

Free SE-1X Manual Version 0.1 (Covers OS Version 0.75)

Copyright ©2005, by Nectarine City, LLC.
See the LICENSE section of this document for the details
of your rights regarding this document.

January 4, 2006

1 Preface

In November of 2005 I bought an SE-1X second hand on eBay. I was pretty shocked to find that I couldn't download a PDF file of the manual for free. In fact, the charge was relatively high. I posted an admittedly inflammatory message to the Studio Electronics Yahoo! E-group about wanting a manual, I got an angry reply back saying that manuals were expensive to produce, and that it was unreasonable for me to expect them for free over the Internet. I resolved to write my own manual for the SE-1X and release it under a Creative Commons license. This is that.

2 Introduction

The SE-1X is an updated version of the SE-1, a monophonic analog synthesizer. The SE-1X is capable of producing a wide variety of tone colors and timbres, many of which are very familiar and desirable to fans of synthesizer music. The SE-1X comes with a large number of pre-programmed patches stored in memory, meaning a deep understanding of how synthesizers work is not required to get good musical results right away. This manual tries to be a tutorial on both the basics of the usual monophonic analog synthesizer and the specifics of the SE-1X. Owners of the old SE-1 manual may be able to use this manual, but a real detailed list of the differences is unavailable (mainly because the author has only an SE-1X).

Because the SE-1X can come with a custom faceplate, it is possible that yours has different markings and words than what is described in this manual. It is in general impossible to account for every possible front panel. Even if your front panel is painted uniquely, the controls will have the same layout as every other SE-1X, so at worst you will have to refer to a front panel diagram.

You cannot learn how to use a synthesizer by just reading. To benefit the most from this manual, you must have your SE-1X in front of you, as well as some kind of MIDI keyboard or sequencer, and an amplifier and speaker. If you are new to synthesizers, begin at the next section, the Quick Start, and work your way through the whole manual. If you are familiar with analog synthesizers, and just looking for the interesting details of the SE-1X, jump to the Condensed Instructions.

3 Quick Start

This section will get your playing your SE-1X in a short amount of time, even if you've never played a synthesizer before.

Obviously, the SE-1X has no keyboard or other mechanism for making sounds other than the knobs and buttons on its front panel. You will need a separate MIDI keyboard or sequencer to get the SE-1X to make or process sound. Also obviously, the SE-1X has no speakers. You will need a separate amplifier and speakers to hear the output of the SE-1X.

Find the SE-1X POWER switch in the lower right hand corner of the front panel, and make sure it is off. The part of this rocker switch labeled O should be pushed in toward the panel. Using a power cable, plug the SE-1X in to a grounded three-pronged power outlet. Using a ground lifter or other adapter may make your SE-1X sound noisy, and could even break it, so be sure to find a three-pronged power outlet. Turn the power switch on. After a brief delay, the display should light up and display some words, including the message “ANALOG IS ON !”.

Using a MIDI cable, connect the MIDI OUT of a keyboard or sequencer into the MIDI IN jack of the SE-1X.

Turn the mixer channel or amplifier you will use for the SE-1X all the way down.

Find the SE-1X VOLUME knob and turn it counter-clockwise as far as it will go (to 0).

Using an audio cable with 1/4” phone plugs (a guitar or “instrument” cable is fine), connect the AUDIO OUT jack on the back of the SE-1X to your mixer or amplifier. The SE-1X is not a stereo instrument, so there is only one audio output. If you see two jacks on the back, only the one labeled “OUT” should be connected to your mixer or amplifier. The other jack is for feeding sounds *into* the SE-1X.

Play the keys of the keyboard, or run some pattern on the sequencer. While playing, slowly adjust the VOLUME knob and the gain control on your mixer or amplifier, so you can comfortably hear the results of your playing.

Notice that you can not play chords. The SE-1X is a monophonic synthesizer, meaning it can only produce one note at a time. The SE-1X can produce chordal sounds, but this will be described later.

