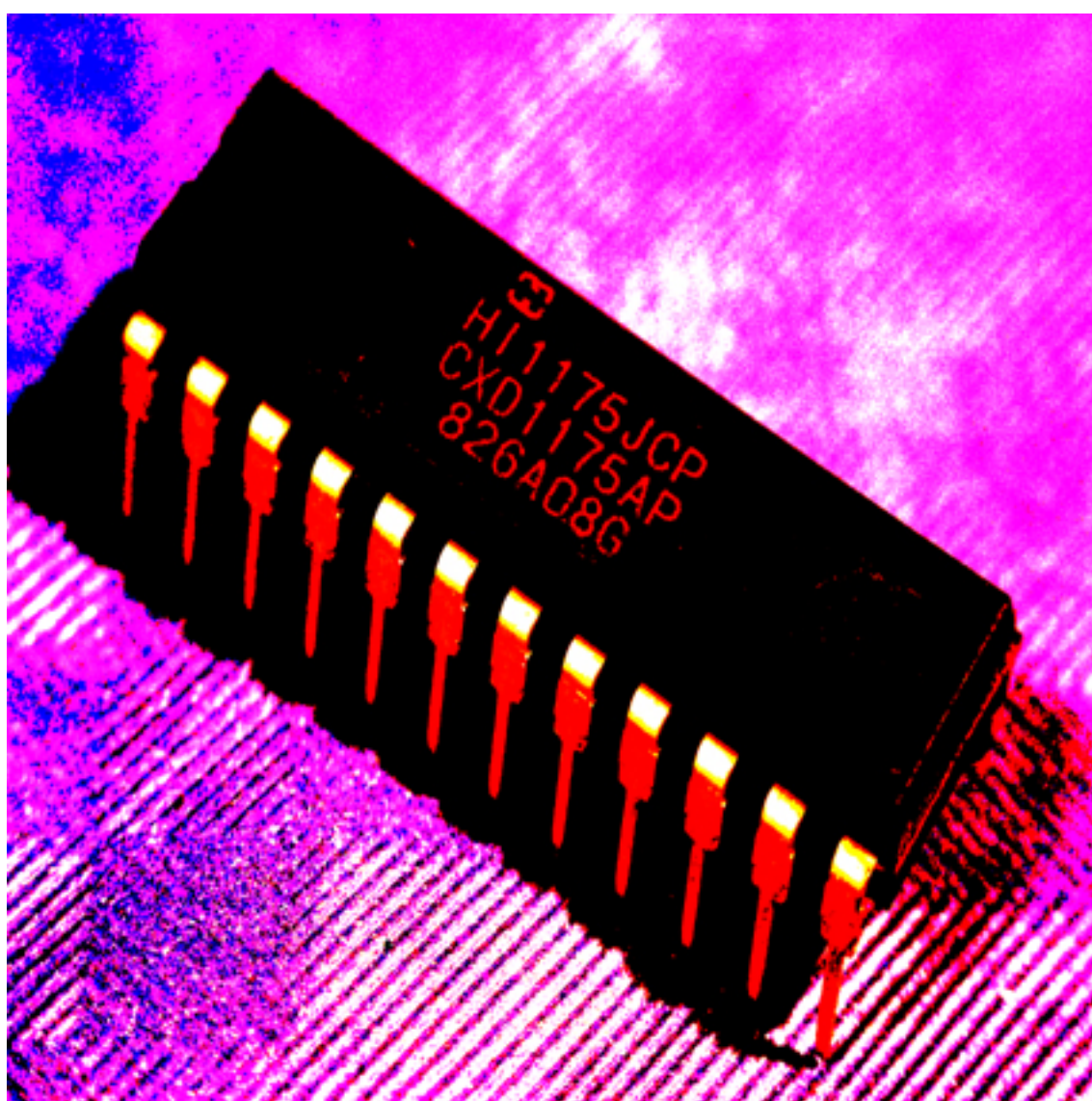


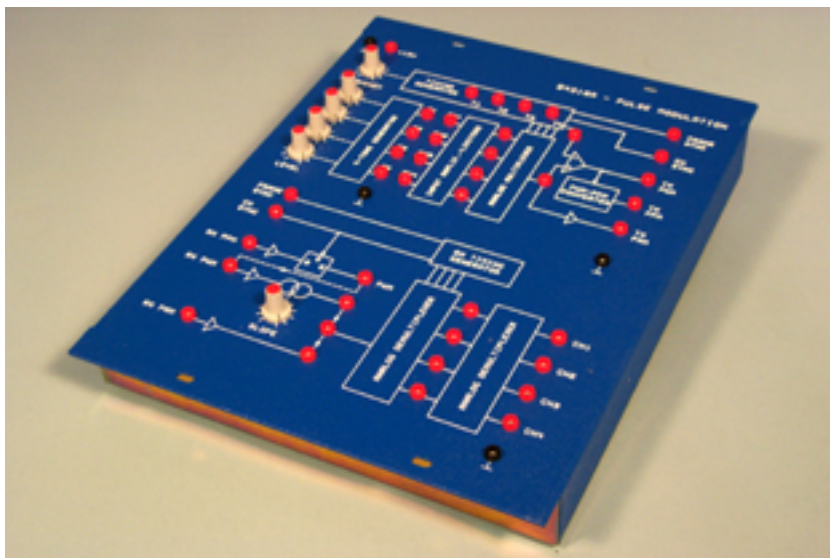
Electron S.R.L.

Design
Production &
Trading of
Educational
Equipment

**B43 SERIES - DIGITAL COMMUNICATIONS TRAINERS
(PANEL VERSION)**



B4310A – PULSE MODULATION TRAINER



General:

This unit includes the circuit blocks to build and study pulse modulation transmission systems of various types.

Features:

- Pulse-Amplitude Modulation (PAM)
- Pulse-Duration (or Pulse-Width) Modulation (PDM or PWM)
- Pulse-Position Modulation (PPM)
- Time-Division Multiplex (TDM) transmission of 4 pulse-modulated signals

The constitution and characteristics of each one of the above transmission techniques are analyzed and experimented, and the relevant performance is matched.

In order to allow the study subjects above, the module includes on-board the following major functional blocks:

