MHz(Read / Write Tag)

> CONFIGURATION

- **ED-1450 : PC Based RFID Trainer**
  - » Number of Modules : 2ea
  - » Module Dimension : 290(W) x 210(H) x 26(D)mm
- **Required System**
  - » DS-1410 : Docking Station(Option)
    - › Please refer to page 24 on DS-1410 specifications
  - » CBIS-1400 : Computer Based Instrument System(Option)
    - › Please refer to page 22 on CBIS-1400 specifications
  - » Computer(Option)

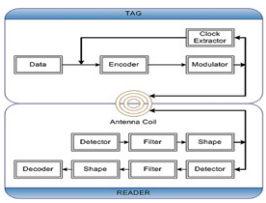
Operating Software



PC BASED RFID TRAINER

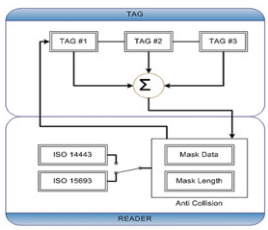
ED-1450

Experiments Module



M-51
RFID 125kHz Module

- Reader Frequency : 125kHz
- CPU : AVR(ATMega128), FPGA(EPM7064S)
- Line Coding : NRZ, RZ, Manchester, Biphase
- Modulation : ASK (Amplitude ShiftKeying)
- RS232 Serial Interface : PC communication
- Dip Switch : 16bits data
- Fixable Numeric Display(FND) : 8 bits Mode Display
- Liquid Crystal Display(LCD) : Data Frame Display



M-52
RFID 13.56MHz Module

- Reader Frequency : 13.56MHz
- CPU : AVR(ATMega128, Mega16), RFIC(TRH031M)
- Line Coding : ISO 14443A(Manchester Coding)/ISO 15693(Manchester Coding)
- Modulation : ASK(Amplitude Shift Keying)
- RS232 Serial Interface : PC communication
- Dip Switch : Tag Data, Mask Data, Mask Length
- Fixable Numeric Display(FND) : 2ea
- Liquid Crystal Display(LCD) : Data Frame Display, Tactile Switch

OS ENVIRONMENT

- Pentium IV above 1.7GHz, RAM 512M or higher
- Hard Disk Min. 500Mbyte free space
- USB 2.0 Compatible
- Windows NT4.0/2000/XP (Recommended OS : Windows XP)

ACCESSORIES

- 125kHz TAG : 5ea
- 13.56MHz TAG : 5ea
- Connection Cord : 1set
- RS232 Cable : 1ea
- Program CD : 1set
- User's Manual : 1ea
- AC Power Cord : 1ea

RFID APPLICATION TRAINER

ED-3100

> FEATURE

- F/W program practices for RFID Reader
- Various types of test point for Air-interface experiments
- Anti-collision function
- OCX Library useful for application engineers
- 13.56MHz I-CODE Type in common usage
- Capability of reading and writing data on Tag
- Mini-Plant interlocked with conveyor(management of warehouse, process, parking lot, etc.)
- Application modules for easy mounting and demounting (Management of dntrance & exit, logistics, vending machine, etc.)

> TOPICS COVERED

- Development Environment(AVR, JTAG, Compiler)
- ED-3100 Configuration and Operation
- AVR Device through sample exercises
- I-CODE1 Label IC
- SLRC400 Reader IC
- OCX(Examples)
- Unselceted Commands
- Anti-collision and Selected Commands
- Write, Selected, Addressed Commands
- Other Commands(Selected read, Halt, EAS/Quiet)

> SPECIFICATIONS

- **RFID Reader**
  - » Reader Control CPU : ATMEGA128
  - » Carrier Frequency : 13.56MHz ±1kHz
  - » Protocol : I-CODE1
  - » Reading Distance : Around 100mm
  - » Display : 2 line character LCD
  - » Input Device : Mode selection switch 4ea
  - » Interface : RS-232, RS-422
- **RFID Antenna**
  - » 2Types(PCB pattern, plant practice part)
- **RFID Tag**
  - » 13.56MHz I-CODE1 (R/W) : 10ea
- **Application Module**
  - » Warehouse management, process management, I/O expansion mode
- **Software**
  - » Electronic textbook per topic
  - » PC-based learning of theory and experiments
  - » Maximization of learning efficiency through visual support GUI

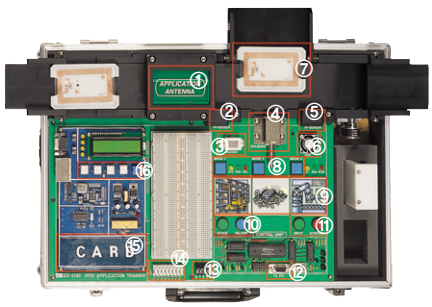
ACCESSORIES

- Guide CD (I-CODE Datasheet, API Guide, F/W Full Source, Demo Program) : 1ea
- Experimental Manual : 1ea

RFID APPLICATION TRAINER

ED-3100

Product Segments : RFID Reader B/D + 3 Types of Conveyor Belt Application Modules



1. Application-use Antenna
2. Object Detection Sensor
3. Buzzer
4. Solenoid
5. Object Detection Sensor
6. FAN
7. Card Case
8. Mode Selection Switch
9. PANEL Mode Windows
10. Warehouse Mode Switch
11. Process Mode Switch
12. Communication Port
13. Power Supply Terminal
14. I/O Output Terminal
15. RFID Antenna
16. Reader Setup Switch

Reader B/D Control Window

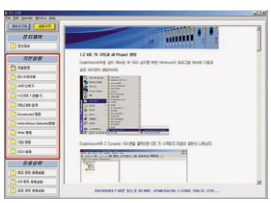
Each control command is based on Icon click, and it enables to check a protocol of data being transmitted or received

① System Initialization
② Topic Selection Button
③ Protocol Monitor Windows
④ RFID Protocol Windows
⑤ Conveyor Belt Control Windows
⑥ Antenna Conversion Switch
⑦ Buzzer Control Windows
⑧ Solenoid Control Windows
⑨ FAN Control Windows

Application Experiments Control Window

Interlocking experiments : Automatic Warehouse, I/O Mode, Process Line with conveyor line
① Topic Selection Button
② “Warehouse Management Mode” Control Windows
③ “I/O Mode Mode” Control Windows
④ “Process Management” Control Windows
⑤ Application Experiment Windows (Warehouse)

Electronic Textbook



The above Window explains how to operate AVR Compiler’s IDE within the development environment folder. Selecting each topic will retrieve files of electronic textbook and display information in needs.

New

ED-3710

RFID APPLICATION TRAINER

- F/W program practices for RFID Reader
- 13.56MHz and 900MHz in common use
- Data Read/Write to 900MHz Tag
- ED-3710 application programming (13.56MHz, 900MHz)
- Fixed Type RFID Reader

> FEATURE

900MHz RFID

- Multi Protocol RFID Reader module that meets the ISO standard and USA's EPCglobal standard
- Suitable for large-scale logistics and retail systems by the multiple tag recognition over 30 objects per second
- Supports ISO/IEC18000-6B/6C, EPC C1G1, C1Gen2 Multi-protocol
- Small, thin and low power design with the world-class MIC and TTA certified
- RF output controllable by the user(Max. +30dBm)
- Convenient host interface and firmware upgrade through serial communication
- 900MHz RFID R/W application program

13.56MHz RFID

- Supports ISO/IEC 14443 Type A, Type B and ISO/IEC 15693 standards
- Supports I-CODE and Tag-It protocol
- Low power architecture
- Internal oscillator buffer to connect 13.56 MHz quartz
- Supports SPI-compatible serial interface
- Programmable ASK modulation rate from 8% to 100%
- Programmable transmission current up to 120mA
- Multi-protocol RFID Reader function

> EXPERIMENTS

- **Part 1 : RFID Overview**
  - » RFID overview and characteristics
  - » RFID hardware and software technology
  - » RFID standardization and security
- **Part 2 : 13.56 RFID F/W Programming**
  - » Microprocessor's structure and function
  - » 8051 structure and function
  - » Usage of 8051 Development Tool
  - » LED control using uVision2
  - » LCD control using uVision2
  - » RFID Program
- **Part 3 : RFIDMaster Program**
  - » ED-3170 Equipment
  - » RFIDMaster
  - » RFIDMaster_Step 01~06 Application
- **Part 4 : 900MHz RFID**
  - » 900MHz RFID application program
  - » 900MHz RFID operation

RFID APPLICATION TRAINER

ED-3710

> APPLICATION USAGE

- Digital door-lock / building entrance
- E-cash reader
- Public transport terminals
- Handheld terminals
- On board Units
- Contactless PC terminals
- Portable or fixed type RFID Reader
- Security, logistics and factory automation

> SPECIFICATIONS

MAIN COMPONENTS

- **900MHz RFID**
  - » Frequency : [Korea] 908.5~914MHz, FHSS
    [USA] 902~928MHz, FHSS
  - » Transmitting Output : 15~30dBm(adjustable by 1 dB step)
  - » Consumption Power : 〈1.5A(Peak), 〈50mA(Standby), 〈2mA (Sleep)
  - » Protocol : ISO18000-6B, 6C
    EPCglobal Class 0+, Class 1
    EPCglobal Class 1 Generation 2
  - » Response Distance : Minimum 3 meter @ 30dBm (ISO/IEC18000-6C Tag, 2.5dBi, Antenna)
  - » Interface Host : RS232 or TTL Serial 9,600~115,200bps
  - » Antenna : MMCX Type
  - » Certification : MIC, TTA
- **13.56MHz RFID**
  - » Multi-protocol RFID Reader : TRHoM31
  - » Frequency : 13.56MHz
  - » Protocol : ISO/IEC 14443 A/B, 15693 standards
    Tag-It Protocol
  - » Modulation Type : ASK 8~100%
  - » Operating Range : ISO 14443 A/B 〈100mm,
    ISO 15693 〈150mm
  - » Supply Voltage : 2.7V~3.6V
  - » Package Size : 7.0 mm x 7.0 mm
  - » Package LQFP(32pin)
  - » Antenna : PCB Patten Antenna
  - » Control Unit : AT89C51ED2, 11.0592MHz, Built-in ISP function
  - » Communication : RS232 port. 9600Bps
  - » LED : 2ea
  - » LCD : 16 x 2 Line Text LCD(4Bit control)
  - » Power : DC +5V, 3.3V

ACCESSORIES

- AC Power Cord : 1ea
- Serial Cable : 2ea
- Program CD : 1ea
- User's Manual : 1ea

• USN / RFID System

RFID LOGISTICS AUTOMATION TRAINER

New

ED-9600S

- Industrial training system grafting RFID technology and PLC technology
- Consists of Logistics Warehouse, Material Supplier, Conveyor and Ejection Unit
- Automation control of various sensors, pneumatic elements and motors by Programmable Logic Controller
- One-touch lever type for Conveyor Unit allowing easy mount and dismount
- Multi-channel [5 channels] function mounted in RFID Reader

> SPECIFICATIONS

SUPPLY UNIT - 1EA
- **Materials Supply :** Aluminum profile structure, sensor mountable and storage of materials up to 9ea(max.)
- **Magazine :** ø16-X75 Supply Cylinder

CONVEYOR A(2EA), B(2EA), C(1EA) - 5EA
- **Urethane Belt Type**
  - » Width : 55mm
  - » Thickness : 2mm
- **Length**
  - » Conveyor A : 672mm
  - » Conveyor B : 742mm
  - » Conveyor C : 870mm
- **Conveyor Motor**
  - » ø35 DC 24V
  - » No Load, No Ratio : 6000RPM 0.025A
  - » Max Load, Ratio : 55RPM 0.09A

CONVEYOR APPLICATION KIT - 4EA
- Direction change block and stop block(mountable and removable)

CLASSIFICATION UNIT - 3EA
- Cylinder, solenoid and sensor in one unit

SOLENOID UNIT - 1EA
- Manifold type, DC 24V 5/2 Way Double Acting Solenoid Valve

STORAGE UNIT - 1EA
- Aluminum profile 20 x 20 structure(3 by 3)

STACKER CRANE - 1EA
- **X Axis**
  - » Type : Ball Screw type, Position Detection Sensor and Cable Bear
  - » LM and Motor : DC 24V, 15W, 3000RPM Decelerator 10 : 1
- **Y Axis**
  - » Type : Ball Screw type
  - » Position Detection Sensor and Cable Bear
  - » LM and Motor : DC 24V, 15W, 3000RPM Decelerator 10:1
- **Z Axis**
  - » Type : Pneumatic type, cylinder and air chuck

CONTROL UNIT - 1EA
- **CPU**
  - » Pressure : 0~10 bar, Memory : 68K bit
- **Power**
  - » Input : AC 100~230V
  - » Output : DC 5V 2A, DC 24V 0.3A

RFID LOGISTICS AUTOMATION TRAINER

ED-9600S

- **Communication Unit**
  - » Computer linked, RS232 : 2ea
- **Input**
  - » DC 24V Input 16 points sync/source : 3ea
- **Output**
  - » Output relay output 16 points : 2ea
- **Base**
  - » Can mount eight I/O modules

TOUCH PANEL - 1EA

- **Display**
  - » TFT Color LCD
- **Touch Screen :** 6.4″ 640 x 480
- **Color :** 65,536

RFID UNIT - 1EA

- **Frequency :** 13.56MHz
- **Channel :** 3CH(Max)
- **Antenna Type :** R-type Antenna

