Kit Pak

Power Supply,
IC-stabilized,
Precision Master Generator;
Vibrato, Delayed Vibrato,
Hawaii-Effect,
Slalom, Slromatic,
Pitch Control, Transposer,
fully pluggable

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Kit Pak 1
Order No. 001

The new
Precision Master Oscillator
and the electronically
stabilized Power Supply.

WERSI always was a leader in the
design of tone generators. Even
the first generator, RG 869, was
IC-equipped. The next generator,
the DT 74, was based on MOS-
LSI technology. Now WERSI
presents the new PRECISION
MASTER GENERATOR G 1.
The new tone generator represents
another of WERSI's achievements.
of course, it utilizes MOS-LSI
technology throughout. All
frequencies produced depend on

a single master oscillator. The
12 frequencies of the highest
octave are derived in an LSI
circuit called the top-octave-
synthesizer (TOS). All other lower
tones are generated subsequently
in divide-by-two IC's. The master
oscillator is incorporated in a
ighty regulated feedback loop.
Other generator functions like
vibrato and slromatic influence
the gain element of the loop. The
arrangement is called a voltage-
controlled oscillator or more
commonly a VCO.
The generator outputs are normally
"silent". A tone is delivered only
when a key is depressed. If you
already have owned an organ you
know what that means. With most
organs all tones are continuously
fed to the extensive wiring result-
ing in cross-talk. This is called
"sing-through". It cannot happen
with the new WERSI generator.
The output waveform of our
generator is a square wave. This raw
signal is switched by the electronic
keyers. After the keyers the
square wave is either used directly
as an input to some formant
filters, combined by staircasing for
formant filters requiring sawtooth
inputs or filtered to sine waves for
the drawbars. A rectangular wave-
form with a 3:1 on/off ratio is
produced directly at a second set
of generator terminals. This pulsed
waveform is used for the piano.
We have four different basic wave
forms available simultaneously.
By connecting our transposer kit
the generator can be tuned to suit
any key of an entire octave. It can
be switched up 5 half-tones to F from standard pitch (C) and down 6 half-tones to F. The assembly of the generator is easy. All IC’s are supplied with sockets. The other components are simply inserted into the board and soldered. You will appreciate the easy-to-see layout so familiar with the WERSI products. The master oscillator is tuned by means of stable Cermet trimpots. All tones are automatically locked to the oscillator. The organ tones can never be out of tune with each other.

**Generator Functions**

The new WERSI tone generator has a basic tone range of 8 octaves. Count the slalom control and you have 9 octaves. Do not forget the transposer which adds another octave for a grand total of 10. Standard functions are the Hawaii-effect, vibrato (speed and intensity adjustable), delayed vibrato with adjustable delay, transposer, slalom and slalomatic as well as the master pitch control. All functions of the WERSI tone generator are programmable. When programmed these functions are available from memory like the functions of all other building blocks of the new WERSI organ kit system.

**Output Connectors**

All 96 tones are fed to 3 parallel rows of connector pins. Each of the outboard pins has a number assigned which corresponds to the frequency number. The entire musical scale is numbered sequentially, starting with the #13 for the lowest C (C3) and ending with the #108 for the highest B (B4). The output connector pins will receive the daughter boards as part of the keying system (Kit Pak 2).

**MOS LSI-Technology**

In the Precision Master Oscillator the heart of the WERSI-organ

**Slalom and Slalomatic**

The slalom slide control on the left endblock continuously tunes the generator over an octave. The slalomatic feature does the same thing automatically. When a key is depressed it siews up or down at your desired speed. The slew range spans an octave or less depending on the slalom control setting.

**Power Supply**

Our new twin-voltage power supply has fewer parts than this paragraph has words. This little giant is IC-stabilised, short circuit-proof and packs thermal overload protection. The large array of connector pins can be used for the distribution of power to all building blocks of the organ except the power amplifier chassis. The Power Transformer is included in this Kit Pak. Later it will become part of the power amplifier chassis (Kit Pak 6).
Kit Pak

Electronic Keying with
Envelope Control for
Immediate and Soft Attack.
Three Sustains for
all Footages.
Drawbar System
Printed Matrix
Wiring Harnesses

The electronic keying, contained in this Kit Pak, represents a major step into the future of electronic organ kits. Many organ brands still use multiple mechanical key switching.

