

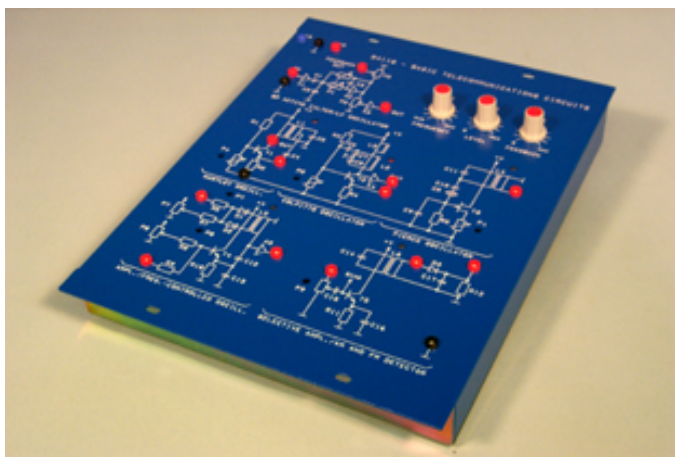
Electron S.R.L.

Design
Production &
Trading of
Educational
Equipment

B41 SERIES – BASIC TELECOMMUNICATIONS TRAINERS (PANEL VERSION)



B4110 – BASIC TELECOMMUNICATIONS CIRCUITS



General:

This panel is intended to familiarize the students which already attended a General Electronics course, with circuits specifically employed in the telecommunications field. The basic features of each circuit type are investigated, together with some application examples of special interest.

For instance, a tunable bandpass active filter is first investigated in its fundamentals and then turned into a Low Frequency oscillator by looping its output signal to the input. This allows the student three-fold Telecommunications study topic: active filters, feedback, signal generation.

Another module of the B4110 trainer is a varicap oscillator, which is first studied as it is, then its amplitude and frequency ranges are investigated. Furtherly the circuit is configured as an Amplitude Modulator and Frequency Modulator, and finally the amplitude and frequency control characteristics of the circuit are used to show the principle of stabilization of these parameters by means of feedback.

Features:

- Band-Pass active filter and its conversion into a Low Frequency oscillator
- Hartley and Colpitts oscillators
- Crystal-controlled Pierce oscillator, with FET
- Amplitude and Frequency controlled oscillator
- Selective amplifier with AM and FM detectors

The trainer comes complete with a cable accessories kit and an extensive instructions manual.

Study topics:

- The tunable active bandpass filter
- Fourier analysis of a squarewave by means of the tunable BP filter
- The low-frequency sinewave oscillator
- The Hartley oscillator
- The Colpitts oscillator
- The Varicap oscillator
- Amplitude modulation of the Varicap oscillator
- AM demodulation
- The Varicap FM modulator
- The FM slope demodulator
- The Pierce oscillator

The panel requires a stabilized power supply delivering +15, -15V DC. The B4192 power supply is recommended.

The trainer is available in two versions. One is the Panel version, shown in the picture, where the circuits are enclosed in a sturdy aluminium cabinet (340 x 260 x 40mm size). The other version is an open Board one, with the components in view.