Turning the SE-1X large dial labeled “Q” will change between different pre-programmed sounds. For historical reasons, each pre-programmed sound is called a “patch”. Each patch has a name. Unlike the other knobs on the SE-1X, the Q knob is a dial that clicks into different positions as you turn it, as opposed to moving smoothly around. As you play the keyboard or run the sequencer, turn the Q knob slowly to listen to some different programs. Once you’re bored with the programs you can hear by turning the Q dial, use the buttons labeled with up and down pointing triangles to change banks. Each bank is another set of 99 patches which can be selected with the Q dial. There are a little under four hundred ready made patches, all in banks one through four.

When you’re bored of that, select one of your favorite programs so far. If you don’t have a favorite, select bank one, program four, named “BASIC RECORD”. Find the FILTER part of the front panel, and try turning the FREQUENCY and RESONANCE knobs while you play the keyboard or run the sequencer.

You may never need to learn more about your SE-1X than this. For some, bank one, patch four, and the FREQUENCY and RESONANCE knobs are as much as you need to learn about the SE-1X. That’s fine. Never forget that what’s most important is the music.

Aside from blowing out your speakers by turning the VOLUME knob too high, you can’t hurt anything by turning knobs and pushing buttons on the front panel. Experiment with all the different knobs and buttons. As you try different things, you might watch for clues as to what you’re doing in the yellow-green display in the PROGRAMMER section. If you get stuck, if it stops making sound, or if your experiments have otherwise gone horribly wrong, turn the SE-1X off and then on again to reset everything.

4 Front Panel Walk-through

The front panel of the SE-1X is divided into sections by vertical stripes. Each section is labeled at the top. Begin at the left side of the SE-1X front panel, in the section labeled PROGRAMMER.

4.1 PROGRAMMER

At the top of the PROGRAMMER section is a two-digit numeric display labeled PATCH. This display is relatively easy to read from a distance. If you change the programming of the SE-1X without saving your work, two small dots will light up at the lower left hand corner of each of the digits in this display. Find the GLIDE knob in the CONTROL section and twist it a little. Notice that this makes the dots in the numeric display light up.

Below the PATCH display is a larger green display, which can display more complicated text, but is not as readable from far away. When you first turn on the SE-1X, this display will report that it is on an SE-1X (as opposed to an SE-1), what patch and bank the SE-1X is set to (more on patches and banks can be found in later sections), and what version of the SE-1X operating system software is installed (more on the operating system later, as well).

Below the text display is the large dial labeled Q. Turn the Q dial. Notice that it does not move smoothly, but instead snaps into definite positions as you turn it. As you turn the Q dial, also notice how both the PATCH display and the text display change. The Q dial has many purposes other than changing the PATCH. Turn the GLIDE control again, slightly, so that the two dots in the PATCH display light up. Now turn the Q dial one click clockwise to select a new patch, then one click counter-clockwise to re-select the old patch. Notice that the edits are gone and the red dots at the bottom of the PATCH display are no longer lit. If you are programming the SE-1X, and do not save your changes before changing programs, you will lose your changes (editing and saving are described in detail later).

Around the Q dial are four buttons labeled with triangles pointing up, down, left and right. Press the up and down buttons to change which bank of patches are active. Press the left and right buttons to change which patch in a bank is active. Notice how the PATCH and text displays change as you do so. The SE-1X has eight banks of patches, four ROM (meaning you can't write over them with your own patches) and four RAM (meaning you can change the contents of the patches in this bank). Return to bank one, patch one, before going on.

Also in the PROGRAMMER section is the MIDI lamp. Press a key on your keyboard or play a note on your sequencer and notice the light flashes. This flashes every time the SE-1X receives a MIDI message of any kind. It can be useful for figuring out if the cable got yanked, or if your keyboard or sequencer has been programmed incorrectly.

