Feedback

Engineering Teaching Solutions

NEW Modern Digital Communications Range   55 series

This NEW Modern Digital Communications Range of trainers from Feedback provide rugged hardware with the necessary protections necessary for effective and safe student teaching, are supplied with a high quality, detailed experimental manual, theory and experimental software, each trainer providing up to 20 hours of laboratory time.

They cover the fundamental principles in the following areas:

55-100 Mobile Phone Trainer
55-200 Bluetooth Trainer
55-300 Zigbee Trainer
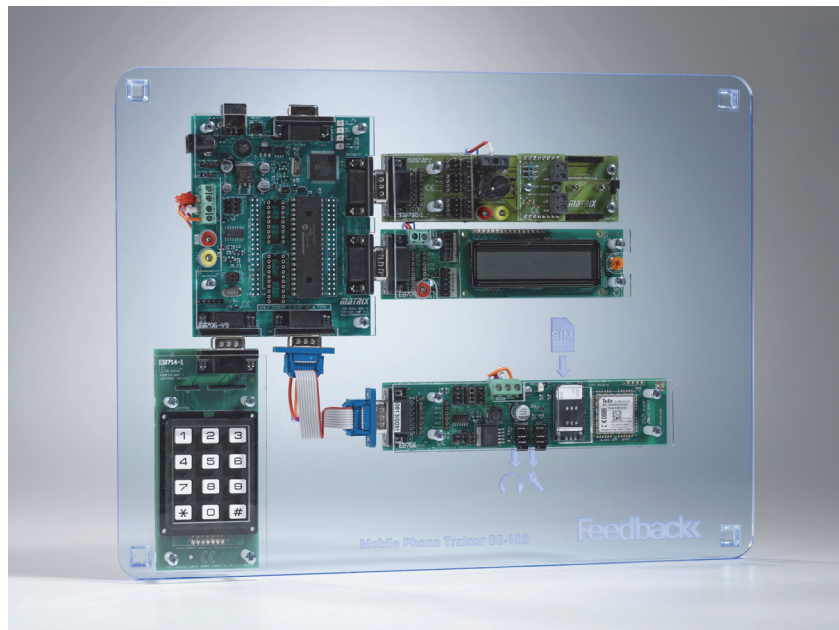**55-400 USB Trainer**
55-500 RFID Trainer
55-600 Embedded Internet Trainer
55-700 CAN bus Trainer
55-800 FPGA Trainer
55-900 Audio DSP Trainer

## 55-100 Mobile Phone Trainer

The Mobile Phone Trainer provides a complete course in developing communication systems covering the subject areas of communications systems, the AT command protocol and communications strategies. Subjects studied include:

Programming:
- General programming of systems including LCD and Keypad
- RS232 protocol and programming
- String construction and deconstruction in communications
- The use of state machines in controlling electronic systems

Communications:
- RS232 communications and handshaking protocols
- ASCII representation of characters in messages
- AT command structure and command protocols used in telecommunications
- Sending and receiving text messages in mobile phone systems
- Modem control and messaging

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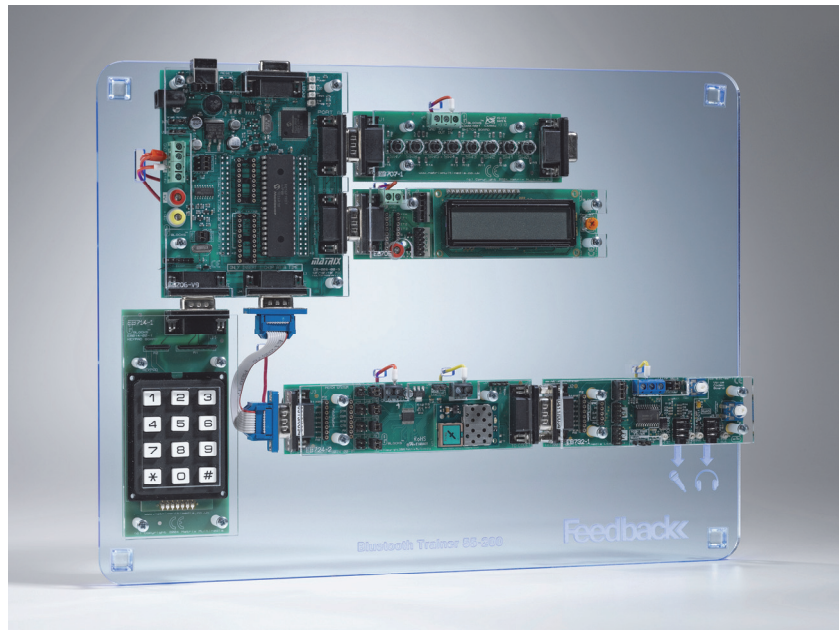
55-200 Bluetooth Trainer