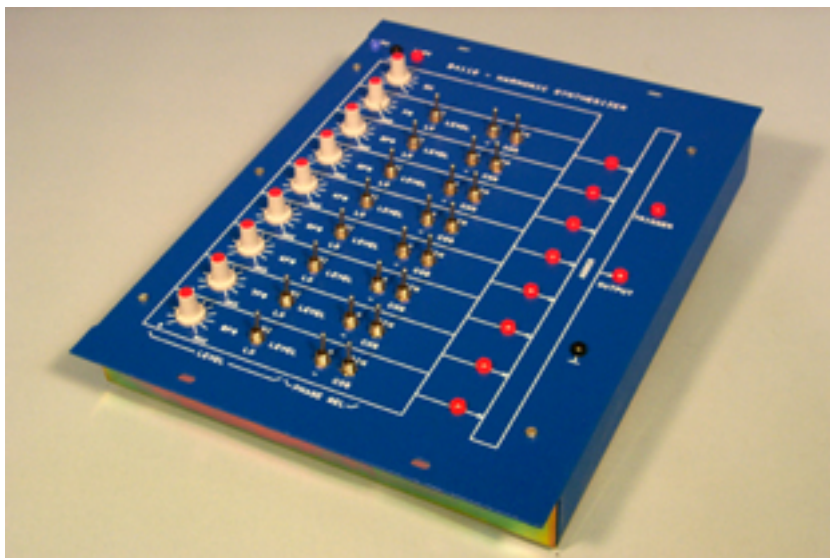
Both versions have substantially the same technical characteristics and allow the same study topics.

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

Ordering code:

B4110-P (Panel type)

B4112 – HARMONIC SYNTHESIZER



General:

This panel is an application of the Fourier's theory on spectral composition of periodic signals.

The panel provides sinewaves, precisely generated by cyclical readout of EPROM memories, whose frequencies are 100, 200, 300, 400...800Hz and whose phase is carefully controlled.

The sinewaves can be adjusted in level and summed, to be used as the Fundamental and the Harmonics of the waveshape to be synthesized.

Any periodic waveform can be synthesized. Examples which are part of the guided experiments are:

- Squarewave
- Triangle
- Sine half-wave
- Parabola
- Exponential

The panel is to be power-supplied from a stabilized source at +/-15V.

Use of our B4192 power supply is recommended.

The power drain does not exceed 100mA from each one of the sources.

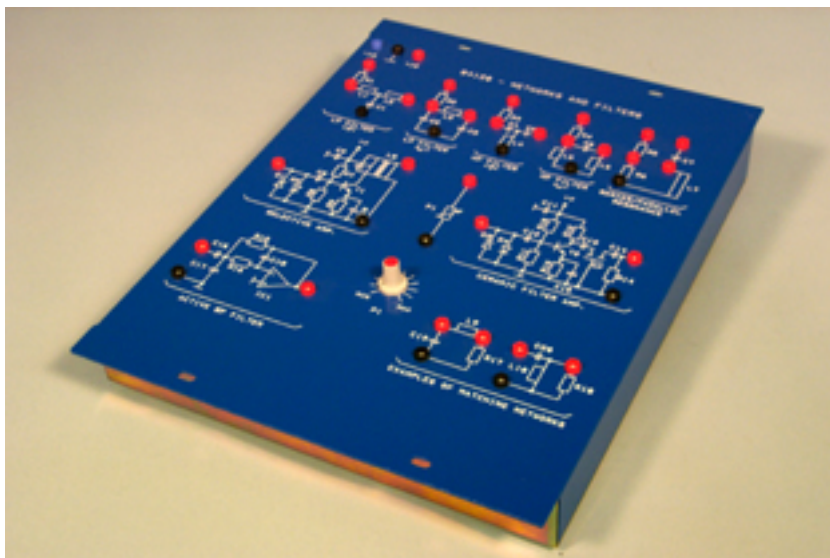
Full exploiting of the training capabilities of this trainer only requires use of simple and general purpose laboratory instruments, consisting of:

- Dual-trace oscilloscope, 20MHz bandwidth
- Frequency meter.

Ordering code:

B4112 (panel type only).

B4120 – NETWORKS AND FILTERS



General:

This panel deals with important aspects of network analysis and synthesis, as well as with filters.

These subjects are a background requirement for students attending courses in telecommunications.

Study topics:

- Resonance. Resonance curves
- Resonance in loaded circuits
- Impedance transformation. Coupled circuits
- Passive Filters of various configuration and characteristics (Low-Pass and High-Pass with "T" and "PI" structures)
- Active Band-Pass filter
- Piezoelectric Crystals
- Selective amplifier
- Matching networks
- Network reduction exercises

The panel requires a stabilized power supply delivering +15, -15V DC. The use of the B4192 power supply is recommended.