The keyer has the responsibility of transmitting the generator signals to the tone forming circuits whenever a key is depressed. Depending on the number of footages a dozen or possibly more contacts are required per key. This means that approx. 800 to over 2,000 contacts are needed in an organ.

WERSI replaced the mechanical contacts with electronic switches. These electronic switches are contained in integrated circuits. They have no moving parts. A single contact per key controls any number of these switches. The contact controls a DC command voltage and no audio signal. WERSI's electronic keyers are designed for single pole make only action ensuring trouble free operation.

The IC for the electronic keying is a WERSI in-house development. It is being manufactured in PL technology by one of the largest semiconductor companies, Texas Instruments. This IC does away with contact problems. The keyer circuits also contain the sine wave forming for all footages. All outputs are taken from low-impedance operational amplifiers.
WERSI's electronic keying actually takes place in two locations. In the inactive state, electronic gates at the generator outputs prevent any signals from reaching the wiring and the keyers are off. When a key is depressed the corresponding generator gates are requested to pass only the signals required. All other signal-distributing wires remain inactive. This results in very clean tones while you play and virtual silence otherwise.

Several years of research and development preceded the introduction of this keying system. Besides the desired soft attack the keying envelope must provide instantaneous response to the depression of a key. WERSI puts much emphasis on the fast attack which is so important for some solo voices and drawbar registrations. The technical realization of the variable attack feature led to a patent application. WERSI's electronic keying offers you a number of advantages: High reliability, choice of fast or soft attack and short/medium/long sustain. The organ can be played polyphonically with sustain in all footages and with all stops. A WERSI organ, even when equipped at the lowest option level, has a multitude of musical expressions usually found in instruments costing much more.

The assembly of the electronic keyers is simple. Resistors, capacitors and IC's are installed on small plug-in boards. These boards, in turn, are soldered to the printed matrix. The wiring is accomplished by connecting the ready-made harnesses.

The integration of electronic keying makes it possible to provide sophisticated circuitry at reasonable cost. The keyers combine the fast attack property of mechanical contacts with the flexible envelope control of solid-state switching.

Kit Pak 2 also contains the sine wave forming and the drawbar assemblies. In connection with Kit Pak 1 you now have the basic electronics needed to make up a drawbar organ.

The IC for the electronic keying is a WERSI in-house development. This IC does away with contact problems.

12 or more key contacts were required yesterday, today it is modern IC technology. These two pictures illustrate the progress.
Kit Pak

Pre-Assembled Manuals,
Envelope Control With Quick
and Soft Attack,
Three Sustains,
Sine Wave Drawbars,
Wiring Harnesses.

A single contact controls
the Electronic Keyers with
Fast or Soft Attack and
Three Sustain Levels.

This Kit Pak contains the envelope
control with the key contacts. The
envelope control boards will be
mounted directly to the underside
of the manuals. The key contacts
are included on the circuit boards
enabling an easy and fast assem-
by. The contact is a self-cleaning
spiral spring.

Depending on the selected mode,
the envelope circuitry controls the
electronic keying either with direct
tone attack, soft attack and short,
medium or long sustain. This
envelope control is an important
prerequisite, together with WERSI-
VOICE, for the incorporation of the
STRING ORCHESTRA into all
WERSI organs. The circuits are
built with modern IC's. The
medium sustain can be adjusted
by a trim pot to suit your personal
taste.

Combining Kit Paks 1 through
3 you own all necessary electronics
which are necessary to form a
basic organ. It would be capable
of playing drawbar settings. Only
the rotating baffle effect of WERSI-
VOICE is missing. Adding the
fixed stops you could play all the
bright solo voices including the
entire string choir. WERSI's
smallest spinet is equipped with
envelope control in the upper
manual while it is optional equip-
ment for the lower manual. All
other models have standard enve-
lope control in all manuals.

The soft attack feature is especially
valuable for classical and liturgical
music. It simulates the natural
sound build-up of pipes. The tones
appear with a slight time delay and
start softly. This makes WERSI's
organs perfectly suited for classical
and liturgical interpretations.

