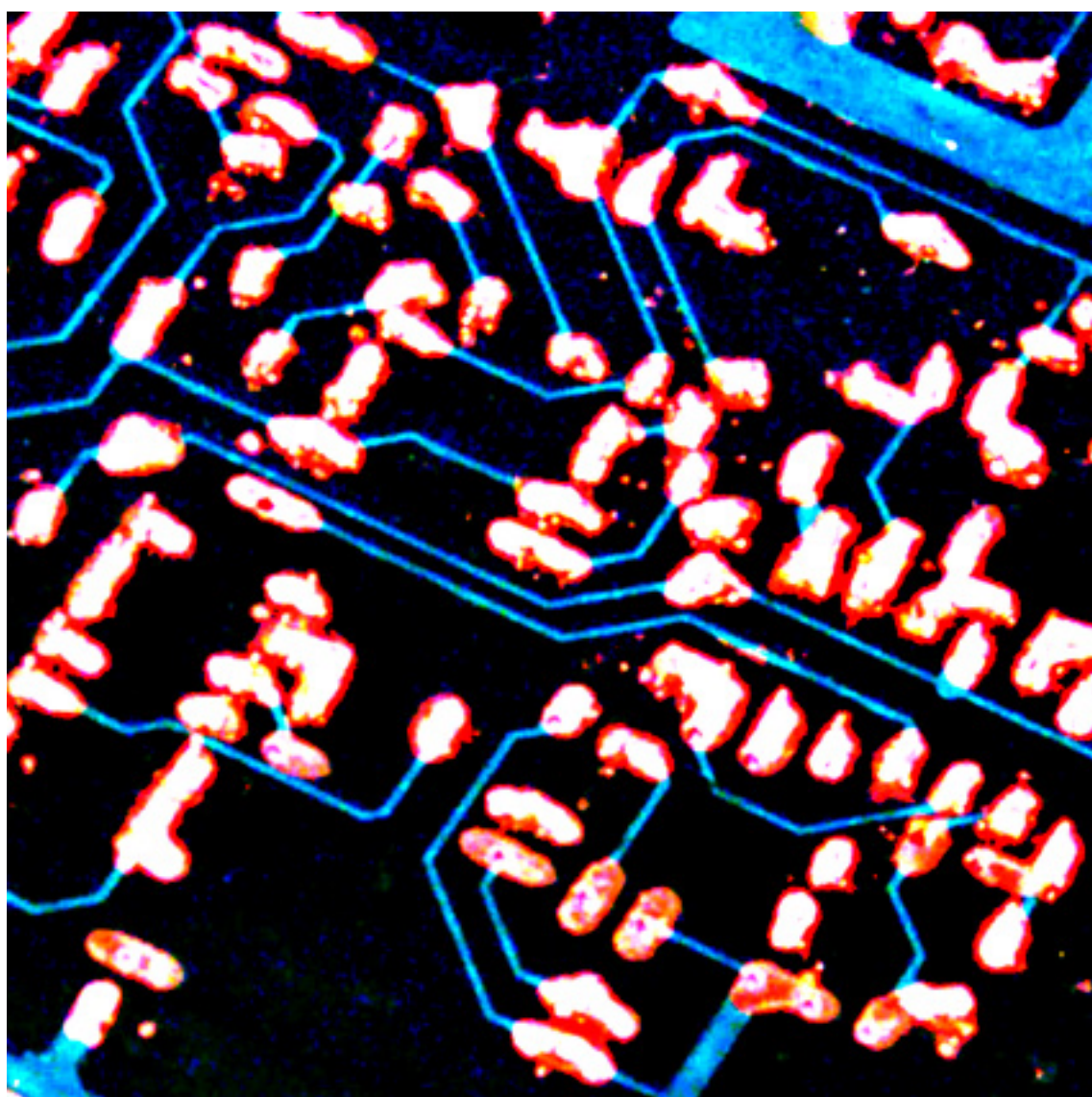


*Electron* S.R.L.