The trainer is available in two versions. One is the Panel version, shown in the picture, where the circuits are enclosed in a sturdy aluminium cabinet (340 x 260 x 40mm size). The other version is an open Board one, with the components in view.

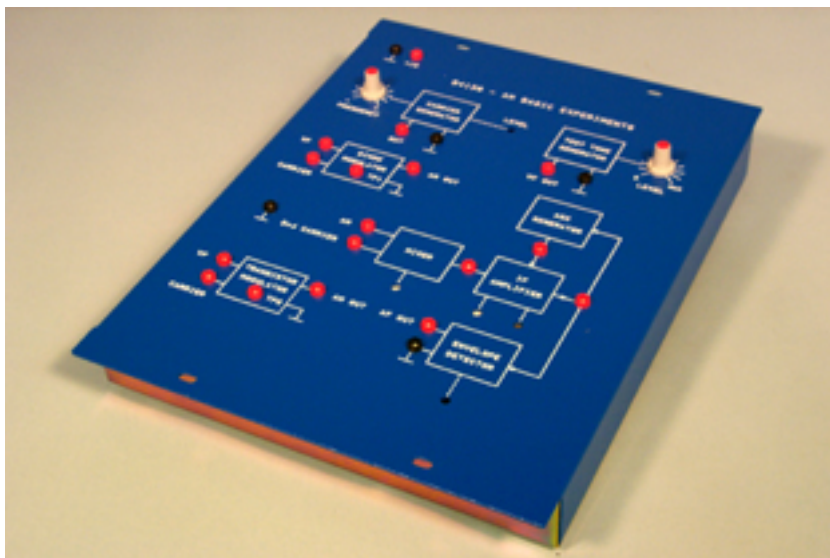
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Please refer to the Electron Catalogue section for the Board series for further details.

Ordering code:

B4120-P (Panel type)

B4130 – AM BASIC EXPERIMENTS



General:

This panel consists of a set of modules to study and experiment the basic properties of AM Waves and to introduce the student to the most widely diffused circuits to generate and process these signals.

Features:

- Diode AM modulator
- Transistor modulator
- AM mixer/frequency converter
- IF amplifier with AGC
- AM diode detector
- VF and carrier generators

The panel is to be power-supplied from a +15, -15V DC source. The use of the B4192 power supply is recommended.

Study topics:

- Basic properties of AM: spectra and power.
- AM wave generation: operation of AM modulators, efficiency, linearity, modulation index, etc..

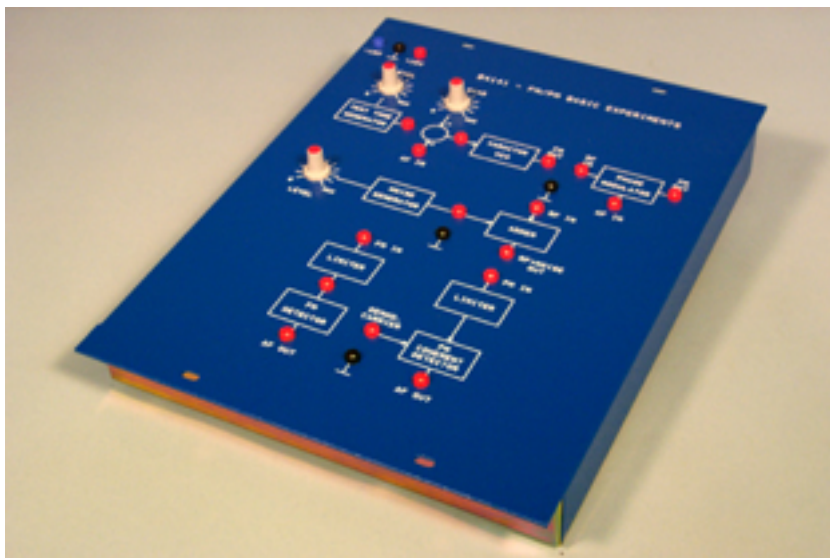
- AM modulation conversion: operation of mixers/converters, conversion products, filtering of unwanted terms, etc..
- AM wave processing: principle of IF amplifiers, gain, bandwidth, stability.
- AM wave detection: operation of driver/detector stage.