- 4 sinewave test signal generator, as signal source
- TX timing generator
- Analog multiplexer
- PAM, PWM, PPM coders
- Rx timing generator
- Rx input amplifiers and decoders
- Demultiplexers
- Output amplifiers and filters

The trainer is power-supplied from a stabilized +15V source. The B4192 power supply is recommended.

For the efficient execution of certain experiments, use of the B4350 – Transmission Channel Simulator is recommended with this module.

The trainer is supplied complete with cable accessories and instructions manual.

The trainer is available in Panel version only, shown in the picture, where the circuits are enclosed in a sturdy aluminium cabinet (340 x 260 x 40mm size).

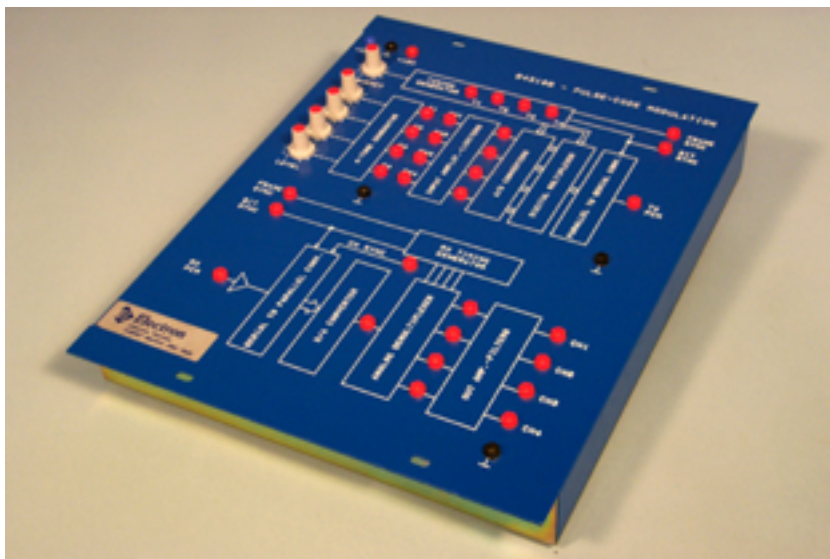
For where the Board version is preferred (with the components in view) the B43S1 trainer is available, covering, amongst others, these same study topics.