The sound of a real sine wave
drawbar system excites every
musician. Why all the emphasis on
"real"? Often you find organs
equipped with drawbars but they
lack the purity of true sine waves.
To generate 'sine wave signals
spanning the entire manual and all
Each WERSI Organ has Fast and Soft Attack in all Footages.

footages a sine wave tone generator or chained filtering of square wave signals can be used. One single filter cannot handle the combined output of an entire manual. If a sine wave generator is used bright wave fixed stops are difficult if not impossible to obtain.

In connection with WERSI’s new precision master generator, the electronic keying, the staircase combiners and the drawbar system we have sine wave (cascaded filtering), square wave and sawtooth wave forms available simultaneously.

WERSIVOICE is equally important as is the correct waveform for that familiar drawbar sound coming from the rotating baffle. We have the drawbars and WERSIVOICE. Plus all square and sawtooth wave voices as well as numerous special effects. Many professionals have recognized these facts.

You may look at the drawbar system as a complete pre-set registration for each manual. If you switch a WERSI organ from drawbars to fixed stops you hear the sound characteristics of two different worlds. You can even combine the two systems, add the piano and a large variety of special effects. After the completion of this Kit Pak and the addition of a suitable amplifier system you already have a very versatile organ.

The drawbar system is an integral part of the system, not an afterthought. WERSI has cast its organ concept in this light.
Kit Pak

Cabinet With Selected Veneers,
Hinged Stop- and Keyboards,
Steel Control Panel,
Bench

Kit Pak 4
Order No. 004

Completely finished Cabinets in selected veneers for all WERSI Organs.

A WERSI Organ easy to assemble — a fascinating Do-it-Yourself project.

WERSI has outfitted its new line of organs with redesigned cabinets. They are mechanically stable and are equipped with a novel hinge system for stop- and keyboards. The mechanical system has led to the application of a patent. It enables the kit builder to assemble the playing table accurately. The cabinets and all panels have the cutouts for the highest option level.

Should you elect to limit the equipment of your organ to option level 1 or 2 you may want to order the missing stop tablets ahead of time for optical completion. Another possibility: You devise bezels to cover the unused openings. The mechanical assembly is easily accomplished and does not require any special tools. The new WERSI hinge system allows the access to all building blocks during the assembly as well as after the completion of your project.

WERSI manufactures all cabinets in its own cabinet making facility. There is an extensive array of hand-selected veneers available. American black walnut is supplied standard. For a premium you can order other veneers such as Brazilian Rosewood, Teak and light or dark Oak, for prices see price list. Consult factory for availability. The portable model Orion W 1 T comes in a vinyl-clad cabinet. The portable Helios W/2 T is finished in wood and sits on a chrome plated frame.

The front panel is a pre-fabricated and contoured steel frame. This ensures an accurate fitting of the stop switches and control elements. All surfaces of the playing table are finished with a scratch-resistant velvet-like coating.
Mono Preamp with Reverb, Bass, Treble and Loudness Control, Stereo Preamp with Reverb, Bass, Treble and Loudness Control, Main Wiring Harness with Connectors

The assembly of the electronic subunits is easy. You take the components from the bags, install them into the circuit boards and solder their leads. We know from experience that most mistakes are made when wiring the entire organ. You must watch where the wires go, you have to avoid cross-talk by proper routing and the grounding of subunits requires special attention.

WERSI always supplied harnesses for the wiring between the generator and the key switching. When designing the concept of the new line of organs WERSI decided to include a comprehensive wiring harness which accomplishes the interconnections of all building blocks for the highest option level. You merely attach the connectors to the wire ends, fasten the harness to the cabinet and plug in the connectors—your organ wiring is done.

The assignment of harness wires is made clear through color coding. Each wire exits from the harness exactly at the location where it will be connected. Unused branches for future options are simply left alone. Even an incompletely equipped organ is operational.

Let's illustrate the assembly of a WERSI organ: Subunits are assembled, checked and mounted in the cabinet according to the detailed kit- and organ assembly manuals. Then the small wiring harnesses are installed and finally the main harness. All connectors...
Close-up view of the Main Wiring Harness.

WERSI Wiring Harnesses eliminate wiring errors for the do-it-yourself organ builder.

are plugged in. Now the organ, you built yourself, will sound exactly the same as one of our factory-produced models. The system is designed for the non-expert builder.