The trainer is available in two versions. One is the Panel version, 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 B41S 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:

B4130-P (Panel type)

B4141 – FM/PM BASIC EXPERIMENTS



General:

This trainer consists of a set of modules to study and experiment the basic properties of FM and PM waves and to introduce the student to the basic circuit configurations in use to generate, process and detect these signals.

Features:

- Auxiliary voice frequency generator, adjustable in level and fixed in frequency, to be used as a source of modulating signal
- Carrier oscillator, capable of use as a FM modulator
- PM modulator
- Limiter and FM detector
- Limiter and PM coherent detector
- Artificial noise generator/adder, to study the performance of FM and PM in noisy transmission media

The panel operates at a nominal frequency to approx 470kHz. This allows execution of the experiments with low-cost instruments.

The panel is to be powered from an external power supply, at +15, -15V stabilized such as the B4192 power supply.

The panel is supplied complete with plug-in cables and instructions manual.

Study topics:

- Study of the voice frequency auxiliary generator
- The Varicap modulator (FM)
- Modulation index and deviation ratios
- Side bands and bandwidth for FM and PM
- The FM detector
- The PM coherent detector
- Performance of FM and PM in noisy transmission environment

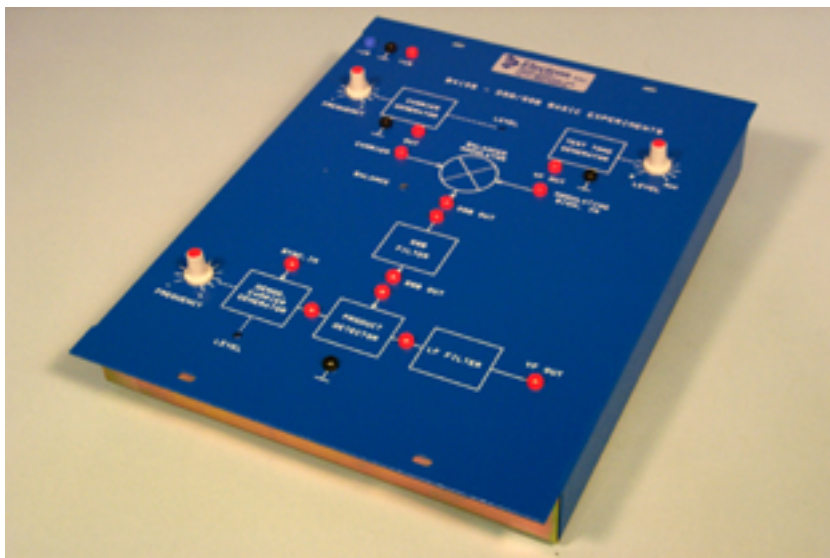
The trainer is available in two versions. One is the Panel version, shown in the picture, where the circuits are enclosed in a sturdy aluminium cabinet (340 x 260 x40mm size). For where the Board version is preferred (with the components in view) the B41S trainer is available, covering, amongst others, these same study topics.

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

Ordering code:

B4141-P (Panel type)

B4150 – DSB/SSB BASIC EXPERIMENTS



General:

This panel consists of a set of modules to study and experiment the basic properties of AM with suppressed carrier (DSB-SC), Single Side Band (SSB).

In addition the panel introduces the student to the basic circuits to generate, process and detect DSB/SSB signals.