4.2 CONTROL

Next over to the right of the PROGRAMMER section is the CONTROL section. If you followed the Quick Start (above), you've already found the VOLUME knob. This controls how loud the whole SE-1X is. Adjust the VOLUME knob and notice that the red dot lamps in the PATCH display do not light up. VOLUME is not considered part of a patch. If you change patches, you need not re-adjust the VOLUME knob.

The GLIDE knob controls how long it takes for the note played by the SE-1X to change. This is often called "portamento". Set the GLIDE knob to zero, and play some notes from your keyboard or sequencer. As you are playing, turn the GLIDE knob clockwise. Notice how the pitch glides from one note to another. Set the GLIDE knob back to zero again before you proceed.

At the bottom of the CONTROL section are the SHIFT and SAVE buttons. Hold down the SHIFT button and press any of the triangle directional buttons. Notice that completely new information appears on the text display as you do so. Each time you press a directional button while holding shift, you move to a new "page" of the editor. Once you release the SHIFT button, you can move an underline mark (the "cursor") around within the page with the directional buttons. The value above the cursor can be changed with the Q dial. Usually, you will be using knobs on the front panel to edit the current patch of the SE-1X, but in some cases you must use these editor pages. Using individual editor pages will be described later. Before you proceed, turn the SE-1X off and then back on again, to reset it.

4.3 Review

So far we've covered the PROGRAMMER section, the CONTROL section, and the MOD section.

The PROGRAMMER section has a PATCH display, visible from a distance, which tells you what patch number you're on, and whether you've changed things from how they were when you first selected the patch. If you've changed things, little red dots light up.

The PROGRAMMER section has a large greenish text display, which displays different pages. The page we're most interested in so far is the one that shows the name of the patch and the bank number.

In the PROGRAMMER section, the arrow buttons (marked with triangles) move a cursor (looks like an underline) around the page, or change the patch, depending on which page you're on and where the cursor is in the display.

Finally, the PROGRAMMER section has a light that flashes on whenever the SE-1X receives a MIDI message.

The CONTROL section has a VOLUME control, which is independent of any patch, and controls how loud the SE-1X is.

The CONTROL section has a GLIDE control, which can make pitches for new notes change gradually rather than immediately. In traditional western music notation, this is called portamento.

The CONTROL page has SHIFT and SAVE buttons. These have functions which are described later. Hold down the SHIFT button and press one of the directional (triangle) buttons to change pages. It can be a pain to find your way back to the first page that shows bank number and patch name, but here is a trick. Press the SAVE button, then press the SHIFT button. When you press SAVE you tell the SE-1X you'd like to save your settings, and it moves you to a special page for saving. When you press SHIFT you cancel the SAVE, and it goes back to the first page which displays the patch name and bank number.

The remainder of the sections on the front panel of the SE-1X may not make much sense to you, unless you already understand the basics of subtractive synthesis.

4.4 MOD

Next to the right of CONTROL is the MOD section. This section controls the characteristics of the three low frequency oscillators ("LFO"s) which can be used to change a sound rhythmically over time.

Find the LFO2 and LFO3 buttons in the middle of the MOD section. These buttons allow you to select LFO2 or LFO3. If neither of these buttons is lit, LFO1 is selected. You can only one of the three LFOs can be selected at a time. Press the LFO2 button and notice it lights up. Also notice that the editor window has moved to a page for editing LFO settings. Most of the front panel controls automatically also move you to the editor page they're related to. This will be described in more detail later. Press the LFO3 button and notice that it lights, and that the LFO2 button is no longer lit. Press the LFO3 button again, noticing that now once more neither of the two buttons are lit. This can be slightly confusing, but so long as you remember that when neither of the LFO buttons is lit, that LFO1 is selected, everything else should be clear.