RFID CONTROLLER - 1EA

- **Characteristics**
  - » RFID Reader's communication data display
  - » Manual input of RFID Tag Data
  - » Compatible to various types of PLC
  - » Relay between RFID Reader and PLC and display functions
  - » Memory area allocation per function and per channel
  - » Connection by PLC serial and Internet
  - » Communication without configuring a separate PLC communication frame(protocol)
  - » Ethernet communication mountable without hardware modification

- **Specifications**
  - » 8 bit Microprocessor
  - » Screen size : 113 x 64mm
  - » Communication : RFID - RS232/422/485
    PLC - RS232/422/485, Ethernet(option)
    System firmware upgrade port
  - » Power : DC 24V 0.7A
  - » Power switch : ø16 Key Switch
  - » Data keyboard : Numeric input, MODE, direction key
  - » Function Key : Read, Write, Reset
  - » Display : READ mode, WRITE mode, SETUP mode
    4CH data communication display
  - » Compatible System : GLOFA, MASTER-K, Melsec-Q, SIMATIC S7-300

PNEUMATIC SERVICE UNIT - 1EA

- **Gradient adjustable type**
  - » Operating pressure : 0~10 bar, Setup pressure : 0.5~ 8.5 bar
  - » Air Filter, Pressure Adjusting Valve(with Pressure Gauge)
  - » Automatic Drain Valve mounted

WORK TABLE - 1EA

- **Dimension :** 1060(W) x 760(H) x 830(D)mm
- **Material :** Aluminum profile and MDF structure
- **Groove Space :** 25mm

ACCESSORIES

- Work Materials : ø45 x 25mm MC(9ea)
- Cable : AC Power Cord, RS232C Cable, B-Jack Cable (1set)
- User's Manual
- Pneumatic Hose

New

NETWORK TRAINING SYSTEM SERIES

ED-NET4-x

- Step by step courses on the networks theories to train the engineers
- CISCO Router based training will help obtain CCNA, CCNP, CCIE certificates
- Functions and characteristics of network system(LAN Card, Router, L2 Switching Hub, L3 Switching Hub)
- 19″ Rack type structure for effective network configuration
- Optimized learning system for the Router based on one on one training(OPTION)

Total of four steps to train the engineer to the advanced level through in-depth theories and systematic experiments on the Network System

- **Step - 1**
  - » Network Cabling : UTP Cable, fiber optic cable and phone cable
- **Step - 2**
  - » Network System Setting : Routing, switching, switch/router and wireless LAN technologies
- **Step - 3**
  - » Network Protocol Analysis : traffic, data structure capture and error packet
- **Step - 4**
  - » Network Security : Firewall, VPN, IDS

> SPECIFICATIONS

	Model	ED-NET4-A	ED-NET4-B	ED-NET4-C
General	Rated Voltage	AC 220V, 50/60Hz		
	Dimension (WxHxD)mm	700 x 1600 x 750	700 x 1900 x 750	700 x 2100 x 750
	Material	Aluminum(4 doors)		
Basic Experiment	Channel Service Unit	T1/E1, RMON / VLAN / IP Multicasting / SNMP		
		10/100 LAN 1Port, WAN 1Port		
	Router	Motorola MPC860T Power QUICC(50MHz) Processor, Flash		
		Memory 16MB, DRAM 32MB, Cisco ISO Software		
	L2 Switching Hub	10/100Mbps LAN 24Port, Optical Giga 1Port, Switching Capacity 12Gbps		
		ARM7 Processor, Flash Memory 4MB, DRAM 24MB, Packet Processing Speed 6.6Mbps, VAN 32ea		
LAN Cable System	Patch Panel Outlet	Category5 RJ-45 Type, 24Port(Front RJ-45, Back-110 Block)		
		Category5 RJ-45 Type, 24Port(Front RJ-45, Back-110 Block)		
Optical Cable System	Optical Distribution Unit	ST Type(4ea), SC Type(4ea), SC to SC 2Core Patch Code(1ea), SC to St 2Core Patch Code(1ea)		

NETWORK TRAINING SYSTEM SERIES

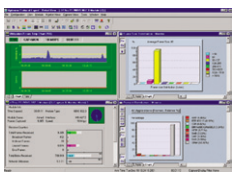
ED-NET4-x

	Model	ED-NET4-A	ED-NET4-B	ED-NET4-C
Phone Cable System	Main Telephone Box	110 Block Type(100P)		
	Medium Telephone Box	110 Block Type(50P)		
	Home Distribution Telephone Box	110 Block Type(30P)		
	Home Distribution Terminal	Outlet type 2Port(1Port data, 1Port for telephone)		
Tool Kit Box		RJ-45 Tool, 110 Punching Tool, LAN Tester(Link Runner), UTP Patch 5M ASS'Y 3ea		
Protocol Analysis		60-user license (per institute), 7-layer analysis, CISCO ISL 802.10 VLAN analysis		
		Expert function per layer		
		Alarm, Trigger, Spanning Tree, Error Statistics, Auto Save functions		
Wireless LAN System		-	IEEE802, 11b, 11Mbps	
			40/128 Bit WEP Security Wireless LAN Card(11Mbps) : 5ea	
Switch/Router(L3 Switching Hub)		-	Layer 3 switching function	
			10/100Mbps LAN 24Port, Fiber Optic Giga 2 Port expansion	
			Switching Capacity : 13Gbps, Packet Processing Speed : 6.6Mbps	
			VLAN 256ea, Mac Address 8,192ea	
Network Security Solution Training	Firewall	-	-	Hardware and software in one as consolidated (19″ Rack, 1U)
				Packet Size : 50MB SD
				Concurrent Session : Over 200,000
				Processing per second : Over 18,000 sessions
				Double Bridge and Router modes
				Bandwidth Management per HA, LB and service
				Can interact with IDS
				Hardware and software in one as consolidated (19″ Rack, 1U)
	VPN	-	-	Remote Access, xDSL, Cable Modem, LAN
				IPSec, Split, NAT, DES, 3-DES, HMAC-MD5, HMAC-SHA1
				External CA function, IKE Protocol, GUI/WEB

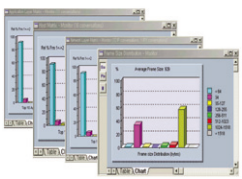
NETWORK TRAINING SYSTEM SERIES

ED-NET4-x

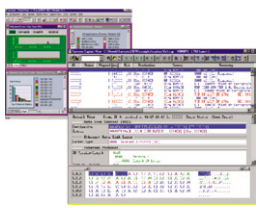
	Model	ED-NET4-A	ED-NET4-B	ED-NET4-C
Network Security Solution Training	IDS	-	-	100Mbps 2Port
				Hardware and software In one as consolidated (19″ Rack, 1U)
				OS : Linux 7.1 or above
				TCP : 65,535ea UDP : 65,535ea
				Real-time monitoring for the network traffic
				Detection and analysis of abnormal traffics



Network Monitoring



Transition of Traffic Per Layer



Cature & Decoding of Packet

Curriculum	Model	ED-NET4-A	ED-NET4-B	ED-NET4-C
Basic Experiment	Channel Service Unit	O	O	O
	Router			
	L2 Switching Hub			
LAN Cable	Patch Panel	O	O	O
	Outlet			
Fiber Optic Cable System	Fiber Optic Distribution Box	O	O	O
Phone Cable System	Main Telephone Box	O	O	O
	Medium Telephone Box			
	Home Distribution Telephone Box			
	Home Distribution Terminal			
Tool Kit Box	UTP RJ-45 Tool	O	O	O
	110 Punching Tool			
	Tester(LinkRunner)			

NETWORK TRAINING SYSTEM SERIES

ED-NET4-x

Curriculum	Model	ED-NET4-A	ED-NET4-B	ED-NET4-C
Protocol Analysis	OptiView Protocol Expert	O	O	O
Wireless LAN System	Access Point	-	O	O
	Wireless LAN Card			
Switching /Router	L3 Switching Hub	-	O	O
Network Security Saolution	Firewall(SecuiWALL)	-	-	O
	VPN(SecuiVPN)			
	IDS(Sniper)			

OPTION		
Category	Model	Description
Modular Router	ED-NET4-001	1Chassis 3Router~5Router
		1Router 3Ethernet Port
		CISCO IOS S/W command RAM 64MB, CFC 32MB
LAN Tester	ED-NET4-002	LinkRunner-kit/Network Multi-meter/IP ping test
Portable LAN Analyzer	ED-NET4-003	NetTool/Traffic verification, IP ping test, storage and report on the traffic data
Integrated Network Analyzer	ED-NET4-004	Hardware and software in one as consolidated, OptiView WorkGroup Analyzer

LAN(LOCAL AREA NETWORK) TRAINING SYSTEM

ED-NET-3

- Panel type structure for good grasp of entire network configuration
- Learning about the functions and characteristics of basic network equipments such as NIC, HUB, Router and DSU, plus installation and maintenance
- Interlocking experiments with Internet for clear understanding a real network
- Capable of conneting to the open network on campus

> EXPERIMENTS

- Understanding of communication theory / protocol
- LAN Card setup practice
- Field practices for wire arrangement among the LAN products
- Concept of HUB setup practice
- DSU function, Line Path characteristics and use of Interface
- Fuction of Router and interface setup
- Opration of the program for packet Analysis
- Network design and programming
- Interlocking functionality for ADSL Training Sysem(ED-NET2 model)

> LEARNING OBJECTIVES

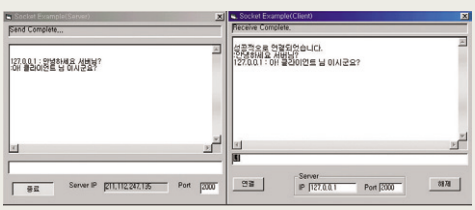
Covering experiment topics for a course of 8 weeks, each system set starts from basic theories and understanding of the essential equipments with real field installation, and ends with use of the installd network and identification of minitoring tasks. Each chapter of the Experimental Manual consists of theory(2 hours) and practice(2 hours)

LAN(LOCAL AREA NETWORK) TRAINING SYSTEM

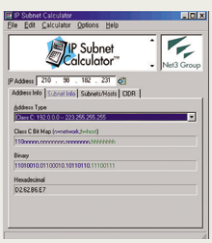
ED-NET-3

> SPECIFICATIONS

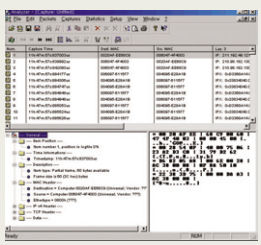
Classified		NETWORK-A	NETWORK-B
ROUTER A	10Base-T Ethernet port 1ea, WAN port 2ea		10 Base-T Ethernet port 1ea, WAN port 1ea
	Routing Protocol	RIP, OSPF	
	Service	Frame Relay, X.25, HDLC and PPP	
	Working Board	10Base-T, Console, WAN0, WAN1 port	10Base-T, Console, WAN0 port
CSU A	Standard	IEEE802.3 10Base-T	
	Transmission Speed	10Mbps	10/100Mbps
	Transmission Mode	Full/Half duplex	
	Port Number	RJ-45 Port 8ea	
	Working Board	RJ-45 Port 8ea	
Data Service Unit A	Transmission Speed	Sync/Async 2.4/4.8/9.6/19.2/56/64 Kbps	
	Working Board	RS232, V.35, RJ-45 port	
	Self-diagnosis by LLB, DLB, RDLB Test		
	Sync/Async DTE		
	Buzzer and LED alert		
General Specification	Input Power	AC 220V, 50/60Hz	
	Dimension	510(W) x 405(H) x 415(D)mm	
	Weight	16.3kg	14.9kg
Other Equipment			
Network Interface Card(5ea)	IEEE 802.3, 10/100Base-TX Fast Ethernet		
	Automatic detection for 10/100 Mbps transmission speed		
	32bit PCI Bus		
Line Tester	Checks an error for 2,3 or 4-pair voice and the data channel's wires		
	LED indication for Short, Open, Reversal or Miswire		
UTP Cable	4Pair x 24Awg, 300 meter		
RJ45 Jack &Tool	RJ 45 Jack and UTP cable tool for connection		
Others	Experimental Manual		



Example of WINSOCK Program



Packet Analyzer Program



Calculator Subnet

ADSL(ASYMMETRIC DIGITAL SUBSCRIBER LINE) TRAINING SYSTEM

ED-NET-2

- Wide learning coverage from the basic theories of ADSL and high-speed telecommunication to field wire arrangement
- Study of functions, characteristics, installation, repair and maintenance of basic ADSL components such as Telephone Exchange, Splitter, DSLAM, ADSL Modem, HUB and LAN Card
- Network structure through interworking experiments with Internet and capability of Internet usage and simple programming
- Capable of interworking experiments with ED-NET-3(LAN Training System)

> EXPERIMENTS

- Overview of ADSL and introduction to xDSL
- LAN Card installation
- Field practices of wire arrangement among ADSL products
- Concept of HUB and HUB setup practice
- Function of Splitter and connection with telephone
- Function of DSLAM and Interface setup
- Program operation for Packet Analysis
- Network design and programming
- Interworking functionality for LAN Training System

> LEARNING OBJECTIVES

Covering experiment topics for a course of 8 weeks, each system set starts from basic theories and understanding of the essential equipments with real field installation, and ends with use of the installd network and identification of minitoring tasks. Each chapter of the Experimental Manual consists of theory(2 hours) and practice(2 hours)