Features:

- Carrier generator with adjustable frequency and level
- Audio frequency generator, for use as a modulating signal
- DSB balanced modulator
- SSB filter
- DSB/SSB synchronous, asynchronous demodulator
- Frequency generators for demodulation

Study topics:

- Basic properties of DSB/SSB waves: bandwidth, power, spectrum.
- DSB waves generation: operation of the

modulator efficiency, etc..

- SSB waves generation by DSB filtering. Requirements of the SSB filter.
- DSB/SSB detection: operation of the detector, beating frequency concept, efficiency and linearity of the detector.

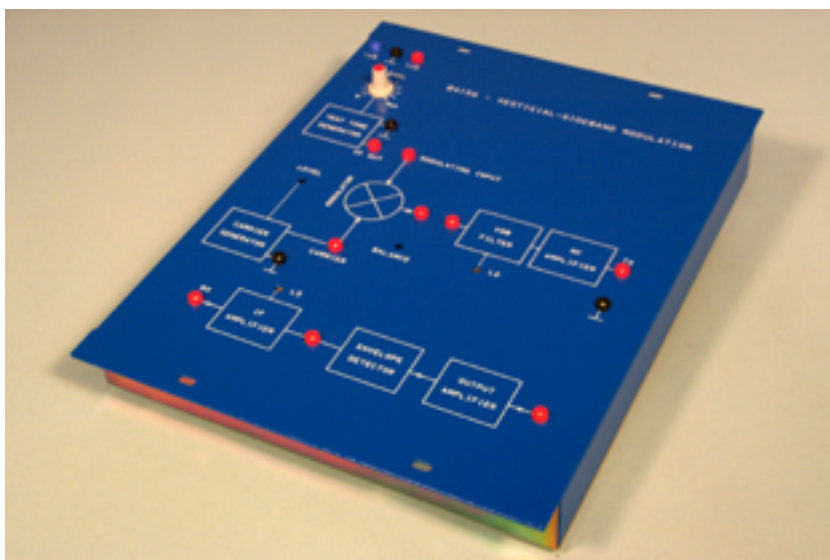
The panel requires a power supply at +15, -15V DC. The use of the B4192 power supply is recommended.

The trainer is available in two versions. One is the Panel version, 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 B41S 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:

B4150-P (Panel type)

B4156 – VESTIGIAL SIDEBAND MODULATION



General:

The trainer includes on a single panel the facilities required to study and experiment the Vestigial Sideband Modulation (VSB) technique.

Features:

- Carrier generator
- Amplitude Modulator
- VSB filter and RF amplifier
- Receiver with IF amplifier and detector

The modules above can be interconnected to implement a VSB transmitter and receiver system for demonstration and study purposes.

The trainer also includes on-board an auxiliary test-tone generator to serve as a sample audio-frequency signal.

The trainer is to be powered from stabilized supply sources delivering +/-15V. The current drain does not exceed 100mA from each source.

Use of our B4192 power supply is recommended.

Optional accessories:

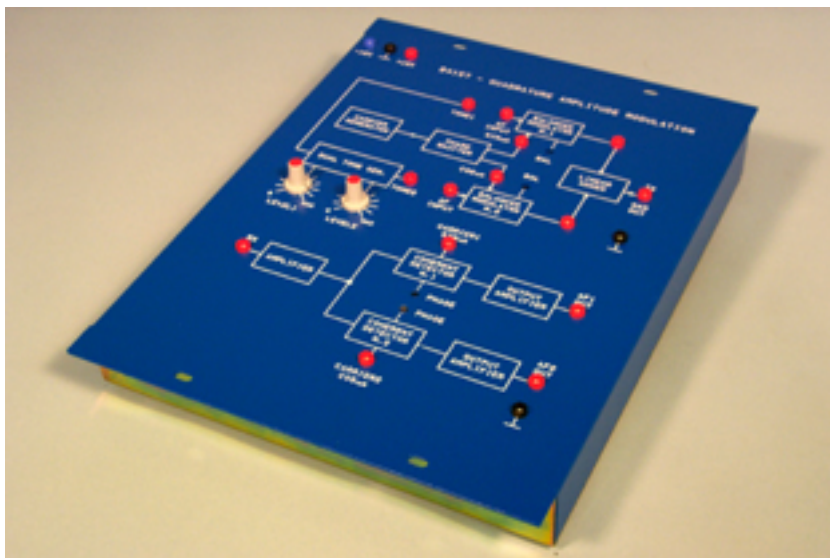
- Dual-trace oscilloscope, 20MHz bandwidth
- Frequency counter.