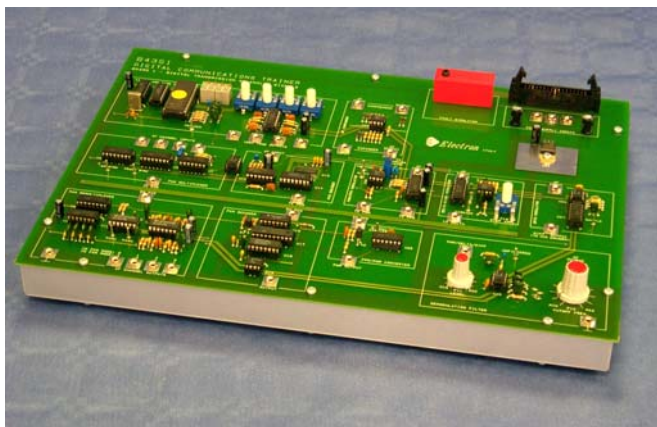
Design  
Production &  
Trading of  
Educational  
Equipment

B43 SERIES - DIGITAL COMMUNICATIONS TRAINER  
(BOARD VERSION)



# B43S1 – DIGITAL COMMUNICATIONS TRAINER

## Digital Transmission of Analog Signals



### General:

This trainer is a comprehensive collection of circuit modules contained on a single, large-size board. The modules allow to set-up complete transmission test systems and to experiment the most diffused techniques for pulse and pulse-code modulation.

In addition to the basic circuit modules to experiment the various transmission techniques, the board also includes auxiliary devices such as clock and timing generators, sources of analog and digital signals etc., so as to make the experimental work simple and efficient. Each functional block or module of the board is clearly identifiable by labels or silk-print indications.

### Features:

- On-board quadruple low-frequency signal generator. Four synchronous sinewaves are generated, each one separately adjustable in level. These are to be used as a source of audio test signals.
- Pulse-Amplitude Multiplexer and Modulator (PAM-TDM), operating on 4 independent analog sources (channels)
- PAM receiver and demultiplexer, performing as the receiving end of a PAM-TDM transmission system
- PAM-to-PCM encoder, with 8-bit flash A/D converter
- PCM-to-PAM converter/decoder
- PWM/PPM (Pulse-Width and Pulse-Position Modulation) encoder
- PWM/PPM decoder
- Delta modulator and demodulator
- DPCM (differential PCM) coder/decoder

- Audio Componder (compressor-expander) to demonstrate the techniques of Adaptive Coding and Decoding

- Fault simulation by 8-microswitches concealed under a cover accessible to the Instructor.

In addition to this manual fault simulating system the trainer is fully compatible with the B1180-WS Laboratory Student Workstation.

The B1180-WS provides a PC based fault simulation system, virtual instrumentation (optional) and all the power supplies required for the trainer.

A dedicated system CD is supplied containing the software for fault simulation and trainer documentation.

In cases where the advanced features of the B1180-WS are not required, a simple power supply delivering +15/-15V stabilized should be provided. Use of the B4192 power supply is recommended.

### Study topics:

- The principles of sampling and time-division multiplexing
- The PAM, PWM, PPM, DELTA Modulation techniques
- Digital encoding (PCM), quantizing error, quantizing noise
- Bandwidth and spectra
- The Shannon's theorem and Nyquist's rate
- Noise impairment on the transmission systems (using the transmission channel of the companion trainer B43S2)
- Troubleshooting of communication systems

The B43S1 is constructed following adequate standards as far as safety of the personnel and equipment itself.

The inputs and outputs of the module are reasonably protected against mishandling accidents such as shorts and foreign potentials.

The trainer is provided with cables accessories and instruction manual.

For the efficient execution of certain experiments, use of the B43S2 board is recommended. This board includes a transmission channel simulator and error counter useful to perform measurements of transmission error.

This trainer (board) has equivalents in the Panel version within the trainers of the B43\*\*-P series. Please refer to the Electron Catalogue section for details (codes B4310-A, B4310-B, B4330).