ADSL(ASYMMETRIC DIGITAL SUBSCRIBER LINE) TRANING SYSTEM

ED-NET-2

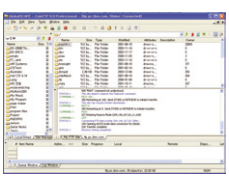
> SPECIFICATIONS

ADSL Modem		
General Characteristics	ADSL Modem supporting the Ethernet 10Base- T interface	
	Data Transmission Speed	Download : Max. 8Mbps
		Upload : Min. 1Mbps
	Communication Distance : 5km	
	Rate Adaptive in 32kbps Steps	
	Bridge/Router configurable	
	NAT function applicable	
	Environment configuration through Web	
Standards	10Base-T(IEEE 802.3) - ITU-T G992.1(G.dmt) ADSL Standard - ITU-T G992.2(G.Lite) ADSL Standard	
	IEEE Standard : IEEE 802.3 10Base-T	
Interface	Ethernet	10 Base-T(IEEE802.3)
	ADSL Line	Line Code : DMT
		Downstream : 32kbps/8Mbps
		Upstream : 32kbps/1024Kbps
		Connector : RJ-11
	Console	Web Console
DSLAM		
General	ADSL	ANSI T1.413
		Upstream : Up to 1Mbps
		Downstream : Up to 8Mbps
		Maximum Range : 5km
Standard	ADSL Standard	ANSI T1.413
		ITU-T G.992.1 (G.dmt)
	IEEE Standard	IEEE 802.3 10 Base-T
		IEEE 802.3u 100 Base-Tx
	IEFT Standard	RFC 1058 RIP v1
		RFC 1723 RIP v2, etc.
	Management Standard : RFC 1157 SNMP v1	
Interface	ADSL Line	Line Code : DMT
		Upstream : Up to 1Mbps
		Downstream : Up to 8Mbps
		Connector Loops : 1 Pair(2-wire)
	Up-Link Interface : Fast Ethernet	
	Connector-Front : 3 Port of RJ-45(Ethernet, Console, RMCS)	

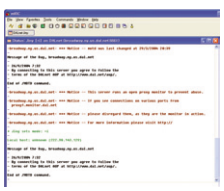
ADSL(ASYMMETRIC DIGITAL SUBSCRIBER LINE) TRANING SYSTEM

ED-NET-2

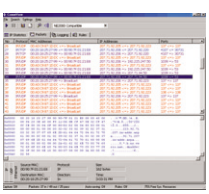
Packet Centralizer(HUB)	
Standard	IEEE802.3 10/100Base TX
Speed	10 Mbps
No. of Port	RJ-45 port 8ea
Splitter	
No. of Port	24 Port(50-pin Flat Cable)
Telephone Exchange	
Basic (Max.) Capacity	3 Central Office Lines, 8 Extension Lines
Capable of Central Office / Extension Line Reservation, Wakeup Time Registration, Conference call, Proxy Answering, Music On-hold, Speaker Phone, Password Registration	
General Characteristics	
Power Source	AC 220V, 50/60Hz
Dimension	510(W) x 420(D) x 400(H)mm
Weight	26kg(Central Office), 18kg(Customer premise)
Auxiliary Devices	
Key Phone	Incoming Call Lamp, Multi-purpose Buttons, Up/Down Key
Telephone	Redialing, Tone Control, Pause and other functions
Network Interface Card	IEEE 802.3, 10/100Base-T Fast Ethernet
	Automatic detection capability of the transmission speed
	32bit PCI Bus
Line Tester	To check a connection error in 2, 3 or 4-pair Cable
UTP Cable	4-pairx24Awg.
RJ-11, RJ-45 Jack and Tools	
Connector	Needed for cable connection experiments
Others	User's Manual



FTP Server



IRC Program



Packet Analyzer

Subnet Calculator

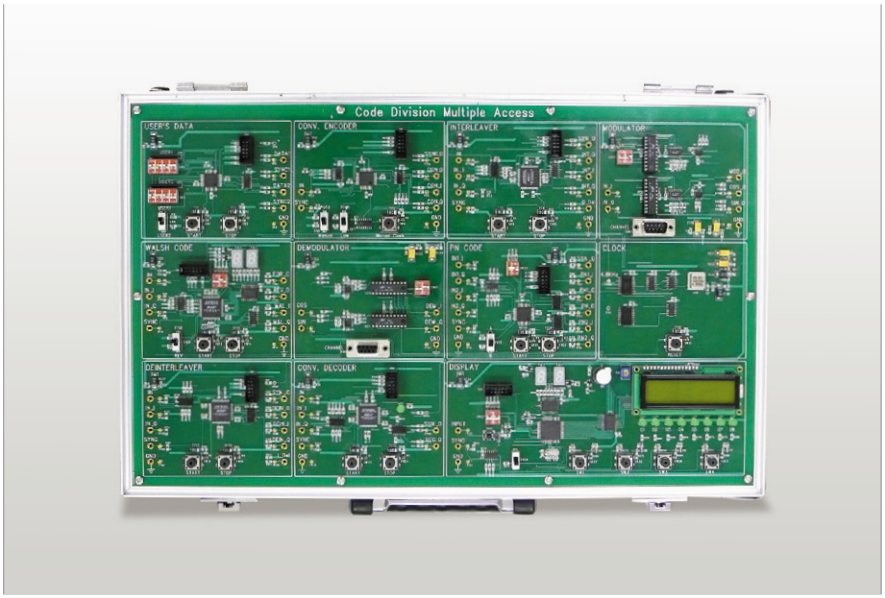
New

CDMA TRAINING KIT

ED-2945

- Rich experiments devoted to IS95 standard
- Easy-to-follow structure as main functions are itemized in modules

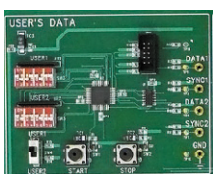
« USER'S DATA
« CONV. ENCODER
« INTERLEAVER
« MODULATOR
« CLOCK
« WALSH CODE
« DEMODULATOR
« DEINTERLEAVER
« PN CODE
« CON. DECODER
« DISPLAY



> EXPERIMENTS

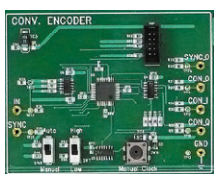
- CDMA Overview (IS95A)
- CDMA Trainer
- CDMA Transmitter
  - » Forward Channel
    - › USER'S Data
    - › Convolution Encoder
    - › Block Interleaver
    - › PN Code
    - › Walsh Code
    - › Modulator
  - » Forward Channel
    - › PN Code
    - › Walsh Code
- CDMA Receiver
  - » Demodulator
  - » Block Interleaver
  - » Convolution Decoder
  - » Display
- Compiler setup and programming
- Firmware experiments
- Overall experiments

Experiments Module



USER'S DATA

Generates the two signals in 8-bit NRZ(Ch1, Ch2)

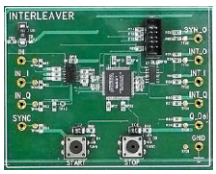


CONV. ENCODER

It is a type of codes that boast for excellent error correction efficiency in the CDMA system and uses for the Channel Code. This module codes a previously stored data with regular rules using the memory elements. Two types of modes : Manual Mode and Auto Mode

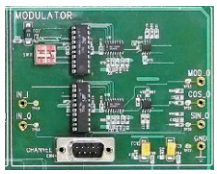
CDMA TRAINING KIT

ED-2945



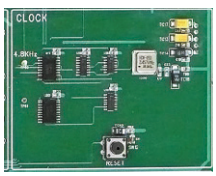
INTERLEAVER

Prevents Burst Error by dispersing the symbol signal column randomly at the time axis through Interleaver without having to send continuous symbol signal for specific data. This module helps understand a principle on how to prevent Such Burst Error.



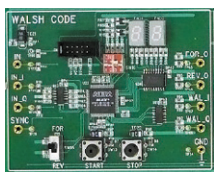
MODULATOR

Experiments on QPSK modulation which is used for channel modulation in the mobile system



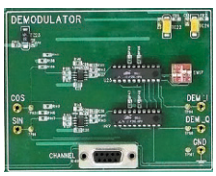
CLOCK

Generates CLOCK which is a standard of CDMA modules



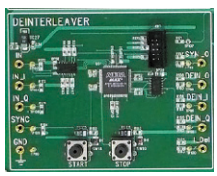
WALSH CODE

Generates Walsh Code being used as a cross signal in IS95A CDMA. In forward direction, it generates 16x16 Walsh Code, whereas it is used as a cross modulation code in reverse direction



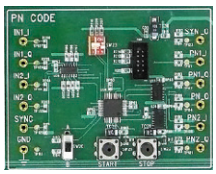
DEMODULATOR

Experiments on QPSK demodulation for channel demodulation in the mobile system



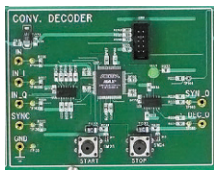
DEINTERLEAVER

Demodulates INTERLEAVER SIGNAL at transmission



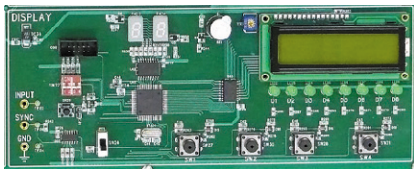
PN CODE

Experiments on Maximum Length, Balance Property, Run Property, Shift and Add Property, Autocorrelation Property which are the characteristics of PN Code



CONV. DECODER

At reception, it recovers the transmitted data which was coded in Trellis at transmission



DISPLAY

Displays received information on LED, FND and LCD

PC BASED DIGITAL COMMUNICATION TRAINER

New

ED-1440

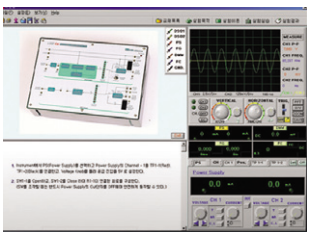
> FEATURE

- The PC Based Digital Communication Trainer ED-1440 is a complete training system of total 16 experimental modules for identifying digital communication theories and principles. The learning objective is to acquire general theories of digital pulse modulation and demodulation and form a foundation applicable to real communication Systems.
- Basically, ED-1440 is designed for use by connecting to DS-1410 Docking Station. PC connection through the Docking Station enables contact control on MMI(HMI) based software. It is also used together with CBIS-1400 for real-time measurements on the computer screen.
- The Electronic Manual operable on PC comes with ED-1440 and e-learning is optimized by remote control of student's operating program and evaluation of student's online peport in real time.
- Through DS-1410, it provides Variable Power Supply(VPS), Function Generator(FG), Analog Output, Digital Output needed for experiments.

> CONFIGURATION

- **ED-1440 : PC Based Digital Communication Trainer**
  - » Number of Modules : 16ea
  - » Size of modules(each) : 290(W) x 210(H) x 26(D)mm
  - » Module Storage Box(2ea) : 596(W) x 318(H) x 255(D)mm
- **Required System**
  - » DS-1410 : Docking Station(Option)
    - › Please refer to page 24 on DS-1410 specifications
  - » CBIS-1400 : Computer Based Instrument System(Option)
    - › Please refer to page 22 on CBIS-1400 specifications
  - » Computer(Option)

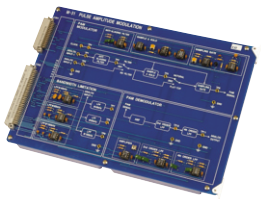
Operating Software



PC BASED DIGITAL COMMUNICATION TRAINER

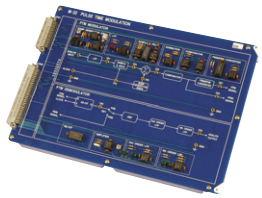
ED-1440

Experiments Module



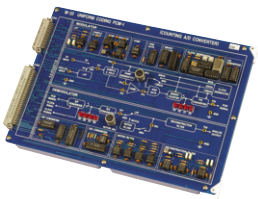
M-31 PAM

- To understand sampling PAM (Natural, Flat-top) signal generation
- To explain an effect of sampling signal frequency at the time domain upon PAM signal



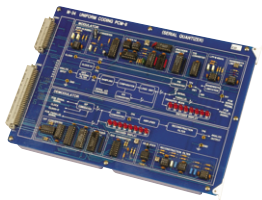
M-32 PTM

- To identify PTM(Pulse Time Modulation) signal generation
- To understand PTM signal characteristics at the time domain
- To grasp relationship between PWM and PPM Signals



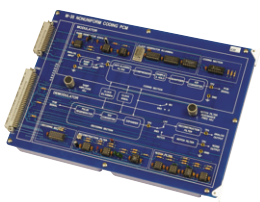
M-33 UNIFORM CODING PCM-I (COUNTING A/D CONVERSION)

- To understand A/D and D/A conversion
- To learn methods of counter-type A/D conversion and parallel-type D/A conversion
- To illustrate an effect of quantizing intervals at the time domain upon the quantization noise



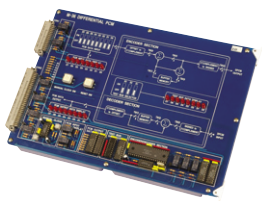
M-34 UNIFORM CODING PCM-II (SERIAL A/D CONVERSION)

- To learn the principles of Parallel A/D Conversion and the transmission methods of PCM signal
- To illustrate the effect of interference among adjacent symbols caused by the bandwidth limitation in the PCM signal transmission



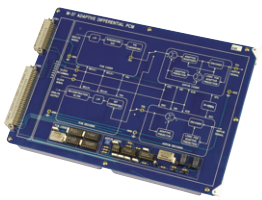
M-35 NONUNIFORM CODING PCM

- To differentiate the companding characteristics curve of μ- and A-law
- To understand the companding effect upon the Demodulation signal
- To grasp quantization noise's effect associated with amplitude variation of an analog input signal