The RATE and DEPTH knobs change the selected LFO. Make sure that LFO1 is selected (neither LFO button should be lit). Press and release SAVE, then press and release SHIFT. This switches the text display back to the patch selection page. Use the Q dial to select patch four in bank one (called "BASIC RECORD"). This patch will allow you to hear a note for as long as you hold it on the keyboard or sequencer. Find the FREQUENCY knob and turn it to five. Turn the DEPTH knob all the way clockwise, to 10. Turn the RATE knob all the way counter-clockwise, to 0. Play and hold long notes on the keyboard or sequencer. As you hold the notes, turn the RATE knob clockwise. You should now be hearing the effect of LFO1, which is assigned to change the pitch of the note you're playing. Set the RATE knob to 2. As you play and hold long notes, turn the DEPTH knob counter-clockwise. Notice that the amount of effect the LFO has on the filter lessens. LFOs can be used at low DEPTH settings to add subtle changes to make a sound feel more alive, or at high DEPTH settings for special effects and science-fiction sounds. The RATE and DEPTH knobs change those settings for the LFO which is currently selected. In the BASIC RECORD patch you're on right now, neither of LFO2 or LFO3 are assigned to anything.

Another way to say all this is that the MOD section can select one of three LFOs using the LFO2 and LFO3 buttons. When neither is lit, LFO1 is selected. The RATE and DEPTH knobs change how fast and how much the selected LFO changes something. Assigning an LFO to change a particular something is described later.

4.5 OSC BANK

The controls in the OSC BANK section tune three oscillators, and adjust certain subtle interactions between them. The SE-1X has three oscillators, all nearly the same. Each oscillator can make a saw, square, or

triangle wave shapes. Any two, or all three of these shapes may also be selected simultaneously. These three wave forms are all considered part of the same oscillator, because the musical notes they're playing are bound to one another, and because the electronics inside the SE-1X actually generates these three shapes nearly as easily as it generates one of them. Each of the three oscillators is controlled by one of the rows of two knobs and three buttons in the OSC BANK section.

Reset the SE-1X by turning it off and then on again. You should be on bank 1 patch 1. Notice that of all the buttons in the OSC BANK section, there are three lit. The lit buttons show that OSC1 and OSC2 are set to saw waves, and that OSC2 is in SYNC with OSC1. What "SYNC" means is difficult to describe without getting far into the math of it all. Play some notes on your keyboard, or run your sequencer. While playing, press the lit SYNC button. Notice that this button goes out when you press it, and notice how the sound has changed. Also, notice that you have now changed to a different page in the text display. SYNC can have subtle or drastic effects on the sound made by the oscillators, depending on how they are tuned. The uppermost SYNC button synchronizes oscillator 2 with oscillator 1. The lower SYNC button synchronizes oscillator 3 with oscillator 1. Turn SYNC back on between OSC1 and OSC2.

Now, find the buttons with the saw shaped wave drawing above them in the rows for oscillator 2 and oscillator 1. Press these buttons so that they both go dark. Notice that you can turn an oscillator completely off this way. Oscillator 3 is already off. Find the square shaped wave drawing above a button in the row for oscillator 1, and press it, so that it lights up. Play the keyboard or run the sequencer, and notice how this sounds different than the saw waves you were hearing before. You are now hearing only oscillator 1 play a square wave. Now find the PULSE WIDTH knob to the right of this button, and manipulate it as you play the keyboard or sequencer, listening to the effect you are having on the sound. All the way to the right of each row is a knob for adjusting the relative pitch of that oscillator. Find the knob labeled **FREQ1**, and adjust it as you play the keyboard or run the sequencer. Notice how the pitch changes in "half steps" or semitones. There is a way of adjusting the pitch of these oscillators more precisely, but you can't do it as easily as this.

Now, turn on (at least) the square wave of each of the three oscillators and use the **FREQ** knobs to tune them into a chord. Although the SE-1X is properly called a monophonic synthesizer, it can play chords in this limited way. Although the oscillators can only be patched to react to one MIDI note at a time, one of the ways they can react is as a multi-oscillator chord. Once this sort of thing stops being confusing, you know you've got a good handle on how the SE-1X works. For extra amusement, try turning the **GLIDE** knob up while you're playing your chord patch.