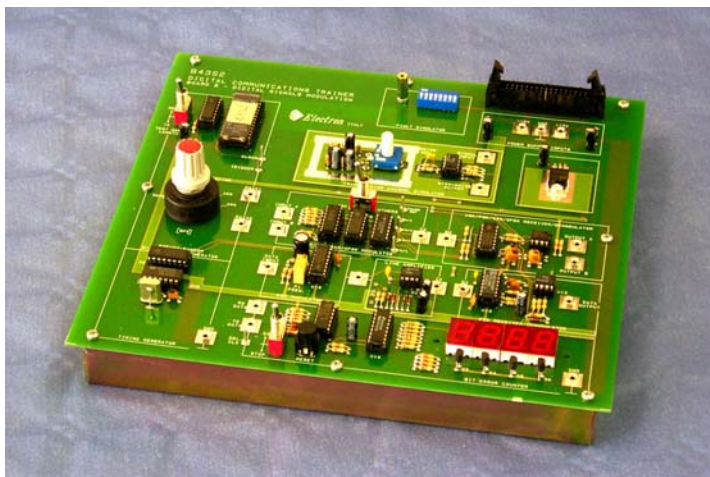
**Optional accessories:**

- B1180-WS Laboratory Student Workstation including the interface for fault simulation, with application software package
- Dual-trace oscilloscope, 20MHz
- Frequency counter
- Laboratory multimeter

**Ordering code:** B43S1

# B43S2 – DIGITAL COMMUNICATIONS TRAINER

## Digital Signal Modulation



### General:

This trainer is a comprehensive collection of circuit modules contained on a single, large-size board. The modules allow to set-up complete transmission test systems and to experiment the most diffused techniques for the modulation of digital data.

In addition the trainer is complete with the required auxiliary devices such as clock and timing generators, sources of digital signals etc., so as to make the experimental work simple and efficient. Each functional block or module of the board is clearly identifiable by labels or silk-print indications.

### Features:

- On-board Pseudo-Random data sequence generator. 2 sequences are simultaneously generated
- Selectable bit rate from 300 to 9600 Bps
- Selectable transmission test word length: 16 bits or 256 bits
- On-board clock, timing and carrier generators
- FSK transmitter and receiver, in PLL technique
- ASK, BPSK, QPSK, QAM encoder/transmitters and receivers
- Transmission channel simulator with additive noise signal generator
- TX/RX data matcher circuit and error counter with 4-digit high-visibility display
- Fault simulation by 8 microswitches concealed under a cover accessible to the Instructor.

In addition to this manual fault simulating system the trainer is fully compatible with the B1180-WS Laboratory Student Workstation.

The B1180-WS provides a PC based fault simulation system, virtual instrumentation (optional) and all the power supplies required for the trainer.

A dedicated system CD is supplied containing the software for fault simulation and trainer documentation.

In cases where the advanced features of the B1180-WS are not required, a simple power supply delivering +15/-15V stabilized should be provided. Use of the B4192 power supply is recommended.

### Study topics:

- Basic and advanced concepts of data transmission
- Set-up and performance analysis of an ASK system
- Set-up and performance analysis of an FSK system
- Set-up and performance analysis of an PSK/QPSK/QAM system
- Bit error rate measurements
- Data transmission on noise-impaired channels
- Troubleshooting of digital modulation systems

The B43S2 is constructed following adequate standards as far as safety of the personnel and equipment itself.

The inputs and outputs of the module are reasonably protected against mishandling accidents such as shorts and foreign potentials.

The trainer is provided with cables accessories and instruction manual.

This trainer (board) has equivalents in the Panel version within the trainers of the B43\*\*-P series. Please refer to the Electron Catalogue section for details (codes B4340, B4350, B4351).