Please refer to the Electron Catalogue section for the Board series for further details.

Ordering code:

B4310A-P (Panel type)

B4310B – PULSE-CODE MODULATION TRAINER



General:

This panel is the logical extension of the preceding B4310-A to study the principles of digital coding in addition to the techniques of pulse modulation provided by the former. While being complementary in covering the study matter, the two trainers are designed to be used independently of each other.

Features:

- Input amplifiers for 4 audio channels (0.3 to 3kHz bandpass)
- Sampler and A/D converter stage
- Time-division multiplexer
- PCM encoder and transmitter
- Receiver, demultiplexer and PCM decoder
- D/A converter stage
- Output filters and amplifiers

The panel includes on-board auxiliary testing facilities to make its simple and handy to use. These are a 4-sinewave test tone generator, as well as independent TX and RX timing generators.

The trainer is to be power-supplied from a +15

stabilized source, such as our B4192 power supply.

The trainer is complete with a set of plug-in cables of various colors and lengths and with an instructions manual.

For the efficient execution of certain experiments, use of the B4350 – Transmission Channel Simulator is recommended with this module.

The trainer is available in Panel version only, shown in the picture, where the circuits are enclosed in a sturdy aluminium cabinet (340 x 260 x 40mm size).

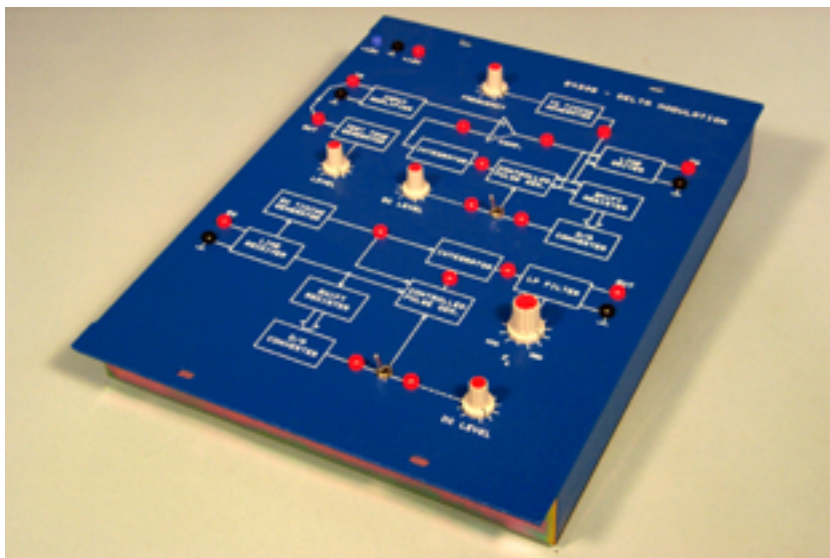
For where the Board version is preferred (with the components in view) the B43S1 trainer is available, covering, amongst others, these same study topics.

Please refer to the Electron Catalogue section for the Board series for further details.

Ordering code:

B4310B-P (Panel type)

B4330 – DELTA MODULATION TRAINER



General:

This panel provides a means to investigate and experiment the principles of Delta Modulation, of both the Fixed as well as Continuously Variable Slope types.

Features:

- Input amplifier/buffer
- Delta Sampler/encoder
- Analog memory
- Adaptive dynamic compression/expansion scheme
- Decoder
- Output amplifier/buffer
- Clock and timing generators

Study topics:

- Delta modulation: basic concepts
- Sampling
- Bandwidth and spectra
- Shannon's theorem
- The Nyquist's rate
- Aliasing
- Analog pulse modulation and Pulse-code modulation
- Quantizing, coding, quantizing error and noise
- Delta modulation
- Adaptive Delta modulation

The B4330 is constructed following adequate

standards as far as safety of the personnel and equipment itself. The module is powered from low-voltage, low-power source. Use the B4192 power supply for adequate current limitation and overload protection.

The inputs and outputs of the module are reasonably protected against mis-handling 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 B4350 – Transmission Channel Simulator is recommended with this module.

The trainer is available in Panel version only, shown in the picture, where the circuits are enclosed in a sturdy aluminium cabinet (340 x 260 x 40mm size).