The new preamps of WERSI's organs make use of operational amplifiers for low-distortion mixing and amplification. Kit Pak 5 contains a single-channel preamp for the Orion models. For all other models twin-channel pre-amps are supplied. The preamp has electronically switched audio inputs and the summation of the incoming signals. The remote controlled channel selectors enable the distribution of the individual sound sources from within the organ to left and right channels. The operational amplifiers sit on the plug-in daughter board. They provide signal amplification and active treble and bass controls.

With twin-channel preamps a single reverb channel is normally used with an externally mounted spring unit. Provisions have been made for the addition of a second reverb channel. The low-impedance output of the preamp — level adjustable — is fed to the power chassis and the jack marked „Ext. Amplifier”.

The swell shoe has an LDR (light-dependent resistor) volume control. The associated amplifier stage on the preamp has provisions for base and treble boost at low volume settings. This is called a physiological loudness control.

Additional in- and outputs on the preamp are designed for recording and playback purposes. The corresponding connectors, together with an ear-phone jack, are mounted under the playing shelf.
The sound of an organ can only be as good as the weakest member of its building blocks. We designed matched amplifier systems for the organs. This Kit Pak contains the power amplifier — monaural for the model "Orion" and stereophonic for all other models.

The power chassis is a right-angled steel frame. It contains one or two power amplifiers and the power transformer. The rear panel of the chassis serves as interface for the outside world. Here you will find the AC power input, the primary fuses and jacks for external speakers and external tone cabinets. WERSI's reliable 70 Watt power amplifiers provide ample power for home use even if you like to play with the windows shaking. Special organ speakers and tweeters radiate the sound.

The power chassis is easy to build. The circuit board(s) is to be assembled and mounted. A ready-made wiring harness is used for all inter-chassis hook-ups and terminates in two connectors.

Kit Pak 6 also contains the complete wiring harness for the organ base. It connects the power chassis, the speakers and the swell shoe to the top half of the organ's cabinet. It is simply fastened in place and connected — now the organ's lower half is fully operational.

The 6-pole receptacles at the rear of the power chassis provide AC power, low impedance audio and a switched control wire for external tone cabinets.
Kit Pak

Formant Filters for All Solo- and Pipe Registers, Stop Switches as well as the Master Control Center for All Volume and Time Functions

Engraved Stop Tablets.

Kit Pak 7
Order No. 007

WERSI developed its own stop switch for the new line of organs. The switches are mounted directly on the respective circuit boards eliminating all wiring between switches and circuits. They have self-cleaning wipe action contacts. The top row of stops are tongue tabs while all others are rocker tabs.

Like all other subunits, the fixed stop filter assemblies are fully pluggable. They contain the saw-tooth combiners and the filters for the individual stops. Each stop filter is on its own daughter board with optional edge connector. The filters are gated on and off electronically such that their functions can be incorporated into the WERSIDATA programming.

The solo stops were expanded and now encompass new sound colors. Each filter system includes string stops producing, with WERSIVOICE, the beautiful voices of a string choir. Brilliant solo stops include clarinet, trumpet, oboe, trombone, saxophone, horns and flutes. Some of the more complex formant characteristics are achieved with the help of active filters.

Channel assignment tabs are located beside the stop tabs, allowing the selective routing of fixed stops and drawbars to the WERSIVOICE. The pre-selector switch „Drawbars/Fixed Stops“ enables fast changing from a drawbar registration to a combination of fixed stop voices at the depression of a single tab.

The envelope controlled electronic keying of the WERSI organs represents a valuable asset to the fixed stop voices. Wind instruments can be reproduced with their natural soft sound build-up. Every key has its own envelope control so that every note appears with the same soft attack whether you are playing in a staccato or legato mode. This is not to be confused with the special effect „Contraction“ which you find in all WERSI organs. The contraction softens the attack only for the first note of a legato sequence.

The sustain feature gives completely new characteristics to some of the fixed stops as well as the drawbars. It makes it possible to simulate bells, a vibraharp and a music box. Sustain is also indispensable for the string voices. Each WERSI organ has at least a 16' Cello, an 8' Viola and a 4' Violin. These voices can be selectively played as solo stops or as ensembles of strings when used with WERSIVOICE.

After the inclusion of the fixed stops you are in a position to play the entire range of classical and liturgical music on the manuals of your organ. Besides the voices of the classical organ the soft attack characteristic of pipes is there too. Having built in Kit Pak 7 you have an organ which is capable of giving you a wide variety of sounds.