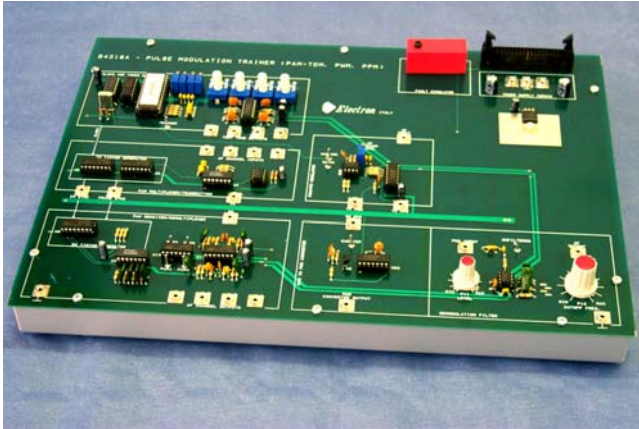
**Optional accessories:**

- B1180-WS Laboratory Student Workstation including the interface for fault simulation, with application software package
- Dual-trace oscilloscope, 20MHz
- Frequency counter
- Laboratory multimeter

**Ordering code:**

B43S2

## B4310A – PULSE MODULATION TRAINER



### General:

This trainer is a comprehensive collection of circuit modules contained on a single, large-size board. The modules allow to set-up complete transmission test systems and to experiment the most diffused techniques for Pulse modulation.

In addition to the basic circuit modules, the board also includes auxiliary devices such as clock and timing generators, sources of analog and digital signals etc., so as to make the experimental work simple and efficient. Each functional block or module of the board is clearly identifiable by labels or silk-print indications.

### Features:

- On-board quadruple low-frequency signal generator. Four synchronous sinewaves are generated, each one separately adjustable in level. These are to be used as a source of audio test signals.
- Pulse-Amplitude Multiplexer and Modulator (PAM-TDM), operating on 4 independent analog sources (channels)
- PAM receiver and demultiplexer, performing as the receiving end of a PAM-TDM transmission system
- PWM/PPM (Pulse-Width and Pulse-Position Modulation) encoder
- PWM/PPM decoder
- Fault simulation by 8-microswitches concealed under a cover accessible to the Instructor.

In addition to this manual fault simulating system the trainer is fully compatible with the B1180-WS Laboratory Student Workstation.

The B1180-WS provides a PC based fault simulation system, virtual instrumentation (optional) and all the power supplies required for the trainer.

A dedicated system CD is supplied containing the software for fault simulation and trainer documentation.

In cases where the advanced features of the B1180-WS are not required, a simple power supply delivering +15/-15V stabilized should be provided. Use of the B4192 power supply is recommended.

### Study topics:

- The principles of sampling and time-division multiplexing
- The PAM, PWM, and PPM Modulation techniques
- Quantizing error, quantizing noise
- Bandwidth and spectra
- The Shannon's theorem and Nyquist's rate
- Noise impairment on the transmission systems (using the transmission channel simulator B4350)
- Troubleshooting of transmission systems

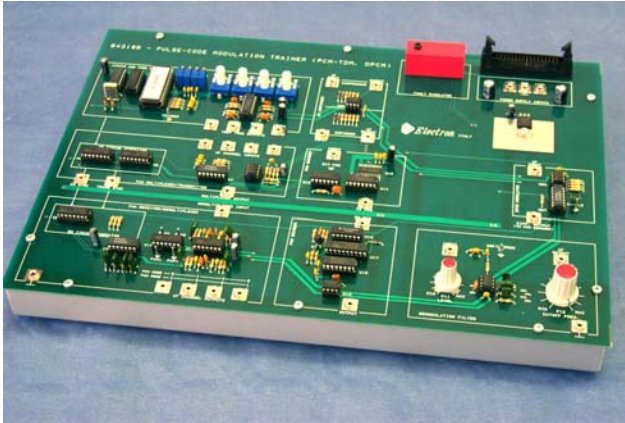
The trainer is constructed following adequate standards as far as safety of the personnel and equipment itself. The inputs and outputs of the module are reasonably protected against mishandling accidents such as shorts and foreign potentials.

The trainer is provided with cables accessories and instruction manual.

### Ordering code:

B4310A-B

# B4310B – PULSE-CODE MODULATION TRAINER



## General:

This trainer is a comprehensive collection of circuit modules contained on a single, large-size board. The modules allow to set-up complete transmission test systems and to experiment the most diffused techniques for Pulse and Pulse-Code modulation.