The trainer is delivered with a set of plug-in cables of various colors and lengths to be used to perform the connections between the panel modules as required to perform the experiments.

Ordering code:

B4156 (panel type only)

B4157 – QUADRATURE AM



General:

The trainer includes on a single module (panel) the facilities required to study and experiment the Quadrature Amplitude Modulation (QAM) technique.

Features:

- Carriers generator – quartz-controlled, providing sine and cosine-phased carrier signals.
- Balanced modulators and linear adder – to implement the transmitting section.
- Coherent detectors – to process the received signal, each one provided with separate carrier phase adjustment to experiment channel crosstalk versus carrier phase.
- Output amplifiers – delivering the decoded received signal.
- Auxiliary test tone generators – the signals from these last is to be used as Audio Frequency source in alternative to external instruments.

The trainer is to be powered from stabilized supply sources delivering $\pm 15V$. The current drain does not exceed 100mA from each source.

Use of our B4192 power supply is recommended.

Optional accessories:

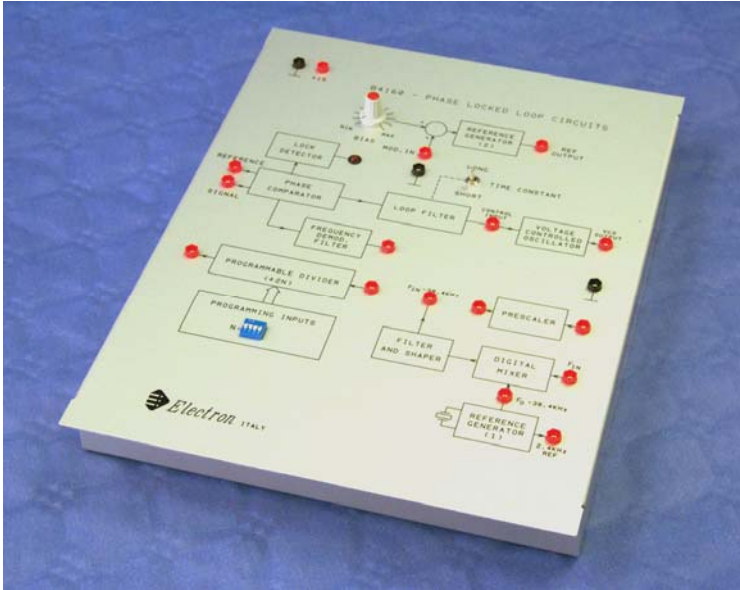
- Dual-trace oscilloscope, 20MHz bandwidth
- Frequency counter.

The trainer is delivered with a set of plug-in cables of various colors and lengths to be used to perform the connections between the panel's modules as required to perform the experiments.

Ordering code:

B4157 (panel type only)

B4160 – PHASE LOCKED LOOP CIRCUITS



General:

The panel deals with the principles of PLL systems in general and with an overview of the major applications of this technique.

Features:

- Voltage controlled oscillator, reference oscillator, frequency divider, phase comparator, loop filter.
- Modules and circuit blocks to demonstrate the frequency shift keying.
- Keying modulation/demodulation process, the FM demodulation and frequency synthesis.