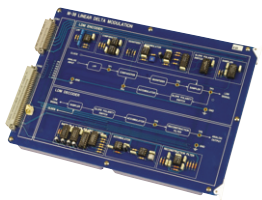
M-36 DPCM

- To familiarize the DPCM signal generation and message signal's demodulation methods
- To understand offset binary, two's complement, encoding binary code and their relationship
- To demonstrate the sequence of DPCM Encoder and Decoder



M-37 ADPCM

- To be acquainted with PCM Codec operation and timing
- To demonstrate ADPCM operation principles and its merit
- To understand the timing of ADPCM Transcoder
- To identify an effect of the message signal's amplitude upon the quantization noise

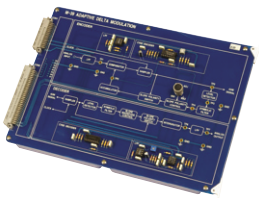


M-38 LDM

- To familiarize the LDM signal generation and message signal's demodulation methods
- To understand Slope Overload Noise generated in the ΔM system and the form of Granular Noise

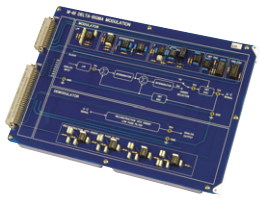
PC BASED DIGITAL COMMUNICATION TRAINER

ED-1440



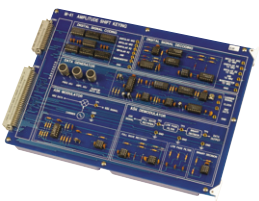
M-39 ADM

- To illustrate the ADM signal generation and message signal's demodulation methods
- To learn methods of Slope Overload Noise prevention in the CVSD modulation system



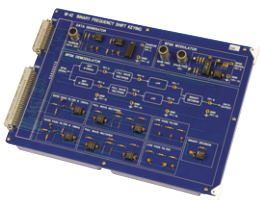
M-40 Δ-∑

- To learn the principles of Δ-Σ modulation and the methods of S/N ratio improvement
- To illustrate the effect of oversampling and noise formation upon the S/N ratio at the state of Δ-Σ modulation



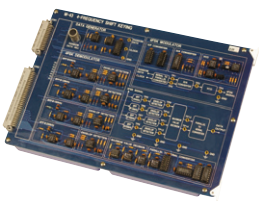
M-41 ASK

- To learn the basic principle and elements of amplitude-shift keying
- To understand the characteristics of ASK and required bandwidth at the frequency domain and time domain



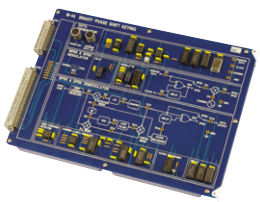
M-42 BFSK

- To learn basic principle and elements of frequency-shift keying
- To understand characteristics of BFSK and required bandwidth at the frequency domain and time domain



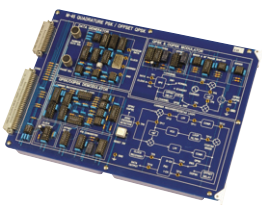
M-43 4-FSK

- To learn the category of multiple modulation methods and the basic principles and elements of 4-FSK
- To illustrate the characteristics of 4-FSK and required bandwidth at the frequency domain and time domain



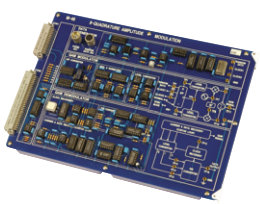
M-44 BPSK/DPSK

- To learn basic principles and elements of Binary Phase-shift keying
- To understand the frequency domain and time domain characteristics of BPSK signal
- To be acquainted with the carrier needed for synchronous demodulators and clock recovery action
- To learn differential phase-shift keying
- To differentiate between BPSK and DPSK and grasp their strength and weakness



M-45 QPSK/OQPSK

- To familiarize the basic principles and elements of QPSK and OQPSK
- To grasp the difference between QPSK and OQPSK



M-46 8-QAM

- To familiarize basic principles and elements of QAM
- To explain 8-QMA modulation and demodulation elements and principles of operation
- To understand characteristics of QAM and its application cases

OS ENVIRONMENT

- Pentium IV above 1.7GHz, RAM 512M or higher
- Hard Disk Min. 500Mbyte Free Space
- USB 2.0 Compatible
- Windows NT4.0/2000/XP (Recommended OS : Windows XP)

ACCESSORIES

- Connection Cord : 1set
- User's Manual : 1ea
- Program CD : 1set
- AC Power Cord : 1ea

PC BASED ANALOG COMMUNICATION TRAINER

New

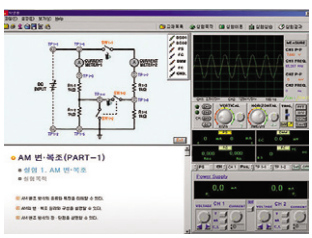
ED-1460

- Interlocking system package with CBIS-1400 and DS-1410 Models (Options)
- Experiments on a measurable low frequency bandwidth
- Realistic experiments on modulation and demodulation
- Verification of the output waveform on PC engaged with CBIS-1400 Model
- Easy operation for checking each signal waveform (standard waveforms provided)
- AM(Amplitude Modulation), FM(Frequency Modulation), PLL(Phase Locked Loop), FDM(Frequency Division Multiplex), TDM(Time Division Multiplex)

> CONFIGURATION

- **ED-1460 : PC Based Analog Communication Trainer**
  - » Number of Modules : 5ea
  - » Size of modules : 290(W) x 210(H) x 26(D)mm
  - » Module Storage Box(1ea) : 596(W) x 318(H) x 255(D)mm
- **Required System**
  - » DS-1410 : Docking Station(Option)
    - › Please refer to page 24 on DS-1410 Specifications
  - » CBIS-1400 : Computer Based Instrument System(Option)
    - › Please refer to page 22 on CBIS-1400 Specifications
  - » Computer(Option)

Operating Software



PC BASED ANALOG COMMUNICATION TRAINER

ED-1460

Experiments Module

M-61 AM

- To understand types and characteristics of AM modulation
- To illustrate AM modulation/demodulation
- To explain strength and weakness of AM modulation method

M-62 FM

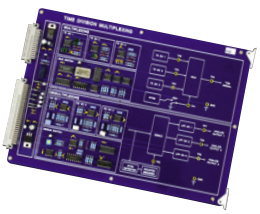
- To understand types and characteristics of FM modulation
- To illustrate the principles and structure of FM modulation and demodulation
- To explain the strength and weakness of FM modulation method
- To familiarize the strength and weakness of FM modulation and AM modulation

M-63 PLL

- To understand principles and characteristics of PLL
- To illustrate the use of PLL

M-64 FDM

- To understand the definition of Multiplex and Demultiplex
- To illustrate the principles and applications of Frequency Division Multiplex / Demultiplex
- To familiarize strength and weakness of Frequency Division Multiplex



M-65 TDM

- To understand the definition of Multiplex and Demultiplex
- To illustrate the principles and applications of Time Division Multiplex/Demultiplex
- To familiarize strength and weakness of Time Division Multiplex

OS ENVIRONMENT

- Pentium IV above 1.7GHz, RAM 512M or higher
- Hard Disk Min. 500Mbyte free space
- USB 2.0 Compatible
- Windows NT4.0/2000/XP(Recommended OS : Windows XP)

ACCESSORIES

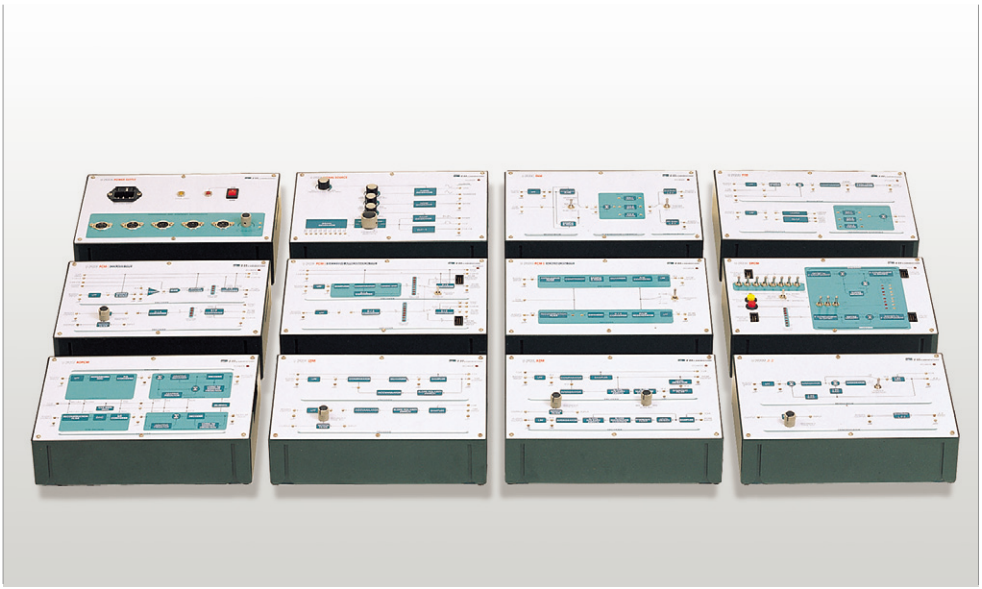
- Connection Cord : 1set
- AC Power Cord : 1ea
- Program CD : 1set
- User's Manual : 1ea

• Communication

PULSE/DIGITAL COMMUNICATION TRAINER

ED-2920

• Modularized by each communicarion type
• PAM, PTM, PCM, DPCM, ADPCM, LDM, ADM, Delta-sigma
• No need to have additional generators (built-in power supply and signal source)
• Can display the test point and measure signals using an oscilloscope



> EXPERIMENTS

- **PAM**
  - » To Understand PAM Signal Generation Which Makes an Example of Natural and Flat-Top
  - » To Know the Impact of Sampling Signal Frequency on PAM Signal At the Time Domain
- **PTM**
  - » To Understand PTM (Pulse Time Modulation) Signal Generation Methods
  - » To Understand PTM Signal Characteristics at the Time Domain
  - » To Understand the Relationship Between PWM Signal and PPM Signal
- **PCM I**
  - » To Understand A/D and D/A Conversion Processes
  - » To Understand the cCounter-type A/D Conversion System
  - » To Understand the Parallel-type D/A Conversion System
- **PCM II**
  - » To Understand the Successive Approximation-type A/D Conversion System
  - » To Understand PCM Signal Transmission Methods
- **PCM III**
  - » To Understand the μ-law and μ-law Companding Characteristic Curves
  - » To Understand the Influence of Companding on Demodulation Signal
- **DPCM**
  - » To Know the Methods of DPCM Signal Generation and Message Signal Demodulation
  - » To Know the Offset Binary Code, 2's Complement Code and Signed Binary Code
- **ADPCM**
  - » To Know the Relationship Between PCM CODEC's Operation Principle and Its Timing
  - » To Know the Relationship Between ADPCM System's Operation Principle and ADPCM Transcoder's Timing Diagram
- **LDM**
  - » To Know LDM Signal Generation and Message Signal Demodulation Methods
  - » To Know the Shapes of Slope Overload Noise and Granular Noise Generated in ΔM System
- **ADM**
  - » To Know ADM Signal Generation and Message Signal Demodulation Methods
  - » To Know the Methods of Oblique Overload Noise Prevention in CVSD Demodulation System
- **Δ-Σ**
  - » To Know Δ-Σ Demodulation Principles and S/N Improvement Methods
  - » To Know the Impact of Oversampling and Noise Shaping On the S/N Ratio at Δ-ΣEemodulation

ACCESSORIES

- Power cable : 5ea
- AC Power Cord : 1ea
- Connection Cord : 1ea
- Experimental Manual : 1ea

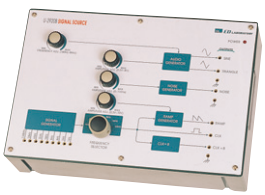
PULSE / DIGITAL COMMUNICATION TRAINER

ED-2920

Experiments Module

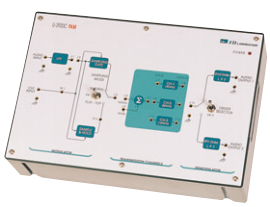
ED-2920A
POWER

- Input Voltage : AC220V, 50/60Hz
- Output Voltage : DC ±15V, ±5V / 500mA (Overcurrent Protection)
- ±5 Variable overload protection circuit(built-in)



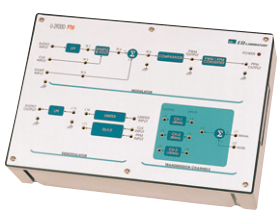
ED-2920B
SIGNAL OUTPUT

- Sinusoidal/Triangular Wave : 200Hz~8kHz, 0.5V~8V
- Ramp Wave : 1, 2, 4, 8, 16, 32kHz, Output 500mV~10Vp-p
- Pulse Wave : 1, 2, 4, 8, 16, 32, 64, 128kHz, 2.08MHz, CLK x 8, Output +5Vp-p
- Noise Generator : 200mV~2Vp-p



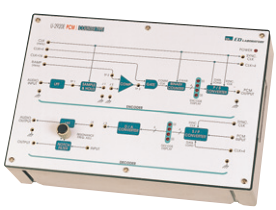
ED-2920C
PAM(Pulse Amplitude Modulation)

- Natural & Sample-and-hold
- 2nd Order & 4th Order Low Pass Filter(fc = 3.4kHz)
- Channel Bandwidth : 40kHz, 80kHz, 160kHz



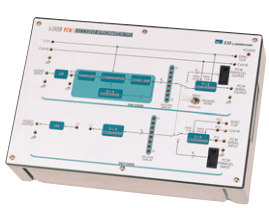
ED-2920D
PAM(Pulse Time Modulation)