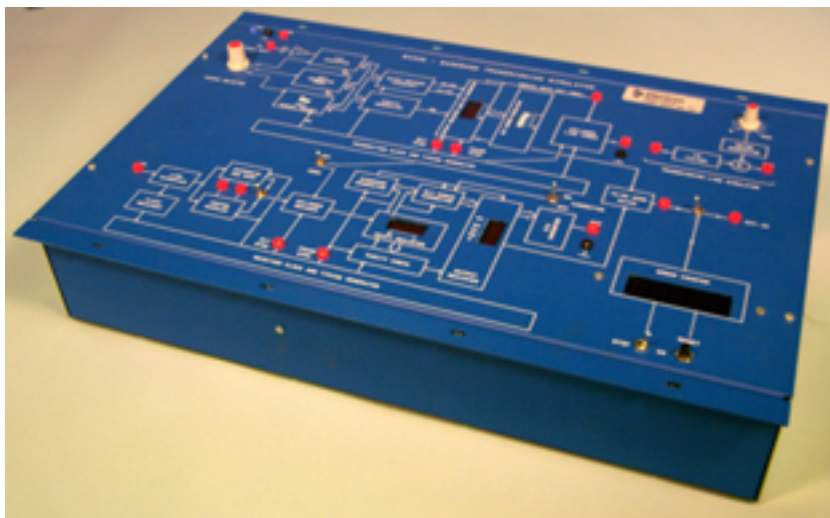
For where the Board version is preferred (with the components in view) the B43S1 trainer is available, covering, amongst others, these same study topics.

Please refer to the Electron Catalogue section for the Board series for further details.

Ordering code:

B4330-P (Panel type)

B4338 – BASEBAND DATA TRANSMISSION SIMULATOR



General:

This trainer is aimed to study transmission of data in its basic unmodulated form, i.e. in Baseband. The fields covered are that of data generation, encoding, error correction and detection.

Features:

- **DATA SOURCE:** selectable from A/D converter, Bit Generator (EPROM) or switches to be manually preset.
- **ENCODERS:** Block Encoder (Hamming Encoder) and parity generator.
- **BIT ERROR SIMULATOR:** each one of the 8-bit of a word can be preset as faulty for the scope of studying the error detection and correction techniques in reception.
- **AMI/HDB3 LINE CODERS**, to allow study of the Alternative Mark Inversion and High Density Binary processing techniques.
- **DATA DETECTORS** of both the Center Sampler type as well as the Integrate And Dump one.
- **AMI/HDB3 DECODERS:** to perform the reverse processing of the coding performed in the transmitter.
- **PARITY CHECKER** and LED display indicator.
- **SYNDROME GENERATOR:** to perform the error detection and correction.
- **TRANSMISSION CHANNEL SIMULATOR** with artificial distortion and additive noise to realistically simulate actual transmission conditions.
- **ERROR COUNTER WITH 5-DIGIT DISPLAY:** This allows to make measurements on the Error Rate in the various operation modes,

with and without automatic error correction.

Study topics:

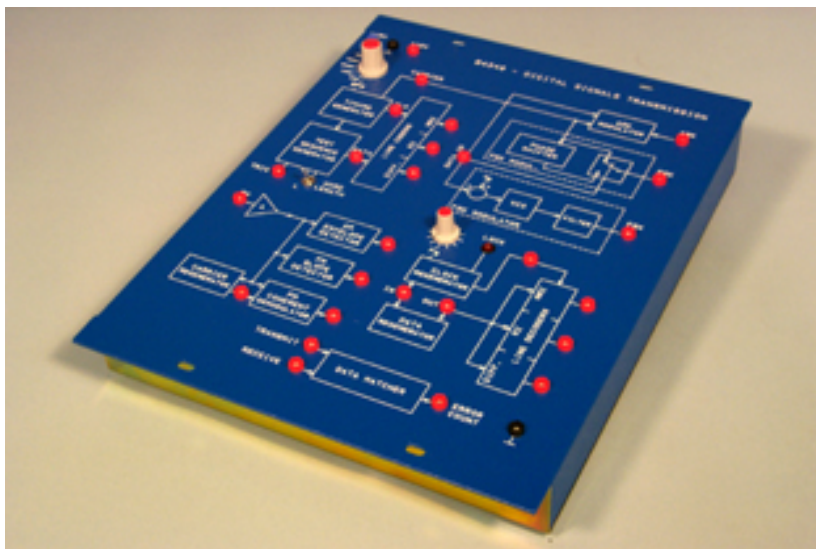
- Signal sources
- Signal encoding stage
- Parallel/serial converter and bit error simulator
- AMI/HDB3 line coder
- Receiver's front end
- Data regenerators and line decoders
- Error detection and correction stage
- Receiver's output stage
- Auxiliary devices
- Basic operation of the trainer with the ROM bit generator source
- Basic operation with the manual preset bit source
- Basic operation with the analog input source
- The transmitter: analysis of digital waveshapes and patterns
- The receiver: analysis of digital waveshapes and patterns
- Use of the bit fault simulator
- The transmission channel simulator and error counter