In addition to the basic circuit modules, the board also includes auxiliary devices such as clock and timing generators, sources of analog and digital signals etc., so as to make the experimental work simple and efficient. Each functional block or module of the board is clearly identifiable by labels or silk-print indications.

## Features:

- On-board quadruple low-frequency signal generator. Four synchronous sinewaves are generated, each one separately adjustable in level. These are to be used as a source of audio test signals.
- Pulse-Amplitude Multiplexer and Modulator (PAM-TDM), operating on 4 independent analog sources (channels)
- PAM receiver and demultiplexer, performing as the receiving end of a PAM-TDM transmission system
- PAM-to-PCM encoder, with 8-bit flash A/D converter
- PCM-to-PAM converter/decoder
- DPCM (differential PCM) coder/decoder
- Audio Componder (compressor-expander) to demonstrate the techniques of Adaptive Coding and Decoding
- Fault simulation by 8-microswitches concealed under a cover accessible to the Instructor.

In addition to this manual fault simulating system the trainer is fully compatible with the B1180-WS Laboratory Student Workstation.

The B1180-WS provides a PC based fault simulation system, virtual instrumentation (optional) and all the power supplies required for the trainer.

A dedicated system CD is supplied containing the software for fault simulation and trainer documentation.

In cases where the advanced features of the B1180-WS are not required, a simple power supply delivering +15/-15V stabilized should be provided. Use of the B4192 power supply is recommended.

## Study topics:

- The principles of sampling and time-division multiplexing
- The PAM Modulation techniques
- Digital encoding (PCM), quantizing error, quantizing noise
- Bandwidth and spectra
- The Shannon's theorem and Nyquist's rate
- Noise impairment on the transmission systems (using the transmission channel simulator B4350)
- Troubleshooting of transmission systems

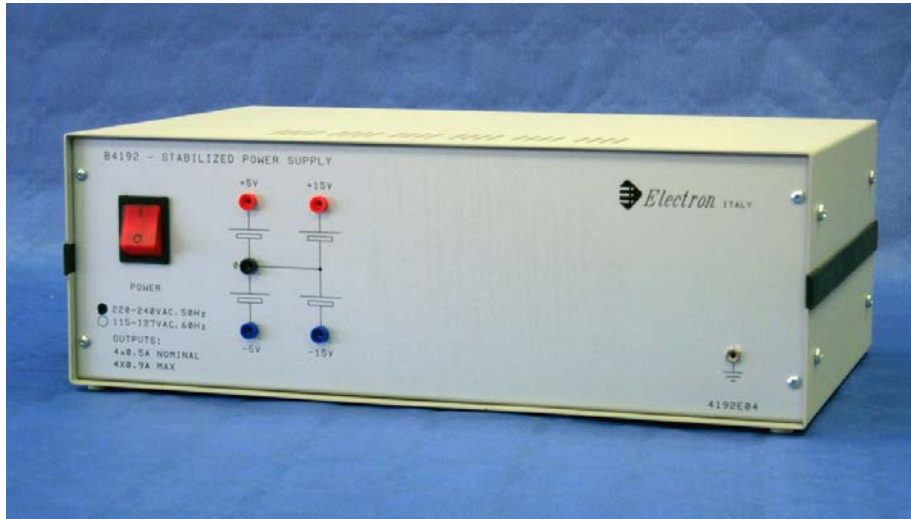
The trainer is constructed following adequate standards as far as safety of the personnel and equipment itself.

The inputs and outputs of the module are reasonably protected against mishandling accidents such as shorts and foreign potentials.

The trainer is provided with cables accessories and instruction manual.

**Ordering code:** B4310B-B

## B4192 – POWER SUPPLY



This power supply is implemented in a desk-top cabinet enclosure, and has the following characteristics:

- Stabilized +5, -5, +15, -15V outputs
- Max nominal current of 500mA on each output
- Max overload current of 900mA on each output
- Overload current limitation: approx. 900mA

Foldback short-circuit current limiting (approx. 200mA I<sub>cc</sub>)

- Output ripple: better than 50mV RMS

The B4192 operates from the AC mains: 110 to 250V, 50-60Hz (please specify while ordering).

Ordering code:

B4192