- PWM modulation/demodulation
- PTM modulation/demodulation
- Channel Bandwidth : 40kHz, 80kHz, 160kHz



ED-2920E
PCM(Counter-type)

- 4-Bit Counter A/D Converter
- 4-Bit Parallel D/A Converter
- 4-Bit Serial Transfer Mode
- Notch Filter : 300Hz~3.4kHz

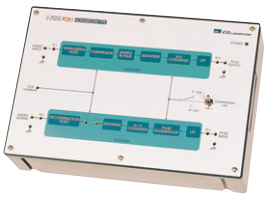


ED-2920F
PCM Ⅱ (Successive Approximation-type)

- 8-Bits Successive Approximation A/D Converter
- 8-Bits Parallel D/A Converter
- 8-Bits Parallel/Serial Transfer Mode
- 8-Bits Encode/Decode Display
- Low Pass Filter(fc = 3.4kHz)

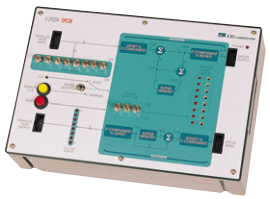
PULSE / DIGITAL COMMUNICATION TRAINER

ED-2920



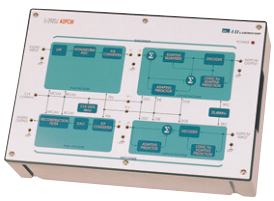
ED-2920G
PCM Ⅲ (Non-Uniform Type)

- 8-Bit Nonuniform A/D Converter
- 8-Bit Parallel D/A Converter
- A-Law/μ-Law Companding
- Low Pass Filter(fc = 3.4kHz)



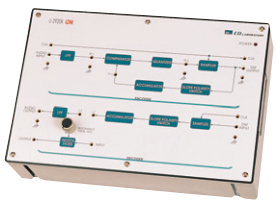
ED-2920H
DPCM(Differential PCM)

- 8-Bit Offset-to-2's Complement Code Conversion
- 8-Bit 2's Complement-to-Signed Code Conversion
- Auto/manual 8-Bit data inputs
- Bus data indication
- Bus data display



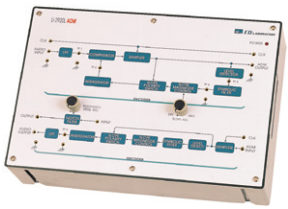
ED-2920J
ADPCM(Adaptive Differential PCM)

- Signal Frequency : 200Hz~3400Hz
- A-law PCM Codec / ADPCM Transcoder
- Short-frame timing PCM Codec / ADPCM Transcoder
- 64kbps transcoding rate ADPCM Transcoder
- Master Clock Frequency : 2.048MHz
- Frame Synchronous Frequency : 8kHz



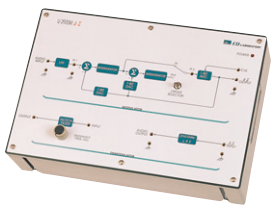
ED-2920K
LDM(Linear Delta Modulation)

- Staircase Approximation Delta Modulation
- Sampling Clock Rate : 8kHz~64kHz
- 4-Bit D/A Converter
- Sampling Clock Rate 8kHz~64kHz
- Low Pass Filter : fc = 3.4kHz
- Notch Filter : 300Hz ~ 3.4kHz



ED-2920L
ADM(Adaptive Delta Modulation)

- CVSD Delta Modulation
- Input Signal Range : ±5Vp-p
- 3-Bit Algorithm
- Sampling Clock Rate : 8kHz~64kHz
- Slope Magnitude Adjustment
- Notch Filter : 300Hz~3.4kHz



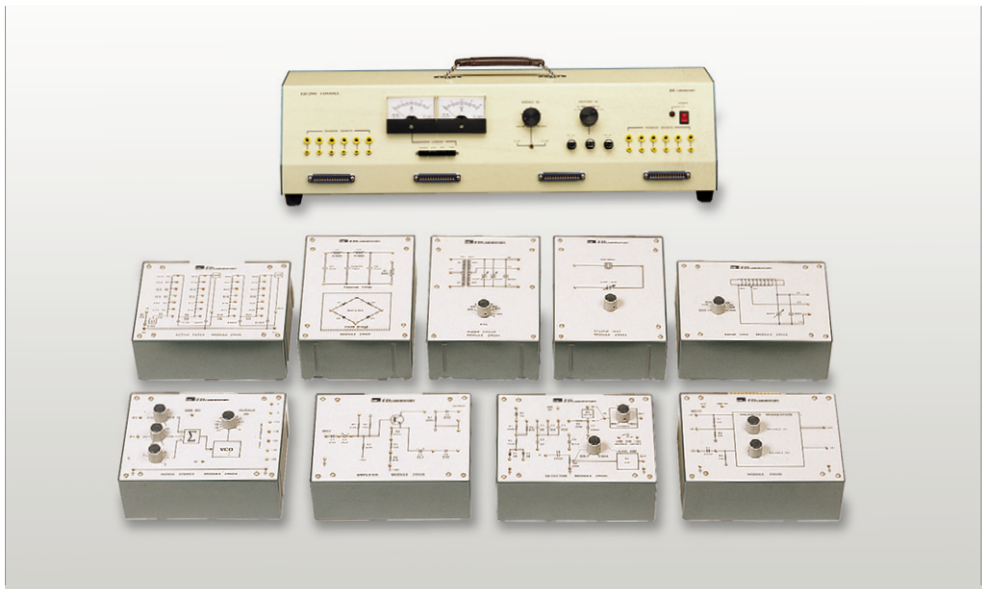
ED-2920M
Δ-∑(Delta-Sigma)

- First/Second Noise Shaping
- First/Second Order Integrator
- Over-sampling clock rate : 8kHz~64kHz
- 8th-order Butterworth LPF : fc = 3.4kHz
- Notch Filter : 300Hz~3.4kHz

ELECTRONIC COMMUNICATION TRAINER

ED-2950

- 10 experimental modules with a mainframe console
- Basic concepts on the communication systems
- Experiments on the broadcast frequency band tuning
- Generation of AM and FM waves and detection theory



> EXPERIMENTAL MODULES (10EA)

MODULE	DESCRIPTION	Q'ty
2950A	Signal Source : Sum.-Amp, VCO Attenuator (36dB, 6step)	1ea
2950B	Amplifier and Coupling	1ea
2950C	Detector : AGC, Delay DC & AC Amp	1ea
2950D	Balance Modulation	1ea
2950E	Active Filter	1ea

MODULE	DESCRIPTION	Q'ty
2950F	Passive Filter & Ring Bridge	1ea
2950H	Variable Tune Unit	2ea
2950J	Crystal Tune Unit	1ea
2950K	Aerial Tune Unit	1ea

> SPECIFICATIONS

CONSOLE (MAIN FRAME) ED-2900(P)

- **DC Output(Regulated) :** 0~20V (3A), ±15V (1A), +5V (2A)
  (Unregulated) : +50V (0.5A)
- **AC Output :** Selectable : 5/10/15/20V, Fixed : 20V(0.5A)
- **Indicator :** Voltmeter(4 ranges), Current Meter
- **Module Connection Capacity :** 4 Modules
- **Input Voltage :** AC 220V, 50/60Hz
- **Dimension :** 710(W) x 190(H) x 195(D)mm
- **Weight :** 12.7kg

GENERAL CHARACTERISTICS

- **Module Dimension :** 166(W) x 65(H) x 250(D)mm
- **System Weight :** 10kg

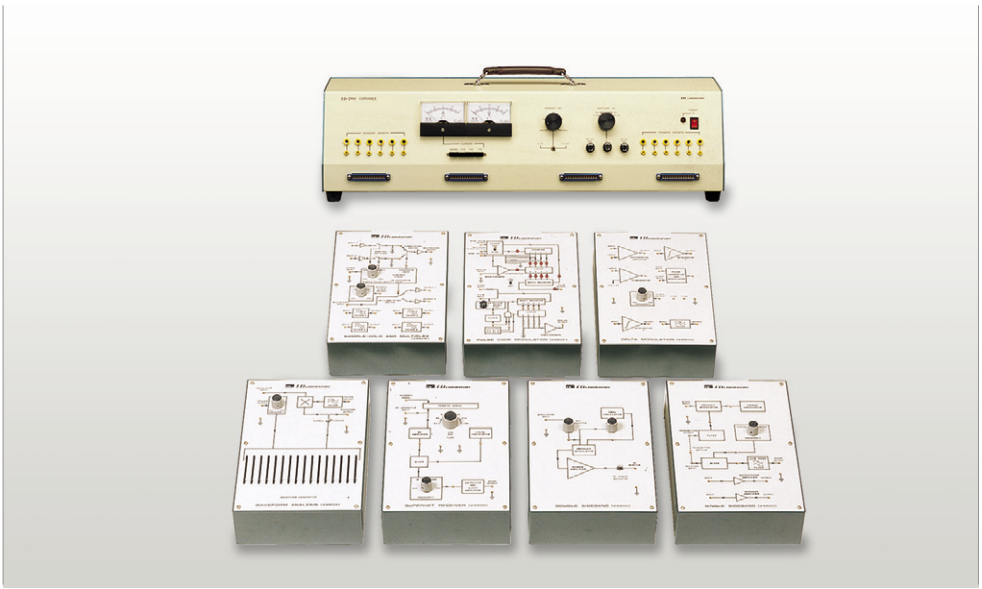
ACCESSORIES

- Connection Cord(ø2 plug) : 1set
- AC Power Cord : 1ea
- Operating Manual : 1ea
- Experimental Manual : 1ea

TELECOMMUNICATION TRAINER

ED-2960

- 7 experimental modules with a mainframe console
- Harmonic Analysis and Superheterodyne Receiver experiments
- PCM(TDM), Sample Hold, and Delta Modulation experiments



> EXPERIMENTS

- Harmonic Analysis of Square Wave
- Harmonic Analysis of Modulated Wave Forms
- Superheterodyne Receivers
- Amplitude Modulation With or Without Carrier Suppression
- Single Sideband Modulation
- Sample and Hold
- Aliasing and Multiplex Signalling
- Pulse Code Modulation
- Noise in PCM Systems
- Delta and Delta-Sigma Modulation

> EXPERIMENTAL MODULES (7EA)

MODULE	DESCRIPTION	Q'ty
2960A	Waveform Generator : Frequency : 50~250Hz Ext. Osc. Input : 5Vp-p	1ea
2960B	Superhet Receiver : RF Amp(600~1600kHz) IF Amp(455kHz) L-Osc, Mixer, Det.	1ea
2960C	DSB Transmitter : Mod.(CF : 1MHz) RF Outt(600mW)	1ea
2960D	Single Sideband : SSB Mod. SSB De-Mod.(86kHz~104kHz)	1ea
2960E	Sample Hold & Mux : Sample Hold, Time Distributer Multiplexer, CH-Filter	1ea
2960F	Pulse Code Mod : Analog CKT Pulse Code & Modulation	1ea
2960G	Delta Mod : Differential-Amp, Integrator, Clock & Pulse Generator Comparator, LPF	1ea

> SPECIFICATIONS

CONSOLE (MAIN FRAME) ED-2900(P)

- **DC Output(Regulated) :** 0~20V(3A), ±15V(1A), +5V(2A)
  (Unregulated) : +50V(0.5A)
- **AC Output :** Selectable : 5/10/15/20V, Fixed : 20V(0.5A)
- **Indicator :** Voltmeter (4 ranges), Current Meter
- **Module Connection Capacity :** 4 modules
- **Input Voltage :** AC 220V, 50/60Hz
- **Dimension :** 710(W) x 190(H) x 195(D)mm
- **Weight :** 12.7kg

GENERAL CHARACTERISTICS

- **Module Dimension :** 166(W) x 65(H) x 125(D)mm
- **System Weight :** 11kg

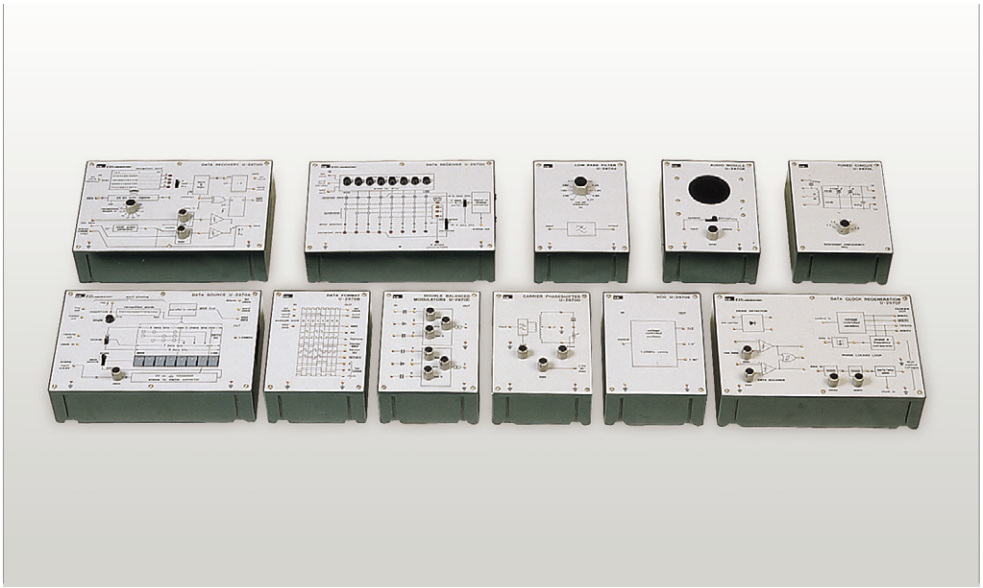
ACCESSORIES

- Connection Cord(ø2 plug) : 1set
- AC Power Cord : 1ea
- Operating Manual : 1ea
- Experimental Manual : 1ea