The trainer is to be powered by an external source at +15V, -15V stabilized, such as our B4192 power supply.

Ordering code:

B4338-P (panel type only)

B4340 – DIGITAL SIGNALS TRANSMISSION



General:

This panel is to introduce and experiment the techniques and problems concerning Digital Data Transmission. The panel includes circuit blocks to set up experimental systems to study Amplitude Shift Keying, Frequency Shift Keying, Phase Shift Keying.

Each transmission technique is thoroughly analyzed and the performance of each one is matched against the others.

Features:

- Timing generator, quartz-controlled, to provide the basic timing for the whole system.
- Pseudo-random test sequence generator, delivering digital test sequences of either 16 or 256 bits.
- Line Coders in the Return-to-Zero, Non-Return-to-Zero and Differential codes.
- Digital Modulators, respectively for the Amplitude (ASK), Frequency (FSK), Phase (PSK).
- Digital Detectors for the 3 types of modulation.
- Clock and data regeneration on reception.
- Line decoders, performing the complementary function of the transmission coders.
- Data matcher, allowing to match the received signal against the transmitted one, thus producing a count signal for BIT ERROR RATE measurements.

Study topics:

- Review of the basic concepts on data transmission.

- The B4340-P trainer: system description.
- Amplitude shift keying technique.
- Frequency shift keying technique.
- Phase shift keying technique.
- NRZ, RZ, DIFF line codes.
- Bit error rate measurement.
- Data transmission in noise-impaired environments.

For the efficient execution of certain experiments, use of the B4350 – Transmission Channel Simulator and B4351 – Bit Error Counter are recommended with this module.

The trainer is to be power-supplied from a +15 stabilized source, such as our B4192 power supply.

The trainer is complete with a set of plug-in cables of various colors and lengths and with an instructions manual.

The trainer is available in Panel version only, shown in the picture, where the circuits are enclosed in a sturdy aluminium cabinet (340 x 260 x 40mm size).

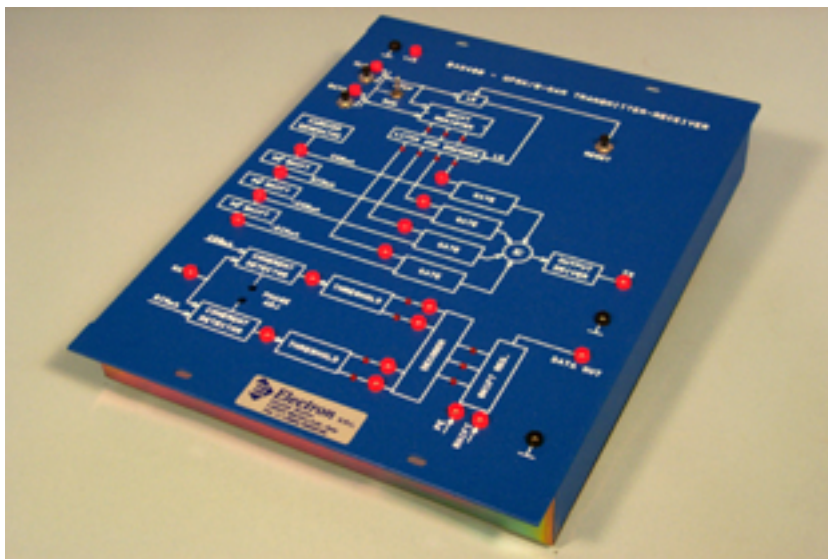
For where the Board version is preferred (with the components in view) the B43S2 trainer is available, covering, amongst others, these same study topics.

