

# INTERNATIONAL 3600 SYNTHESIZER

THE International Voltage Controlled Synthesizers have been developed as "state of the art" systems. Extensive use has been made of digital techniques and CMOS has been used as the primary logic family.

In the larger 4600 unit no compromises were made that would hinder expansion of the system. Construction could pace the ingenuity or finances of its builder. The unit had a 22 x 22 way patchboard to facilitate the rapid selection of various module configurations.

The 3600 offers the most popular features of our larger 4600 synthesizer but is simpler.

It is faster to operate as it has a switch patching system rather than the matrix patchboard of the larger unit.

The 3600 is particularly suitable for

live performance and portable use, being completely enclosed in a rugged carrying case with detachable lid, the lid is large enough to house a monitor loudspeaker which can be driven by the headphone amplifier.

## 3600 FORMAT Three Oscillators:

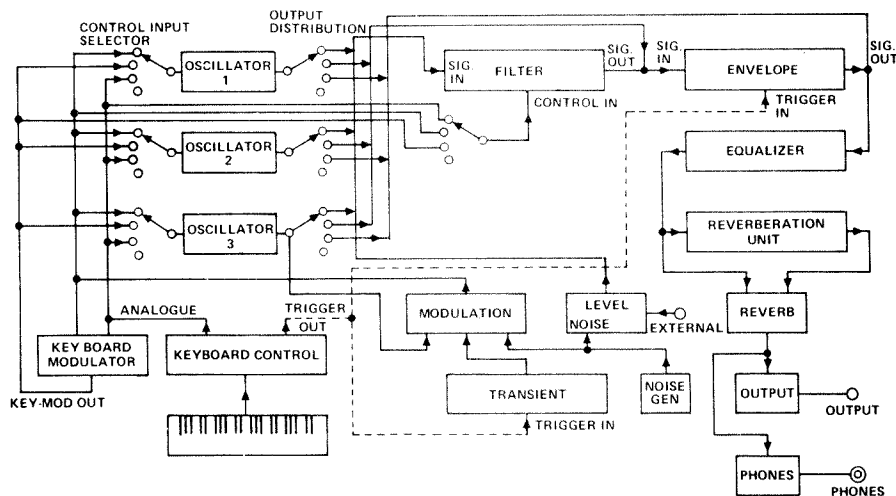
Three identical Voltage controlled Oscillators give Sine, Triangular, Sawtooth, Inverted Sawtooth (Ramp) and Rectangular waveforms. Each oscillator is switchable over seven (precisely tuned) octaves, plus a

This article introduces the construction of the second of our two music synthesizers — the International 3600. The larger International 4600 was described in a series commencing October 1973.

The 3600 is a relatively inexpensive model that is basically designed as a portable, limited capability instrument for stage work. It does however offer a performance superior to most small synthesizers at present on the market.

The larger 4600 is a full scale unit. It uses the same electronics but has more modules, a programming patchboard and many additional features which make it more suitable for studio use.

The flexibility of both units, in particular the larger, allows individual constructors to tailor an instrument to their own requirements.



Block schematic of 3600 unit. Note this will be shown larger next month. (Copyright Electronics Today International © ).

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Sub-sonic (very low frequency) range for control purposes. The oscillators are insensitive to temperature changes.

**Four Octave Keyboard** A four-octave monophonic keyboard is provided with variable 'Glide' and 'Sweep' control. Tuning to other instruments is done using the 'Tune' control located on the 'keyboard control' module.

**Modulation Mixer** A 'Modulation' module provides a control source by mixing the output of Oscillator 3, the Transient generator, and white noise in any combination. The output is also sent to the Keyboard module where it is mixed (technically it is multiplied) with the keyboard voltage and a 'key mod' output is obtained i.e. the modulation modules' output tracks the keyboard.

**External Input** An external input signal such as guitar or voice can be sent directly to the filter by a continuously variable gain control located in the 'Level' module. A white noise control in the same module sends noise directly to the filter input.

**New Low-Pass Filters** A low-pass Voltage controlled filter selects its control from the 'Transient', 'Keyboard', 'Modulation', Module or 'Key Mod' outputs. The depth of control is continuously variable by a control next to the selector switch. A 'Tune' control determines the filters' starting point (pitch) and a 'Resonance' control provides variable resonant peak at the (voltage controlled) cut-off point. This filter is *not* the same as the original filters in the 4600 Synthesizer.

**Unique Transient Generators** A transient generator, intended primarily to control the filter, is triggered whenever a key is pressed on the keyboard and provides a programmed control voltage. It has two slopes, either of which can be rising or falling depending on the 'Start', 'Hold' and 'Final' level setting.

Initiation of the transient can be delayed until some time (variable) after a key is depressed on the keyboard. The hold level can be sustained until the key is released, or it will hold only for the duration of a preset (variable) period regardless of the key being lifted prior to, or after the set period.

**Envelope Generator with 'Hold delay'**. The output of the filter goes directly to the Envelope Control (Loudness contour) which has three slopes and an adjustable Hold Level. A hold delay similar to that in the transient generator is also incorporated. This can be overridden for manual hold on the keyboard.

**Five Section Tone Equalizer** The

output of the Envelope control unit goes directly into a five-section equalizer for finer refinement of tonal quality.

**Reverberation** A Reverberation unit forms the final path for the audio signal. A single control adjusts the amount of reverberation from zero to full.

**Super-stable** A special feature of the 3600 (and 4600) is that an 'exponential' control voltage is derived directly from the keyboard.

The reason for this is that the basic electronics of a voltage-controlled oscillator requires that a 'linear' voltage change at its input will provide a 'linear' pitch change at its output. However, our twelve-semitone musical scale works exponentially rather than linearly, and so a synthesizer keyboard must ultimately provide an 'exponential' voltage scale if the oscillators are to provide an exponential pitch scale.

It is relatively easy to obtain a 'linear' voltage scale from a keyboard by simply having resistors in a chain, all the same value. Voltages are tapped along the chain as a key is depressed. This 'linear' voltage scale is then converted to an exponential scale electronically, by an 'exponential converter' sometimes called an 'oscillator controller'.

Exponential converters are particularly susceptible to temperature, and most instruments based on such techniques have to be frequently retuned to overcome the inherent drift in pitch caused by temperature changes. Synthesizers use only one or two exponential converters to control banks of oscillators, whilst others use a separate converter for each oscillator.

To overcome this very common problem, the 3600 (and 4600) derive an exponential voltage directly from the keyboard by a unique matrixed voltage selection system which is not sensitive to temperature change. This technique also allows more accurate keyboard tuning than the 1% tolerance resistor chain found in most other synthesizers.

Constructional details of the 3600 synthesizer will commence next month. The 3600 uses many modules which are common to the 4600.

Both models are available from Jaycar Pty Ltd in kitset or built up form. The International 4600 completely assembled is \$1590. The price of the 3600 is not yet known but is expected to be around \$1000. (Both units are of course, substantially cheaper in kit form — about 50% less). ●