DIGITAL COMMUNICATION TRAINER

ED-2970

- Modularized by the function of digital communication circuits
- FSK, ASK, PSK, QPSK and digital communication principles
- 12 types of modules including a power supply unit



> EXPERIMENTS

- Demodulation Method
- Bit Clock Recovery
- Bit Recovery
- Word Clock Recovery
- Serial to Parallel Conversion
- Generation and Detection of Parity
- Hamming Code Generation
- Sampling of Analog Signals
- Analog to Digital Conversion
- Parallel to Serial Conversion
- Carrier Modulation
- FSK, ASK, PSK and QPSK
- Data Formats (Unipolar, NRZ & RZ)
- Manchester, Ternary, 2-Line Bipolar

> EXPERIMENTAL MODULES (15EA)

MODULE	DESCRIPTION	Q'ty
U-2970A	DATA Source	1ea
U-2970B	DATA Format	1ea
U-2970C	Double Balance Modulation	3ea
U-2970D	Carrier Phase Shifter	1ea
U-2970E	Voltage Controlled Oscillator	2ea
U-2970F	DATA Clock Regeneration	1ea
U-2970G	DATA Recovery	1ea
U-2970H	DATA Receiver	1ea
U-2970J	Low Pass Filter	1ea
U-2970K	Audio Module	1ea
U-2970L	Tuned Circuit	1ea
U-2970P	Power Supply	1ea

> SPECIFICATIONS

GENERAL CHARACTERISTICS

- **DC Output :** +5V, ±15V(U-2970P)
- **Input Voltage :** AC 220V, 50/60Hz
- **System Case :** 710(W) x 200(H) x 426(D)mm
- **System Weight :** 19.4Kg
- **Modules :** 250(W) x 65(H) x 166(D)mm (2970 A, F, G, H modules)
  125(W) x 65(H) x 166(D)mm
  (2970 B, C, D, E, J, K, L modules)

ACCESSORIES

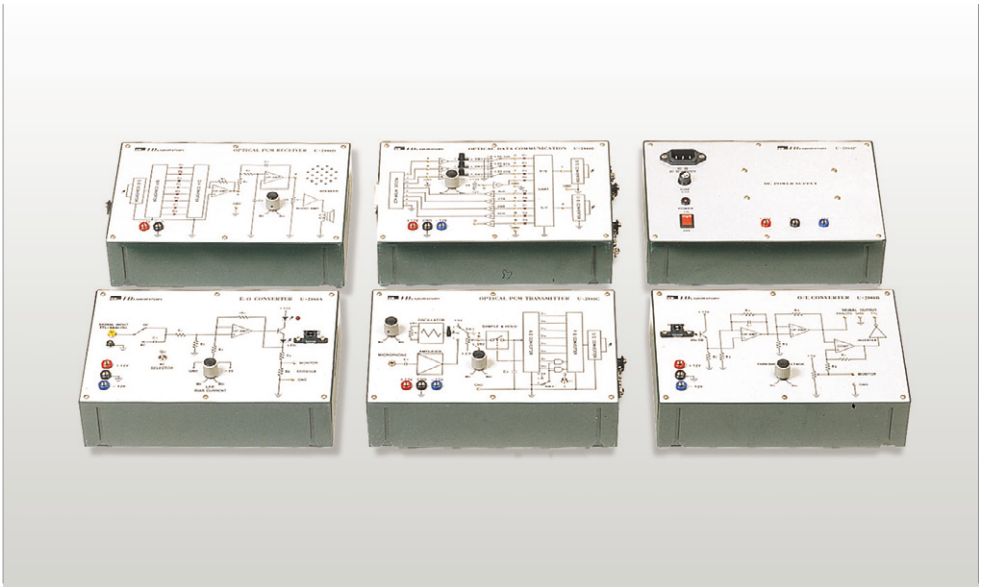
- Circuit Connection Cord(ø2 Plug) : 1set
- Module Power Cord : 10ea
- Component Plug-in Type : 2kΩ(3ea), 1μF(3ea), ZD(1ea), Network(4ea)
- AC Power Cord : 1ea
- Experimental Manual : 1ea

• Communication

OPTICAL COMMUNICATION TRAINER

ED-2980

- E/O and O/E conversion and characteristics
- Optical PCM communication(trasmission&reception)
- Optical Data communications using personal computer
- DC power supply, a roll of fiber cable and the microphone included as peripherals



> EXPERIMENTS

- E/O Converter Related Experiments :
  - » Input and output characteristics of an LED
  - » Input and output characteristics of an E/O Converter
  - » Intensity modulation principles
  - » Frequency characteristics of an E/O Converter
- O/E Converter Related Experiments :
  - » Input and output characteristics of an O/E Converter
  - » Overall frequency characteristics of an E/O and O/E combined
  - » Maximum transmission rate characteristics of an O/E Converter
- Optical PCM Communications :
  - » A/D Converter experiments
  - » PCM communications experiments using an Oscillator
  - » Voice transmission experiments
- Optical Data Communications :
  - » Input and output characteristics of RS-232C interface
  - » Parallel/Serial and Serial/Parallel conversion experiments
  - » Optical communications using personal computer

> SPECIFICATIONS

GENERAL CHARACTERISTICS

- **No. of Modules :** 6ea(Including Power Supply)
- **DC Output :** +12V(1A), -12V(0.5A)
- **Input Voltage :** AC 90~265V, 60Hz
- **Dimension :**
  - » Module : 250(W) x 65(H) x 166(D)mm
  - » System Case : 600(W) x 188(H) x 480(D)mm
- **Weight :** 16.5kg

ACCESSORIES

- Optical Fiber Cable(2meter) : 1ea
- RS-232C Cable : 1ea
- Microphone(Dynamic) : 1ea
- Patch Cord : 1set
- Software CD : 1ea
- Experimental Manual : 1ea
- AC Power Cord : 1ea

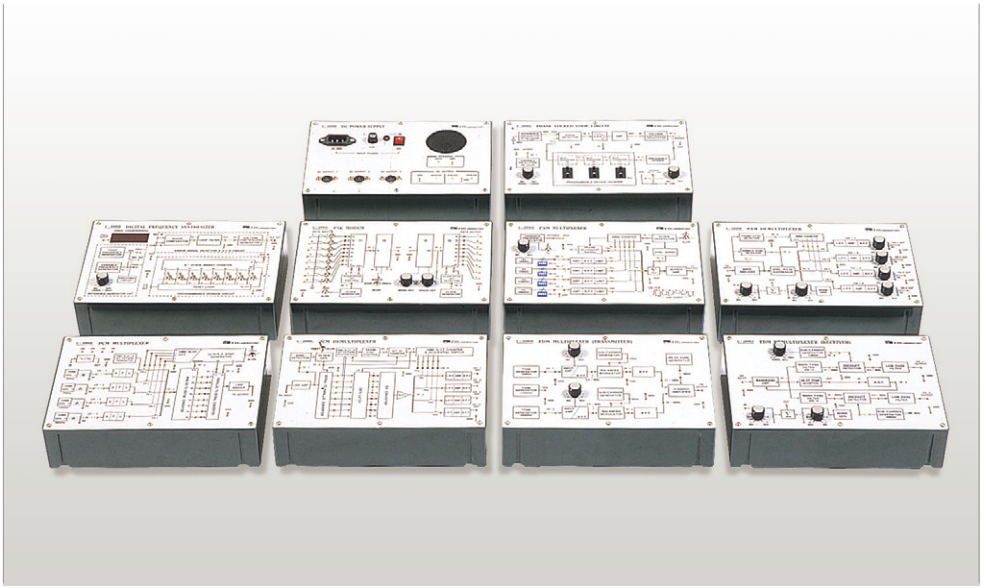
OPTIONS

- RS-232C Cable(Additional)
- Optical Fiber Cable(Additional)
- U-2980E Module(Additional)

MULTIPLEXED COMMUNICATION TRAINER

ED-2990

- PLL and Digital Synthesizer
- PAM, PCM, FDM and FSK Modem
- 10types of module including DC Power Supply



> EXPERIMENTS

- **PHASE LOCKED LOOP CIRCUIT**
  - » Voltage Controled Oscillator
  - » Study of Phase Locked Condition
  - » Phase Detector & Low Pass Filter
- **DIGITAL SYNTHESIZER**
  - » Error Signal Detector
  - » Study of Phase Comparator
  - » Programmable Division Circuit
  - » Transitory Response of Synthesizer
- **PAM(TDM) TRANSMITTER / RECEIVER**
  - » Input Amp. Characteristics
  - » Transmission Timing
  - » Study of the PAM Multiplexer
  - » Study of the PAM Demultiplexer
  - » Characteristics of the PAM System Noise
- **PCM TRANSMITTER / RECEIVER**
  - » Channel Circuit of the Transmitter
  - » Reception Synchronization & Alignment
  - » A/D Converter & Quantization Characteristics
  - » D/A Converter & Demultiplexer
  - » Characteristics of the PCM System Noise
- **FDM MULTIPLEXER / DEMULTIPLEXER**
  - » Input Amp. & Balanced Modulator
  - » Study of the SSB Demodulator
  - » Study of the System Global Response
  - » Crosstalk Response

> EXPERIMENTAL MODULES (15EA)

MODULE	DESCRIPTION
U-2990A	Phase Locked Loop Circuit
U-2990B	Digital Synthesizer Circuit
U-2990C	MODEM Circuit(FSK, PSK)
U-2990D	PAM Multiplexer
U-2990E	PAM Demultiplexer
U-2990F	PCM Multiplexer
U-2990G	PCM Demultiplexer
U-2990H	FDM Multiplexer
U-2990J	FDM Demultiplexer
U-2990P	DC Power Supply

MULTIPLEXED COMMUNICATION TRAINER

ED-2990

> SPECIFICATIONS

GENERAL CHARACTERISTICS

- **Input Voltage :** AC 220V, 50/60Hz(U-2990P)
- **Module Dimension :** 250(W) x 65(H) x 166(D)mm
- **System Dimension :** 715(W) x 565(H) x 230(D)mm
- **System Weight :** 27kg (including a case)

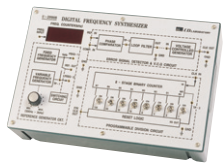
ACCESSORIES

- Patch Cord(ø2 Plug) : 1set
- DC Cord(Special) : 3ea
- AC Power Cord : 1ea
- Experimental Manual : 1ea

Experiments Module

U-2990A PHASE LOCKED LOOP UNIT

- **VCO Frequency Range**
  » 700kHz~1.4MHz
- **PLL Output Frequency**
  » 800kHz~1.3MHz
- **Output Level :** 3Vp-p Approx.
- **Reference Frequency**
  » 1kHz(with 1MHz X-TAL)
- **Variable Oscillator**
  » 500Hz~1.5kHz
- **DC Output :** 0~+15V

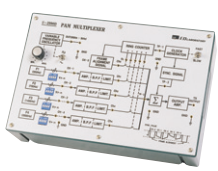


U-2990B DIGITAL SYNTHESIZER UNIT

- **VCG Frequency Range**
  » 1Hz~320kHz
- **Synthesizer Output Frequency**
  » 1kHz~255kHz
- **Output Level :** 15Vp-p
- **Programmable Division**
  » 8-stage Binary Counter
- **Phase Detection Circuit**
  » Logic Comparator
- **Reference Frequency :** 1kHz
- **Variable Frequency Generator**
  » 300Hz~3kHz
- **Frequency Counter**
  » 10Hz~10kHz

U-2990C MODEM UNIT

- **Keying Mode :** FSK
- **Transmission Freq. :** Space : 1200Hz
  Mark : 2400Hz
- **Operating Speed :** 0~300 bits
- **Operating Mode :** Synchronous
- **Data (Input/Output) :** 8 bits

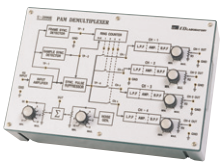


U-2990D PAM MULTIPLEXER

- **Multiplexing Mode**
  » Time Division Multiplexer
- **Transmission Channel**
  » 4-Channel
- **Input Frequency**
  » 350/700/1400/2800Hz
- **Amplitude Range**
  » 2.5V~12.5Vp-p
- **Timing Generator(Speed)**
  » Fast/Slow selectable
- **Variable Frequency Generator**
  » 300Hz~3kHz(Sine/Square)

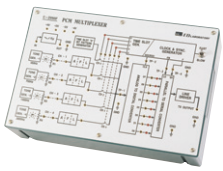
MULTIPLEXED COMMUNICATION TRAINER

ED-2990



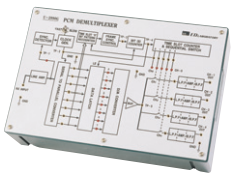
U-2990E PAM MULTIPLEXER

- **Demultiplexing Mode :** TDM
- **Receiving Channel :** 4-Channel
- **Output Frequency Range**
  » 350~2800Hz
- **Sample Sync. Level :** 12.5Vp-p
- **Frame Sync. Level :** 2.5Vp-p
- **Noise Generator**
  » DC 7V + AC 0~5Vp-p



U-2990F PCM MULTIPLEXER

- **Multiplexing Mode**
  » Time Division Multiplexer
- **Transmission Channel :** 4-channel
- **Input Frequency**
  » 350/700/1400/2800Hz
- **Input Dynamic Range :** 43~55dBm
- **A/D Converter :** 8bitsx4ch
- **Clock Generator**
  » Fast : 320kHz, Slow : 8Hz
- **Sampling Speed :** 8000/sec

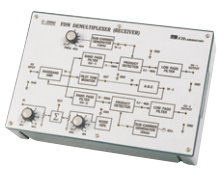


U-2990G PCM DEMULTIPLEXER

- **Demultiplexing Mode**
  » Time Division Multiplexer
- **Capacity of Channel :** 4-channel
- **Output Frequency Range**
  » 350~2800Hz
- **D/A Converter :** 8 bits
- **Synchronizing Clock**
  » Fast/Slow selectable

U-2990H FDM MULTIPLEXER

- **Multiplexing Channel**
  » 2-Voice Channel
- **Input :** 0.3~4kHz, 1Vp-p Max.
- **Sub Carrier**
  » Ch-1: 15kHz, Ch-2: 20kHz
- **Pilot Frequency :** 56kHz
- **Test Tone Generator**
  » 500/1000/2000Hz
- **Transmission Bandwidth**
  » about 11~56kHz
- **Output (Level) :** 5Vp-p



U-2990J FDM DEMULTIPLEXER

- **Capacity of Channel**
  » 2-Voice channel
- **Base Bandwidth :** about 80kHz
- **Band Pass Filter**
  » Ch-1 : 11~15kHz, Ch-2 : 16~20kHz
- **Voice Output**
  » 0.3~3kHz, 1Vp-p Max.
- **Noise Generator**
  » 10Vp-p Max.