The panel is recommended for use in telecommunication courses at basic level and advanced level.

The panel requires a power supply of +15 DC. The use of the B4192 power supply is recommended.

The trainer is available in two versions. One is the Panel version, shown in the picture, where the circuits are enclosed in a sturdy aluminium cabinet (340 x 260 x 40mm size). The other version is an open Board one, with the components in view.

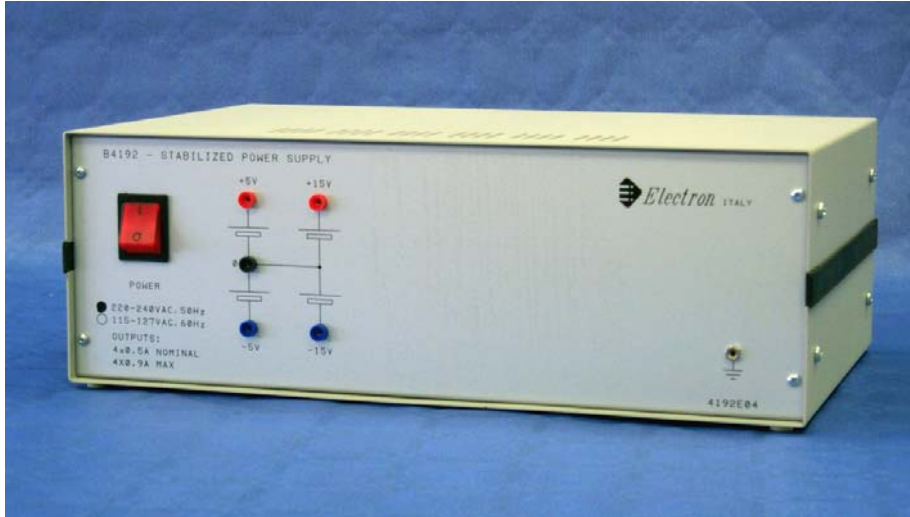
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Please refer to the Electron Catalogue section for the Board series for further details.

Ordering code:

B4160-P (Panel type)

B4192 – POWER SUPPLY



This power supply is implemented in a desktop 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

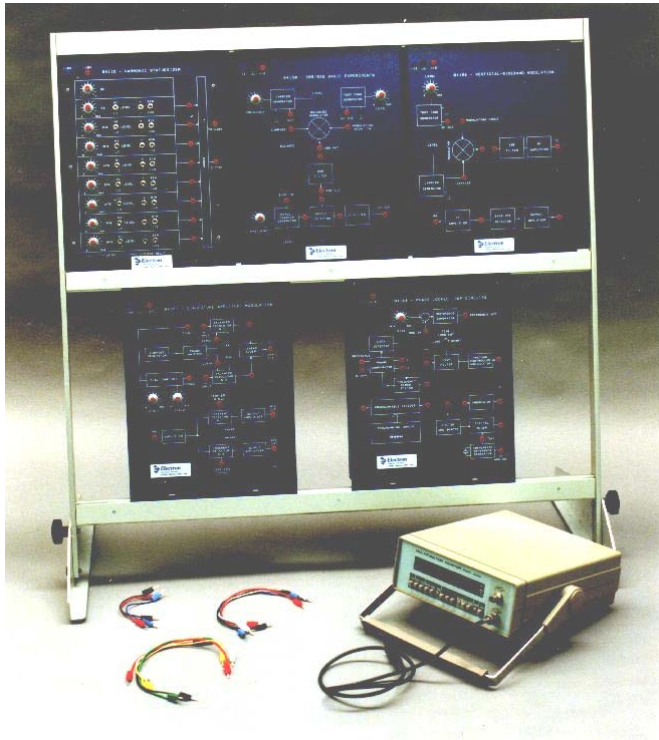
- Foldback short-circuit current limiting (approx. 200mA I_{cc})
- Output ripple: better than 50mV RMS

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