Please refer to the Electron Catalogue section for the Board series for further details.

Ordering code:

B4340-P (Panel type)

B4341 – QPSK/8-QAM TRANSMITTER/RECEIVER



General:

The trainer can be regarded as an appendix or extension of the B4340 trainer.

This last deals with Digital Data transmission in general and focuses on the ASK, FSK, PSK techniques, while the B4341 specifically deals with the further developments of the Phase Shift Keying (PSK) techniques into the multi-phase Quadrature Phase Shift Keying, also regarded as a multi-phase Quadrature Amplitude Modulation.

The B4341 is a complete transmission /reception system simplified to its fundamentals in order to present to the students the essentials of this technique.

A great part of the investigations and experiments foreseen on this trainer can be carried on using this panel alone, while only a few experiments require the joint use of the master B4340 trainer.

The trainer is to be power-supplied by a stabilized 0/+15V source, like the B4192 power supply. Current drain does not exceed 0.2A maximum.

The trainer is supplied with a set of accessories (plug-in cables) and an instructions manual.

Study topics:

- BPSK
- Multi-phase PSK
- Multi-phase demodulation and decoding
- Digital Input circuits (3-bit packaging)
- Carrier generators and phase shifters
- Encoders, carrier gates and adder
- Detection in the receiver
- Level comparators stage and output decoding
- Output parallel-to-serial conversion
- Operating in STEP or RUN mode

The trainer is available in Panel version only, shown in the picture, where the circuits are enclosed in a sturdy aluminium cabinet (340 x 260 x40mm size).

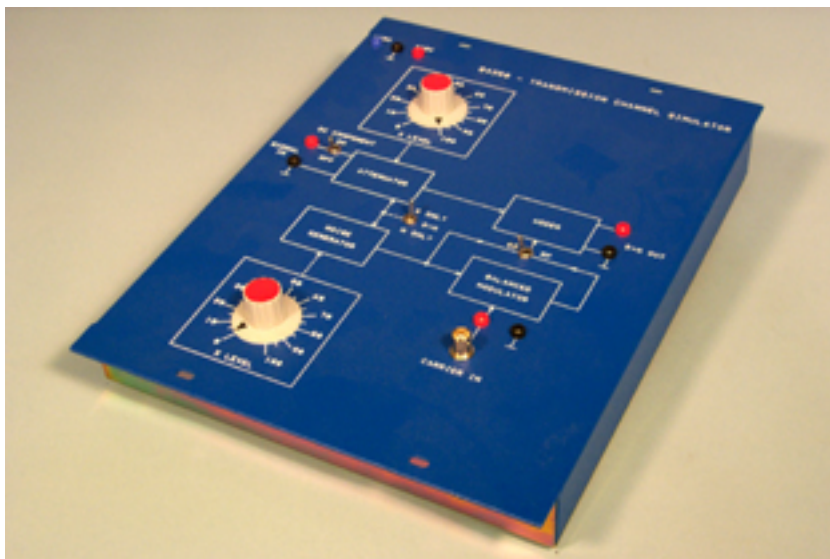
For where the Board version is preferred (with the components in view) the B43S2 trainer is available, covering, amongst others, these same study topics.

Please refer to the Electron Catalogue section for the Board series for further details.

Ordering code:

B4341-P (Panel type only)

B4350 – TRANSMISSION CHANNEL SIMULATOR



General:

This instrument consists of general-purpose test tool to simulate a transmission media subject to noise and attenuation. Its use with the Digital Communication Trainer is recommended to extend the range of the experiments to the performance of these systems in noisy environments.

The instrument consists of a variable attenuator and an RF noise generator.

The RF noise is produced by a white noise generator and a balanced modulator to shift the noise spectrum to the band concerned by the type of transmission experiment being carried out.

The trainer is available in Panel version only, shown in the picture, where the circuits are enclosed in a sturdy aluminium cabinet (340 x 260 x 40mm size).

For where the Board version is preferred (with the components in view) the B43S2 trainer is available, covering, amongst others, these same study topics.

Please refer to the Electron Catalogue section for the Board series for further details.