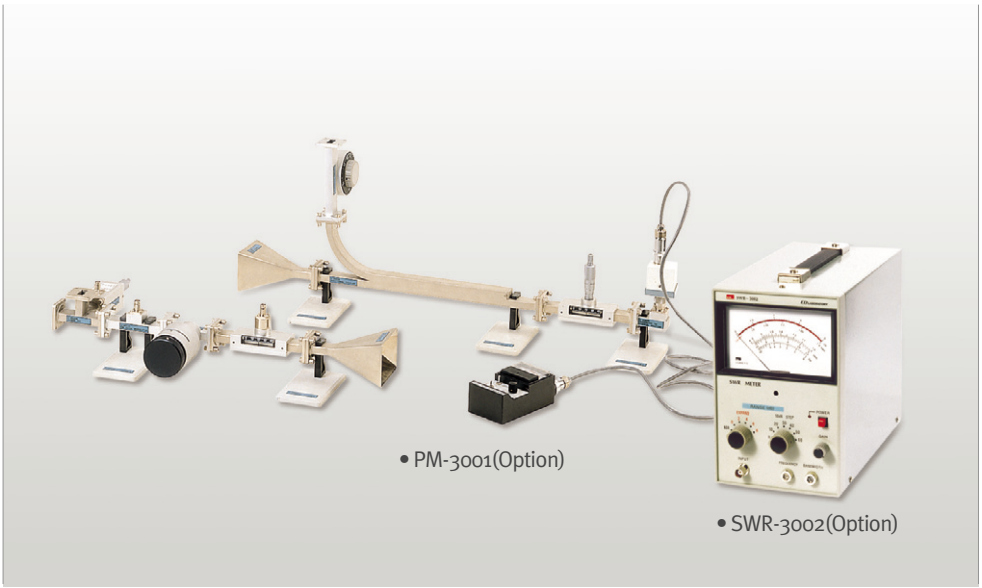
U-2990P POWER MODULE

- Input Voltage : AC220V, 50/60Hz
- Output Voltage
  » DC5V(0.5A), DC ±15V(0.5A)
- Speaker : 0.6W
- Output Connector
  » 3ea(for 3 modules)
- Dimension
  » 250(W) x 65(H) x 166(D)mm
- Weight : 1.4kg

MICROWAVE TRAINER

ED-3000

- Gunn Oscillator base system
- Directinal Coupler & Horn Antenna
- Frequency : 9GHz~11GHz (X-Band)
- Microwave output : 15mV



• PM-3001(Option)

• SWR-3002(Option)

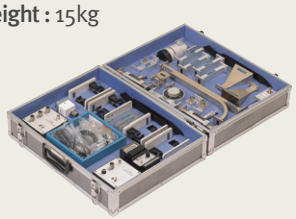
> EXPERIMENTS

- The Gunn Oscillator
- Square-law Characteristics of Microwave Crystal Detector
- Frequency Wavelength and Phase Velocity Measurements
- Q and Bandwidth Measurements in Cavity Resonator
- Power Measurement and Associated Errors
- Measurement of Impedance
- Measurement of Standing Wave Ratio(SWR)
- Attenuation Measurementss
- Directional Coupler's Basic Properties
- Study of a Waveguide Hybrid-T

> SPECIFICATIONS

GENERAL CHARACTERISTICS

- **Frequency Range :** 9GHz~11GHz(X-Band)
- **Microwave Power :** 15mW(Approx.)
- **System Case :** 525(W) x 215(H) x 450(D)mm
- **Weight :** 15kg



ACCESSORIES

- AC Power Cord : 1ea
- Bolt, Nut : 40ea
- PCB2321 : 2ea
- Experimental Manual : 1ea
- Patch Cord : 1set

OPTIONS

- Power Meter(PM-3001D), SWR Meter(SWR-3002)

*Note : Power Meter and SWR Meter are essential for ED-3000 microwave experiments

MICROWAVE TRAINER

ED-3000

> COMPONENT LIST

1. Gunn Oscillator	8. Fixed Attenuator	15. Reflecter with Stand
2. Slide Screw Tuner	9. Terminator	16. Supporter and Holder(7ea)
3. Slotted Line	10. Directional Coupler	17. Power Supply
4. Pin Modulator	11. Horn Antenna(2ea)	18. Coaxial Cable with Connector
5. Crystal Detector	12. Hybrid Tee	19. Square-wave generator
6. Frequency Meter	13. Wave to Coax Adapter	
7. Variable Attenuator	14. Wave-guide(2ea)	

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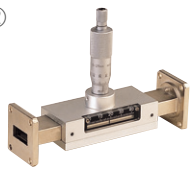
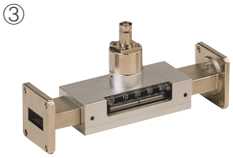
② 

③ 

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ANTENNA TRAINER

ED-3200

- 16 different types of Antenna
- RF source generation : 500MHz, 2GHz and 10GHz
- Software simulation of radiation Patterns and characteristics of Antenna
- Antenna Directional Coupler (Manual / Remote)

> EXPERIMENTS

- Practice of assembling and installing various types of Antenna
- Practical experiments of vertical/horizontal directional characteristics
- Antenna's efficiency and gain calculation and measurement
- Interference experiments

> SPECIFICATIONS

ED-3200A MAIN CONTROLLER

- **RF Generator**
  - » Frequency Range : 500MHz, 2GHz, 10GHz
  - » Power Range : 10mW(Approx.)
  - » Output Impedance : 50Ω(Nominal)
  - » Modulation Frequency : 1kHz
- **Receiver & Control**
  - » RF Input Level : -50.0dBm-~-10.0dBm
  - » Ant. Directional Control Range : 0˚~ 360˚
  - » Ant. Rotor Angle Control : 1˚/step, 5˚/step, 10˚/step Manual / PC Interface(RS-232C)

ED-3200B ANTENNA TRANSMIT UNIT

- Fixing(for polarized wave) : Horizontal / Vertical
- Ant. Directional Control : Manual
- Dimension : 300(W) x 800(H) x 270(D)mm
- Weight : 7.5kg

ED-3200C ANTENNA RECEIVE UNIT

- Fixing(for polarized wave) : Horizontal /Vertical
- Ant. Directional Control : Manual /PC interface(RS-232C)
- Dimension : 300(W) x 800(H) x 420(D)mm
- Weight : 9.5kg

ACCESSORIES

- AC Power Cord : 1ea
- Software CD : 1ea
- Manual : 1ea
- BNC Cable : 1ea
- Cable(4 types) : 1set

ANTENNA TRAINER

ED-3200

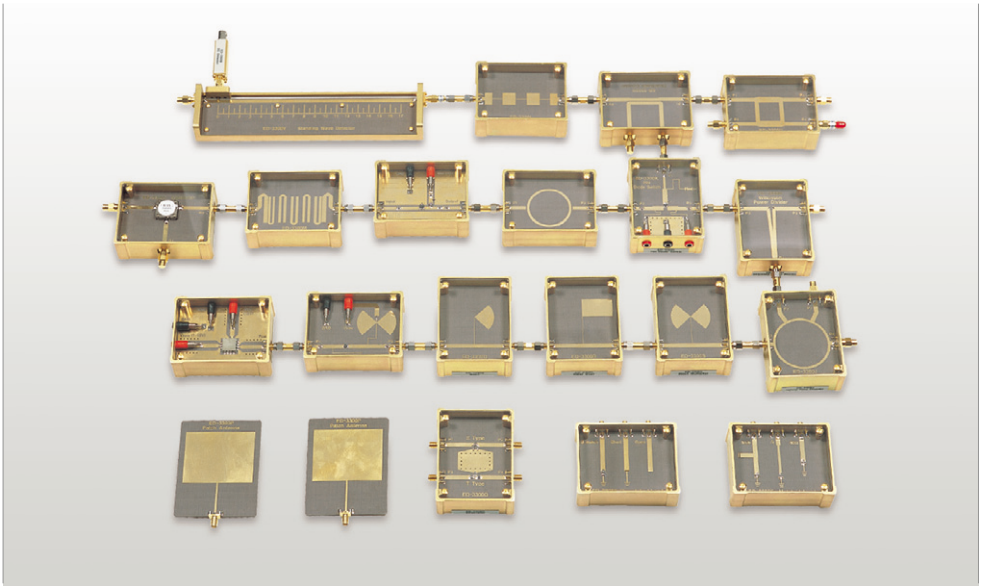
> EXPERIMENTAL MODULES (15EA)

RF FREQ.	TYPE OF ANTENNA	Q'ty	Serial No.
500MHz	Dipole	1ea	ANT-005DP
	Folded Dipole	1ea	ANT-005FP
	Yagi	2ea	ANT-005YG
	Monopole	1ea	ANT-005MP
	Drooping	1ea	ANT-005DR
	Circular Loop	1ea	ANT-005CL
	Square Loop	1ea	ANT-005SL
	Diamond Loop	1ea	ANT-005DL
2GHz	Dipole	2ea	ANT-020DP
	Spiral	1ea	ANT-020SP
	Monopole	1ea	ANT-020MP
10GHz	Helical	1ea	ANT-100HL
	Horn	2ea	ANT-100HR
	Rectangular Patch	1ea	ANT-100RP
	Microstrip Planar Array(Rectangular)	1ea	ANT-100PR
	Microstrip Planar Array(Circular)	1ea	ANT-100PC

MICROSTRIP LINE TRAINER

ED-3300

- Helps understand theories on the Microstrip Line Theory and Microwave Elements Design
- Composed of 22 types of modules such as VCO using Coupler, Divider, Circulator, Attenuator and Filter
- SWR Detector, Modulation, Transmission/Reception, Detector, Self-Oscillation functions



> EXPERIMENTS

- VCO and DC Detector
- Principle of Circulator
- Characteristics of Directional Coupler
- Other types of Coupler
- Reflection and Impedance Matching
- Attenuator
- SWR measurement
- PIN Diode Switch
- MMIC Amplifier

> SPECIFICATIONS

TECHNICAL

- **VCO**
  - » Frequency Range : 1.4~2.4GHz
  - » Output Power : 10dB ±2dB
- **DC Detector**
  - » Measurement Range : -25~10dBm
  - » Output Power : Below 2V
- **Circulator**
  - » Bandwidth : 300MHz
  - » Insertion Loss : 0.5dB
  - » Separation : 20dB
- **Directional Coupler**
  - » Insertion Loss : 0.4dB
  - » Return Loss : 28dB
  - » Coupling : 15 ±0.5dB
- **Unmatched Load :** Load 100Ω, short circuit, open circuit
- **Matched Load :** Load 50Ω, stub, λ/4 Converter
- **Attenuator(T / ∩Type) :** Attenuation : 3dB
- **Wilkinson Power Divider :** Coupling : 3dB
- **Branch Line Coupler** : Coupling : 3dB
- **Hybrid Ring Coupler** : Coupling : 3dB
- **PIN Diode Switch(SPDT)**
  - » Insertion Loss : 1.5 ±0.5dB
  - » Voltage : 5V, 4m/A
- **Low Pass Filter**
  - » Pass Band : DC~1.9GHz
  - » Insertion Loss : 0.4dB
- **Band Pass Filter**
  - » Pass Band : 100MHz
  - » Insertion Loss : 2dB
- **MMIC Amplifier**
  - » Frequency Range : 1~2.5GHz
  - » Gain : 17 ±0.5dB
  - » Voltage : 12V, 110mA
- **Patch Antenna**
  - » Return Loss : 20dB

GENERAL CHARACTERISTICS

- **Transmission Line :** Microstrip Line
- **Peculiarity Impedance :** 50Ω
- **Frequency Range :** 1.4~2.4GHz
- **Center Frequency :** 1.8GHz
- **Connector :** SMA type
- **Dimension :** 460(W) x 350(D) x 120(H)mm
- **Weight :** 6.3kg

ACCESSORIES

- Open Connector : 2ea
- 10dB Attenuator : 2ea
- Short Connector : 2ea
- 20dB Attenuator : 2ea
- SMA 50Ω load : 5ea
- DC Source Connector Cable : 4ea
- SMA Plug-Plug Connector : 8ea
- Spanner : 1ea
- SMA Jack-Jack Connector : 2ea
- User Manual : 1ea