4.6 FILTER

The filter section seems to be very small and innocent, but actually it is what gives the SE-1X all of its personality and charm. If you watch synthesizer players performing live rock or dance music, chances are you'll see them with one hand on the keyboard and one hand on the **FREQUENCY** knob of their synthesizer.

Turn the SE-1X off. Find the **FREQUENCY** knob and turn it to somewhere around 1 or 2 o'clock. Turn the SE-1X back on. Select bank 1, patch 4. While playing your keyboard or sequencer, slowly turn the **FREQUENCY** knob clockwise. Notice the jump in the center frequency of the filter when you first move the knob. Just after you turn it on, or after you change patches, the SE-1X doesn't know how a knob is set to until you move it. This goes for all the knobs on the front panel, not just **FREQUENCY**. This may seem wrong at first, but if things weren't this way, calling up a patch from memory wouldn't do anything, nearly everything would be exactly as the knobs and buttons were set. Bank 1 patch 4 starts out as if the knob was somewhere around 10 o'clock. If you're playing the SE-1X and its knobs live, after you select the bank and patch you want, move the knobs you're going to play until you see the text display change before you start to play, so you don't get a jump like this. (Unless of course you *want* a jump like this.)

The filters on the SE-1X are resonant, meaning frequencies near the center frequency are made louder. Move the **FREQUENCY** knob to somewhere between 10 or 11 o'clock. Turn the **RESONANCE** knob all the way counter clockwise. Now play your keyboard or sequencer while slowly turning the **RESONANCE** knob all the way clockwise. Notice you hear only subtle changes in the sound until you get near all the way clockwise. Leaving the **RESONANCE** knob all the way clockwise, play your keyboard or sequencer while

slowly moving the FREQUENCY knob to between 1 and 2 o'clock, and then back to between 10 and 11 o'clock. The angry sound you're hearing is the filter "self oscillating". Notice that it rises and falls in pitch with the FREQUENCY knob.

Now, while still playing your keyboard or sequencer, press the "24db" button, so that it is lit up. Notice the difference in the character of the sound. It can take a lot of experimentation and listening time to get a feel for these two filters. The 24db filter is "steeper", meaning that it filters out a lot more of the sound than the 12db filter.

Play a pattern of very high and very low notes on your keyboard or sequencer, and at the same time adjust the TRACKING knob. Notice how the high notes are brighter or darker, and the low notes are basically the same. Normally, you want the center frequency of the filter to change according to what note is being played. For some sounds, you want high notes to say dark, or to be extra bright.

4.7 ENVELOPES

The ENVELOPES section of the SE-1X front panel controls four attack-decay-sustain-release ("ADSR") envelopes. ENV1 is always controlling the filter cutoff frequency, and ENV2 is always controlling the loudness. The knobs on the front panel control each of the ATTACK time, DECAY time, SUSTAIN level, and RELEASE time for ENV1 and ENV2, unless the ENV3,4 lamp is lit, in which case the knobs instead control ENV3 and ENV4.

Turn the SE-1X off and then back on again to reset it. You should be on bank one patch one, "ANALOG IS ON!". As usual, play your keyboard or sequencer as you manipulate the knobs in the following ways. The upper row of knobs controls ENV1, the row right below it controls ENV2. Turn the ENV2 ATTACK knob all the way counter clockwise. Now while playing your keyboard or sequencer, rotate this knob clockwise. Notice how the sound changes. Turn the ENV2 ATTACK knob all the way counter clockwise. Now, in a similar way, listen to how the sound changes as you manipulate the DECAY, SUSTAIN, and RELEASE knobs. Notice that if SUSTAIN is set all the way clockwise, DECAY has no effect. This is because DECAY is the amount of time it takes to go from full volume to the SUSTAIN volume. If the SUSTAIN volume is full volume, there's nowhere for DECAY to go.

To summarize ENV2, ATTACK is the amount of time it takes to go to full volume once you hit a key, DECAY is the amount of time it takes to go to the SUSTAIN volume. SUSTAIN sets the volume which the note is held at, and RELEASE is the amount of time it takes for the sound to fade away after you release the key. ENV1 is the same way, except instead of controlling how loud the sound is, it controls how bright the sound is, as if it was manipulating the FREQUENCY knob in the filter section.