Ordering code:

B4350-P (Panel type)

B4351 – EVENT COUNTER



General:

This instrument is meant to serve as an accessory to the B4340 and B4350 trainers. When performing experiments of data in noisy environment, this instrument allows the counting the faulty bits received over a given period. This is for Bit Error Rate (BER) measurements and calculation.

The B4351 accepts input data at TTL level.

Minimum pulse width is 10 μ sec. Maximum counting rate is 50K pulses/sec.

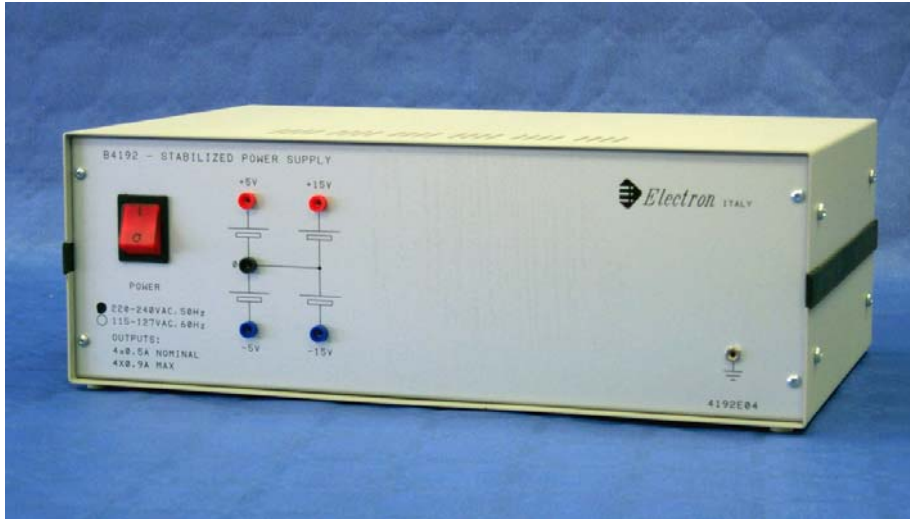
The instrument is provided with a high visibility 5-digit numeric display.

Power supply is from AC mains at 220-240V AC (other voltages available on request).

Ordering code:

B4351

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

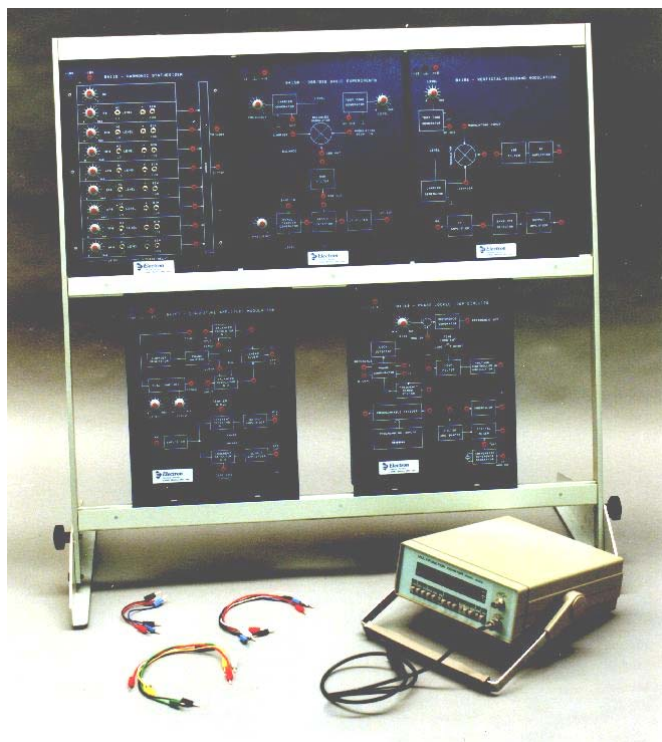
- Foldback short-circuit current limiting (approx. 200mA I_{cc})
- Output ripple: better than 50mV RMS

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

Ordering code:

B4192

B4195 - FRAMEWORK FOR PANELS



This accessory is suitable to hold up to 6 training panels, in two levels of 3, so that they may be used for class demonstration (vertical position) or student use (inclined position).

Structure and rails are in aluminium profile, specially designed for quick insertion of all the laboratory modules