※ Required Instrument : Power Supply(ED-4770 model or ED-330 model recommended)

AM TRANSCEIVER TRAINER

ED-3400

- HF band(3.5~12MHz)
- Transmitter and Receiver mudules for each circuit stage
- Graphical latour of the block diagrams, plus LEDs and test points
- Covers Push-to-Talk and helps understand short wave communications

ACCESSORIES

- Circuit Connection Cord(Rx, Tx) : 1set(for each section)
- AC Power Cord(Rx, Tx) : 2ea
- Microphone(Dynamic) : 1ea
- Experimental Manual : 1ea

> EXPERIMENTAL MODULES (11EA)

	MODULES	FUNCTIONS	EXPERIMENTS
TRANSMITTER MODULES (6ea)	TU-3400A	Carrier Oscillator	LC and Crystal Oscillation
	TU-3400B	Doubler & Buffer Amp	Frequency Multiplier and Buffer Amplifier
	TU-3400C	RF Power Amplifier	Input/Output Coupling of PA
	TU-3400D	π-Network Tuning Circuit	Low Pass Filter and PA Tune
	TU-3400E	Modulation Power Amp.	Audio Circuit and Modulation
	TU-3400P	DC Power Supply(for TX)	Break-In Control
RECEIVER MODULES (5ea)	RU-3400A	RF Amp. & Mixer Circuit	RF Resonance, Selectivity, Frequency Conversion
	RU-3400B	Local Oscillator	Variable and Fixed Oscillator
	RU-3400C	IF Amplifier & Det.	IF Amp. Demodulator, AGC Circuit, CW Reception
	RU-3400D	Audio Amplifier	Audio output with Speaker
	RU-3400P	DC-Power Supply(for RX)	Break-In Control

> SPECIFICATIONS

RECEIVER SECTION

- **Sensitivity :** About 2μV
- **Intermediate Frequency :** 455kHz
- **Frequency Control :** Variable and X-Tal
- **Dimension & Weight :** 425(W) x 180(H) x 410(D)mm, 18kg

TRANSMITTER SECTION

- **RF Output :** 5W Max.
- **P.A Tank Circuit :** π-Network
- **Oscillation Mode :** X-Tal and LC Circuit(Variable Control)
- **Dimension & Weight :** 520(W) x 180(H) x 410(D)mm, 15kg

GENERAL CHARACTERISTICS

- **Frequency Range :** 3.5MHz~12MHz(2-Band)
- **Electro-Wave Mode :** AM/CW
- **Antenna Impedance :** 50/75Ω
- **Operating Temperature :** 0~45˚C, Below 85% R.H.
- **Input Voltage :** AC 220V, 50/60Hz
- **Module Size :** 250(W) x 65(H) x 166(D)mm

• Wireless / Broadcast

FM(STEREO) TRANSCEIVER TRAINER

ED-3600

• Realistic Simulation of FM stereo broadcast
• Graphical layout of block diagrams, display elements and test points
• Covers the principles of FM stereo encoder and decoder
• Experiments on stereo amplifier (equalizer, tone control, pre-amp, etc.)

ACCESSORIES

- Board Rack(BR-3 model) : 1ea
- Circuit Connection Cord : 1set
- Microphone(Dynamic) : 1ea
- Speaker Module : 2ea
- Experimental Manual : 1ea

OPTIONS

- Power Supply : ED-330, ED-333E or ED-333T model

> EXPERIMENTAL MODULES (5EA)

	MODULE	CIRCUIT	EXPERIMENTS
RECEIVER SECTION MODULES (3ea)	ED-3601	FM Receiver	RF Amplifier, Local OSC. & Mixer, BPF, IF Amp & Limiter, FM Detector
	ED-3602	Stereo De-multiplexer (MPX)	Stereo Demodulation & Separation, Pilot Detector, De-emphasis
	ED-3603	Stereo Amplifier	Equalizing Amp. Pre-amp. & Tone Control, Main Amplifier
TRANSMITTER SECTION MODULES (2ea)	ED-3604	Stereo Signal Generator	Pre-emphasis, Matrix, Balanced Modulation, Sub-carrier Generator, Composite Circuit
	ED-3605	FM Transmitter	Reactance Modulation, Frequency Multiplier, AFC, Power Amplitier

> SPECIFICATIONS

TRANSMITTER SECTION

- **Frequency Range :** 88~108MHz(2-channels)
- **RF Output :** 100mW
- **Modulation Mode :** Reactance Modulation
- **Frequency Control Mode :** PLL
- **Deviation :** ±75kHz
- **Audio Input :** 0~-40dB for Microphone

RECEIVER SECTION

- **Frequency Range :** 88~108MHz(FM Broadcasting Band)
- **Sensitivity :** 2μV
- **Intermediate Frequency :** 10.7MHz
- **AF Output :** 0dBm

STEREO SECTION

- **Pilot Frequency :** 19kHz ±5Hz
- **Separation**
  - » Above 50dB : 400Hz~1kHz
  - » Above 40dB : 100Hz~10kHz
- **Frequency Response :** 50Hz~15kHz
- **AF Output :** 2Watts x 2-Channels

GENERAL CHARACTERISTICS

- **Input Voltage :** DC ±15V, 0.5A Max.
- **Dimension**
  - » Module : 420(W)x302(H) x 47(D)mm
  - » Board Rack (BR-3) : 1480(W) x 620(H) x 320(D)mm
- **System Weight :** 41kg

New

ED-IPSTB

IPTV TRAINER KIT

- Best solution for IPTV platform and IPTV Digital Broadcasting System in applications and experiments
- High-performance Microprocessor SIGMA EM8622 for powerful multimedia functions
- IPTV Set-top Box, Media Player, Digital Multimedia Processing
- Various types of media codec such as MPEG-4.10(H.264), WMV9, MP3, MPEG-2 and JPEG
- DEMUX API provided to help develop SD/HD class digital broadcasting service

> EXPERIMENTS

- **Development Environment**
  - » Configuration and connection of the target board and host PC
  - » Installation of development tool onto host PC and environment setup
  - » Setup of Minicom environment and NFS system
- **Kernel / Bootloader**
  - » Bootloader image fusing onto the target board
  - » Kernel config setup and Kernel compiling
- **File System**
  - » Kernel environment setup and compiling for the file system
  - » Creation of file system images
  - » Configuration of the file system environment for IPSTB
- **IPTV Server**
  - » Installation of Multicast server onto LINUX
  - » Installation of Web server onto LINUX for VOD and EPG
  - » Installation of Time server for synchronizing the service time
- **IPTV Application Programs**
  - » Design of XML and class for data communications
  - » IPTV application programs and GUI design
  - » Compiling and execution of IPTV application programs
  - » Creation of Main Menu
  - » Creation of Multicast Service
  - » Creation of VOD Service
  - » Creation of EPG Popup
  - » Creation of Media Players
- **LINUX Device Driver**
  - » Working environment for LINUX device driver
  - » Creation of device module program
  - » Creation of remote controller and application programs
  - » Creation of front panel driver
  - » Creation of network driver

IPTV TRAINER KIT

ED-IPSTB

> SPECIFICATIONS

Hardware

- **CPU**
  - » SIGMA Vantage 8623L(200MHz)
- **Memory**
  - » FLASH : 32Mbyte(8bits Access)
  - » SDRAM : 128Mbyte(32bits Access)
- **Display**
  - » TFT LCD : 6.4″, 16bits Color, 640 x 480
- **Interface**
  - » Ethernet : 10/100 Base T Ethernet(RJ45)
  - » UART : RS-232 serial port
  - » USB : USB2.0 high speed
  - » IDE : IDE Connector(40-pin header)
  - » LED : Status LED
- **Audio/Video Interface**
  - » AUDIO I/O : Stereo analog audio
    Optical and coaxial SPDIF digital audio
  - » VIDEO I/O : NTSC/PAL Composite
    YPbPr component video
    HDMI v1.1 with audio
- **Expansion**
  - » VFDIR : Front panel button
  - » Receiver : Remote control receiver

Software

- **Operating System**
  - » Development kit : Armutils 2.5.102
    MRUA Sigma Tool Kit
  - » OS : uClinux-2.4.22
  - » File System
    - › Romfs : Image Source
- **Application**
  - » IPTV APP
  - » MRUA APP
  - » Driver APP
- **Driver**
  - » Video/audio decoding driver
  - » Display driver
  - » Graphic driver
  - » Transport/Demux driver
  - » USB driver

GENERAL CHARACTERISTICS

- Input Voltage : 12V 3.5A DC
- Dimension : 490(W) x 160(H) x 320(D)mm

ACCESSORIES

- Romote Controller : 1ea
- Cables (Power, Serial, Cross Ethernet) : 1set
- User Manual : 1ea
- CD (Program Source, Circuit Diagram) : 1ea

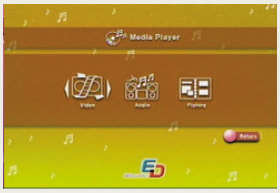
IPTV TRAINER KIT

ED-IPSTB

SOFTWARE

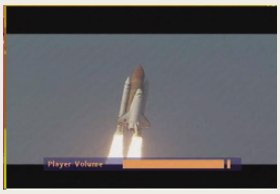
• Main Menu
Supports Multicast, VOD, Media Player, Setup functions in this Menu.

• Media Player Service
Replays the video file, audio file and picture file which was saved to ED-IPSTB hard disk



• Multi Cast Service
Channel List, Category Button, Current Time and Tuned Channel's EPG information

• Contents Replay
Replays the contents in Multicast, VOD and Media Player



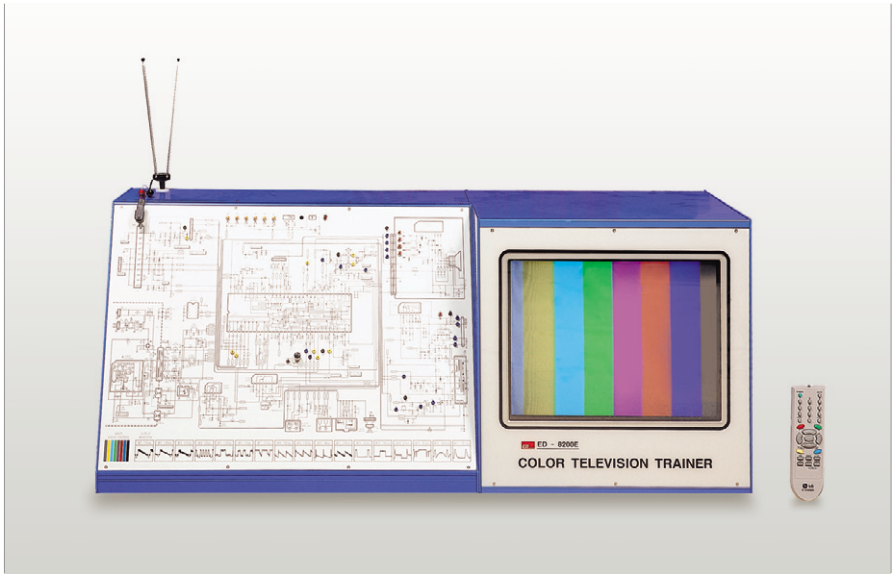
• VOD Service
Shows the list of VOD contents and makes the output of VOD contents's EPG information

• EPG(Electronic Program Guide)
Detailed information on the Multi Cast and VOD(Televising Time, Duration of Program, Director, Main Actors and Actress, and Scenarios)

COLOR TV TRAINER

ED-8200E

- 21 inch color TV Multi-System(NTSC, PAL, SECAM)
- Covers Multi-System reception type circuits and its operation principles
- Schematic diagrams and waveforms printed on the color graphic panel
- 17 points waveform monitoring & 10 points alignment
- 12 Test Switches & Remote Controller



> EXPERIMENTS

- Tuner, Video/Audio IF Circuit
- Synchronization and Deflection Circuit
- Video and Color Demodulation Circuit
- Power Supply Circuit
- Hardware-circuit Control

> SPECIFICATIONS

- **System**
  - » PAL-B/G, G/K, I/I
  - » SECAM-B/G, D/K, L/L
  - » NTSC M, NTSC 4.43
- **Intermediate Frequency**
  - » Vision IF : 38.9MHz
  - » Color IF : 34.47MHz(4.43)
    35.32MHz(3.58) : NTSC-M
    VIF-4.25000MHz : SECAM
    VIF-4.40625MHz : SECAM
  - » Sound IF : 33.45MHz(B/G)
    32.9MHz(I/I)
    32.4MHz(D/K)
    34.4MHz(M)
- **Test Point**
  - » Alignment : 10 Points
  - » NTSC M, NTSC 4.43 Waveform : 17 Points
- **Test Switch**
  - » 12ea(6-Test, 6-Control)
- **Picture Tube(CPT)**
  - » A51QDX992X
- **CPT Anode Voltage(H.V)**
  - » 25.0kV(Approx.)
- **Audio Output :** 7W Max.
  - » Input Power : AC 110 / 220V, 50~60Hz
- **Dimensions**
  - » 1327(W) x 556(H) x 500(D)mm
  - Panel : 740(W) x 540(H)mm
- **Weight :** 56 kg
- **Tuning Range**

Brand	For TV				For CATV
	B/G	D/K	I/I	NTSC	
VHF-low	Ch2-4	Ch1-15			S1'-S3', S1
VHF-high	Ch5-12	Ch6-12	Ch4-13	Ch2-13	S2-S10, S11-S20
Hyper					S21-S41
UHF	Ch21-69			Ch-14-69	

ACCESSORIES

- Rod Antenna : 1ea
- AC Power Cord : 1ea
- Operating Manual : 1ea