If you press the ENV3,4 button, it lights up, and the two rows of ATTACK, DECAY, SUSTAIN, RELEASE knobs now edit ENV3 and ENV4 rather than ENV1 and ENV2. This will be explored more thoroughly in the Editor Page Walk-through.

Finally, there are three knobs at the bottom of the ENVELOPES section, ENV 1 AMNT, ENV 3 AMNT, and ENV 4 AMNT. Of course, these control how much influence the envelopes have over the loudness, brightness, or other part of the sound they have been assigned to. Notice that there is no ENV 2 AMNT knob. The ENV 2 AMNT knob would be exactly the same as the VOLUME knob in the CONTROL section, since ENV2 always controls volume. *Stop and let that idea sink in for a minute.* Since ENV1 is always bound to the filter cutoff frequency, what knob do you think will sound the same as ENV 1 AMNT when you turn it?

4.8 Review

The MOD section controls the three LFOs. If neither the LFO2 or LFO3 buttons are lit, the knobs are controlling LFO1. RATE controls how fast the LFO goes, and DEPTH controls how much of an effect the LFO has.

The OSC BANK section controls three oscillators with three rows of knobs and switches. The FREQ knobs adjust frequency in half steps (semitones). The buttons turn on and off triangle, saw, and square wave output. When all are off, that oscillator is disabled. The PULSE WIDTH knob colors the square wave

output. The SYNC buttons synchronize oscillators 2 and 3 to oscillator one, which also colors the sound of the oscillators.

The FILTER section selects the 24db or 12db filter. The FREQUENCY knob controls the cutoff frequency, and the RESONANCE frequency controls how much sounds around the cutoff frequency are enhanced. The TRACKING knob adjusts how much the center frequency of the filter changes based on the current note being played.

The ENVELOPES section adjust the four ADSR envelopes. ENV3 and ENV4 are adjusted when the ENV3,4 button is lit, otherwise ENV1 and ENV2 are adjusted. ENV1 always controls the filter. ENV2 always controls loudness. The ENV AMNT knobs control how much of an influence the envelopes have on each note. There is no ENV 2 AMNT knob, it would be the same as the VOLUME knob in the CONTROL section.

5 Memory and Random

What we have described so far in this manual are the settings that control what kind of sound comes out of the SE-1X. All of these settings together are called a “patch”, a term that comes from early “modular” synthesizers where the settings were made by patching together modules with cables.

The SE-1X has a patch in it’s memory at all times, which is the patch that actually controls how the SE-1X sounds. We will call this the “current patch”. When you call up a new patch, it writes over the current patch with all the new patch settings. Reset the SE-1X by turning it off and then on again. Notice the PATCH display reads “0 1 “. While playing your keyboard or sequencer, move the FREQ1 knob so that the patch sounds different. What you are doing is changing the current patch. Notice that the patch display now reads “0.1.”. The dots mean something has changed, making the current patch different than patch 1. Now use the Q dial to change to patch 2, and then back to patch 1 again. Notice the PATCH display once again reads “0 1 “. Play your keyboard or sequencer. Notice that the change you had made to the FREQ1 knob is now undone. Moving the FREQ1 knob changed the current patch, but not patch 1.

The current patch can be saved into memory for later recall. Select patch 4 in bank 1, “BASIC RECORD”. It might be nice to make a version of this patch where the cutoff frequency of the filter started out a little higher. Adjust the FREQUENCY knob in the FILTER section while playing your keyboard or sequencer until you have a brighter tone. Now press the SAVE button. Notice how the text display has changed. You cannot save to banks one, two, three, or four, they are marked “ROM”, which stands for “read-only memory”. You can only save to banks marked “RAM”. Use the arrow buttons to select a spot in bank five where you can write your new patch. Select a new patch, then go back to the patch you saved into bank five. Notice that although the sound is brighter, the dots are not lit in the PATCH display.