The Bluetooth Trainer provides a complete course including investigations into the Bluetooth standard using high level macros. Students use the hardware, software and curriculum to investigate the various Bluetooth protocols and functions including the serial protocol (SPP), local area protocol (LAP) and the headset protocol (HPP). Subjects studied include:

- Data communication between microcontroller and Bluetooth modules
- AT command structure and programming strategy in AT controlled systems
- Bluetooth visibility
- Device discovery, pass keys and addresses
- Responses - sequence flow and error checking
- Connecting and pairing
- Data communication
- Using Bluetooth for control applications
- Audio and implementation of the audio gateway
- Headset and telephone profiles

55-300 Zigbee Trainer

The Zigbee Trainer provides a complete course in developing wireless area networks based on the ZigBee standard. It gives students who are familiar with microcontrollers an understanding of the programming tech-niques involved in developing ZigBee wireless communications systems. A ZigBee packet analyser is included in the solution, along with four fully working ZigBee nodes based on E-blocks. Subjects studied include:

- Zigbee protocols, message transmission and reception and networks
- Zigbee principles, topologies and components
- Development of microcontroller based systems
- Moulding the network
- Adding nodes
- Expanding the network
- Reducing power consumption
- Dynamic networks
- Message routing
- Data logging gateways
- A complete modular fire and burglar alarm
- Improving network security

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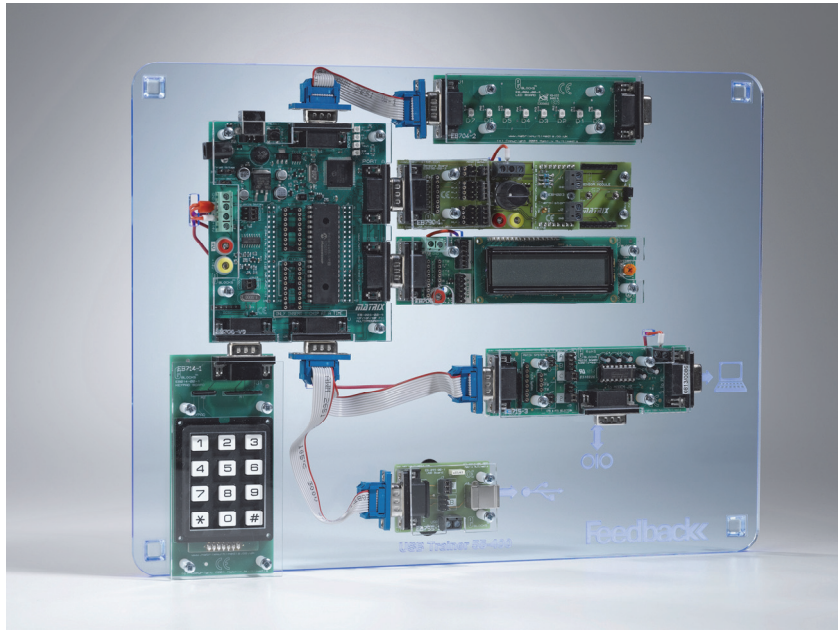
55-400 USB Trainer

This USB Trainer enables practical exercises in USB technology. Students learn about USB through eight different systems: mouse, joystick, temperature logger, USB terminal, USB to RS232 converter, basic slave, storage scope and oscilloscope with variable trigger. By working through these exercises, students build an understanding of the various types of USB system including Human Interface Devices, communications devices and slave devices. Subjects studied include:

- USB protocol and packet structure
- Devices, descriptors and configuration
- USB HID, Serial and slave protocols
- Development of microcontroller based systems using USB technology
- HID Mouse
- HID Keyboard
- HID Datalogger
- HID USB terminal
- HID RS232
- Storage and triggered scope
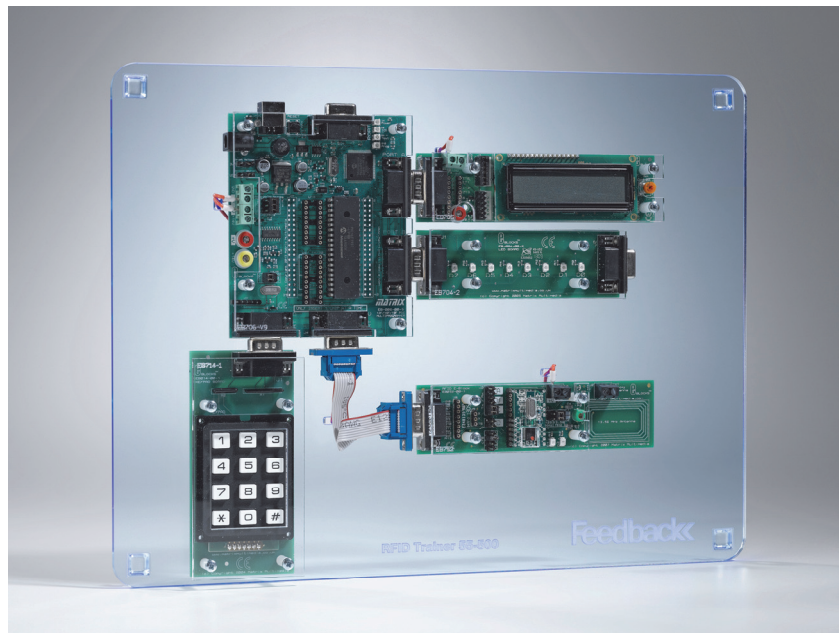
55-500 RFID Trainer

The RFID Trainer provides a complete course in developing RFID systems. It gives students who are familiar with microcontrollers an understanding of the programming involved in developing RFID systems. An RFID board and four RFID tags embedded into credit cards are included. This hardware allows students to learn about reading and writing transponder data in both I-code and Mirfare mode. Subjects studied include:

- RFID systems and applications
- Configuring RFID readers
- Commands and syntax used in reading and writing data to and from RFID cards
- Communication with both Mirfare and I-code systems
- Development of microcontroller based systems using
- Transponder unique ID
- Reading transponder data
- Writing transponder data
- Value format
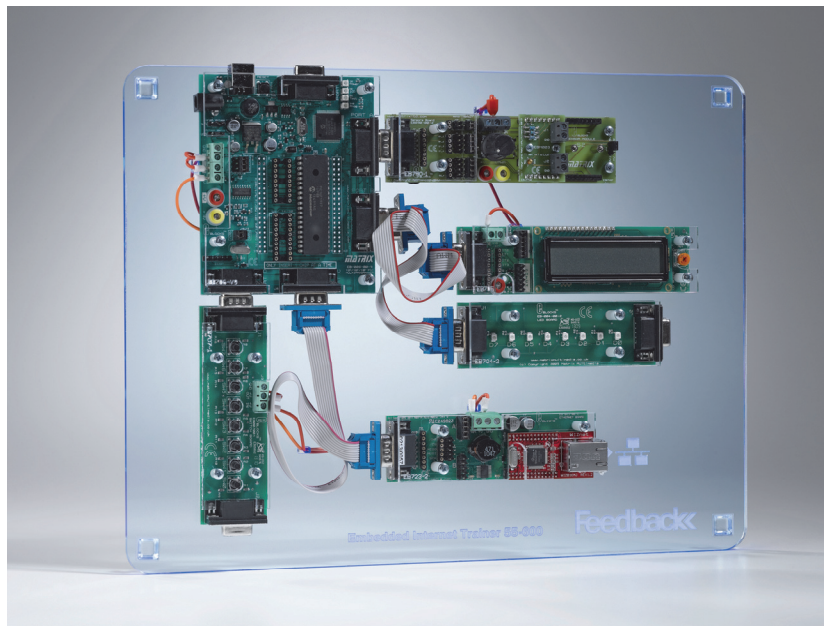
55-600 Embedded Internet Trainer

The Embedded Internet Trainer provides students with a full understanding of modern digital communications protocols and the development of embedded internet-based products. Subjects studied include:

- OSI model and layers
- Ethernet, DLC, MAC, ARP, TCP, IP, UDP, ICMP, HTTP and POP3 protocols
- MAC packet structure and message creation using microcontrollers
- Communication strategy and information flow
- Packet injectors and debuggers
- ARP scanning
- Ping
- Time and date messages using UDP
- Sending HTML using HTTP protocol
- Receiving HTML
- Sending an email using SMTP protocol
- Custom messaging using UDP
- A firewall application
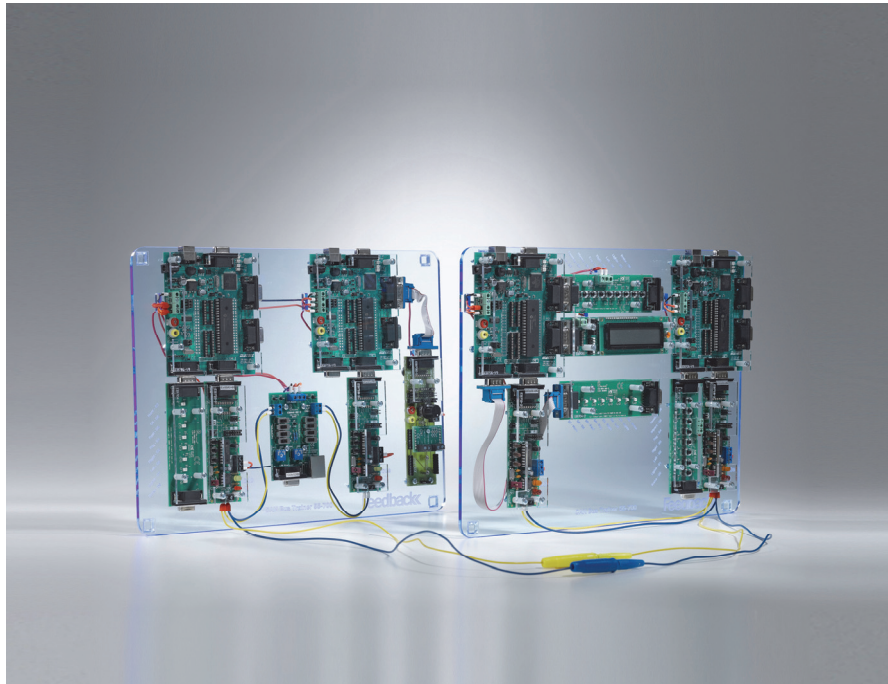
55-700 CAN bus Trainer

The CAN bus Trainer provides a course which includes the development and investigation of systems that use the CAN bus protocol. Four fully programmable CAN nodes are included in the solution, along with circuit boards which mimic the functions of indicator lamps, switches and sensors. A CAN bus analyser and message generator are also included. Subjects studied include:

- CAN technology, wiring, topology and networks
- CAN message structure and physical layer transmission
- Understanding CAN bus protocols
- Using buffers in CAN systems
- Using CAN transmit and receive messages
- Errors in CAN systems
- Programming techniques in CAN systems
- Masks and filters in CAN systems
- Higher level protocols
- Development of complete CAN systems based on microcontrollers

55-800 FPGA Trainer

The Field-programmable Gate Array Trainer provides a platform for learning FPGA programming in either VHDL or Verilog. The trainer includes a FPGA development board, LED boards, switch boards, a dual 7-segment display board, a prototype board, serial D/A board and a power output board.
Subjects studied include:

- PLD technology
- Getting to know QUARTUS II
- Descriptor languages
- Combination logic using HDL
- Combination logic assignment
- Sequential logic
- Modulo-sixty counter

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55-900 Audio DSP Trainer

This solution allows students to carry out a number of practical exercises in audio DSP technology. Students learn about DSP by developing 7 different system developments: Audio pass-through, Echo effect, Reverb effect, Sine wave generator, Waveform generator, Low pass filter, and High pass filter. Working through the exercises students build a good understanding of the various types of DSP operation including Inputs, Outputs, Sum, Level, Filter and Delay. The solution can also be used for teaching microcontroller programming in a highly motivating context. It is also useful for teaching the specifics of Audio DSP development and has many outcomes which include:

Programming outcomes:
- General programming of systems including graphical LCD, I/O
- SPI protocol and programming
- Timer Interrupts used to control sampling rates
- The use of state machines in controlling electronic systems

Communications outcomes:
- SPI communications and protocols
- Splitting and combining data bytes
- DSP functionality and methods of operation

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