If after you press SAVE, you decide you actually don’t want to save the current patch, press SHIFT. SAVE then SHIFT will bring you back to the editor page for selecting patches and banks without changing the current patch.

Bank eight is special. When you save to bank eight, those parameters you have changed will be randomized.

Notice that the setting of the VOLUME knob in the MOD section is *not* saved with the patch.

6 Editor Page Walk-through

Not all of the settings in a patch have a corresponding knob or switch on the front panel. Some can only be set by finding the right editor page and using the arrow buttons, cursor, and Q dial to change their value.

From here on out, to describe exactly what some of the controls do would require a lot of mathematical explanation, which is not critical for making music. The descriptions given in this document will not assume any particular math or music training. If you’re interested in the mathematics of sound and synthesizers, it shouldn’t be too hard to figure out what’s going on signal-wise from these descriptions.

Don't be too concerned if you can't imagine how a particular wave shape will sound before you try it. Nobody imagines a sound and then programs it – instead, you imagine a kind of sound, or a feeling, then you experiment with knobs and settings until you find something close, or perhaps something new altogether. One of the pleasures of using a synthesizer such as the SE-1X is that many of the important controls can be adjusted with easy to reach knobs and switches on the front panel. It is simple and immediate to experiment with new settings, even during a live performance. Don't be afraid to experiment with all settings in the editor pages, as well as the front panel knobs. You can always turn the SE-1X off and on again to reset everything.

As described above, you switch editor pages by holding down the SHIFT button while pressing the left and right arrow buttons. Each of the editor pages is described below in order as you would see them by starting at the patch selection page and going through them all with the right arrow button. Although this part of the manual will not give you specific things to try, you should experiment with all these settings as you read through this section.

6.1 Bank and Patch Selection Page

This page looks like this.

```
* SE-1X *
```

```
#01 ANALOG IS ON !  
BANK 1 ROM    V.0.75
```

This is the page you begin at when you first turn on the SE-1X. Some SE-1 synthesizers have been internally modified to be SE-1X synthesizers, and you won't be able to tell, unless it says "SE-1X" at the top of this page.

After the patch number, the name of the patch, and the bank number, this editor page will show whether the current bank is "ROM" or "RAM". You can only save patches (described later) to banks marked as RAM.

The SE-1X has a small computer in it. In the lower right hand corner, this page tells you what version of software that computer is running. This manual describes software version 0.75.

Unlike other pages, the arrow buttons do not move a cursor around on this page. Instead, up and down change banks, left and right change patches. The Q knob also changes patches.

6.2 Note Processing Page

This page looks like this.

```
GLIDE          ON  
AUTO GLIDE     0  
MULTITRIGGER   OFF  
NOTE PRIORITY  LOW
```

You jump to this editor page when you turn the GLIDE knob on the front panel.

The GLIDE setting can be ON or OFF. If it is turned OFF, the GLIDE knob will have no effect, and the patch will sound as if the GLIDE knob were turned all the way counter-clockwise.

AUTO GLIDE can be set from -48 to +48. When this is not zero and the previous GLIDE setting is ON, playing a note starts this many half-steps away from the note you play, and glides up or down to the note you're playing at whatever rate you choose with the GLIDE knob.

MULTITRIGGER can be ON or OFF. If it is ON, ENV1 will start again whenever a key is pressed. If it is OFF, ENV1 will only start when a key is pressed and no other keys are down.

NOTE PRIORITY can be LOW, HIGH, or LAST. This controls which pitches are held when more than one key is pressed at the same time. LOW and HIGH means the lowest and highest note played are the ones

held. LAST means the last note played is held. In any case, there is only one note of memory. So, when holding down three notes, the first note of the three played is discarded.

6.3 Tuning Page

This page looks like this.

```
TUNING:    MAIN    0
OSC 1    12
OSC 2    25 FINE + 1
OSC 3    12 FINE - 1
```

You jump to this page when you turn any of the FREQ knobs in the OSC BANK section of the front panel.

The MAIN tuning setting can be set from -64 to +63. This tunes the entire SE-1X just over a half-step in either direction.

Each of the oscillators can be coarse tuned from 0 to 63, and fine tuned from -64 to +63. You must use a FREQ knob for coarse tuning, and the cursor and Q dial for fine tuning. Fine tuning will bring you up to just over a half-step in either direction.

6.4 Audio Mixer Page

This page looks like this.

```
AUDIO MIXER
OSC1 98% RMOD  0%
OSC2 95% NOISE 0%
OSC3 15% N2VCA OFF
```

OSC1, OSC2, OSC3, RMOD, and NOISE can all be set from 0 to 98don't all have to add up to 100the full loudness each sound source can make. Notice the RMOD and NOISE sound sources have no controls on the front panel, they can only be found in these editor pages.

When you plug an external sound source (like another synthesizer) into the input jack on the back of the SE-1X, it takes the place of the NOISE source, so the NOISE setting on this page must not be 0won't hear it.

N2VCA can be ON or OFF. It stands for "noise to VCA". When this is ON, the NOISE (or external input, if connected) bypasses the filter and goes directly to the VCA.

6.5 Envelope Page

This page looks like this.

```
ENV 1 > VCF DYN 50%
ENV 2 > VCA DYN 15%
ENV 3 > SWP2 DYN  0%
ENV 4 > SWP2 DYN  0%
```

You jump to this page when you light up the ENV3,4 button.

Each of the DYN percentages can go from 0 to 99velocity sensitive, each time you press a key, it tells the SE-1X how hard or fast you played it. These percentages controls how much this playing dynamics influences the size of each of the four envelopes. For example, if you set ENV2 to DYN 0soft on the keyboard will have no effect on how loud the sound is. If you set it to 99or soft as well.

On this page, ENV3 and ENV4 can be assigned to control parts of the SE-1X. ENV1 and ENV2 always control the filter and loudness. Here is a list of the things you can control with ENV3 and ENV4.

PW1, PW2, PW3 this changes the pulse width of the square wave coming from OSC1, OSC2, or OSC3, just as if you were turning the PULSE WIDTH knob for that oscillator.

MIX2, MIX3 this changes the loudness of OSC2 or OSC3. This is unlike ENV2, which changes the loudness of all the oscillators at the same time.

SWP2, SWP3 this changes the pitch of OSC2 or OSC3.

RMOD changes the loudness of the output of the ring modulator.

NOIS changes the loudness of the output of the noise generator, or external input, which takes the place of the noise generator if it is plugged in.

RESO changes the amount of filter resonance, just like the RESONANCE knob in the FILTER section of the front panel.

Unlike many other synthesizers, the four envelopes in the SE-1X may each only be assigned to control one aspect of the sound.

6.6 LFO Page

This page looks like this.

```
LFO ASSIGN:  WAVE:
LF01>  VCFFM   TRI
LF02> NOASSN   TRI
LF03> OSC2PW   TRI
```

You jump to this page whenever you press the LFO2 or LFO3 buttons in the MOD section of the front panel.

This page lets you change what the three LFOs are assigned to change, as well as the shape of each of the LFOs. There are many possibilities for what an LFO can be assigned to change.

NOASSN this setting makes the LFO have no effect.

OSC123 this makes the LFO control the pitch of all oscillators. *Only LFO1 can be set this way.*

OSC1FM, OSC2FM, OSC3FM these assign the LFO to control the individual pitch of OSC1, OSC2, and OSC3.

OSC2MX, OSC3MX these cause the LFO to control the loudness of OSC2 and OSC3.

RMODMX the LFO controls the loudness of the ring modulator.

NOISMX the LFO controls the loudness of the noise generator or external input.

VCFRES the LFO controls the resonance of the filter, like the RESONANCE knob in the FILTER section of the front panel.

VCFFM the LFO controls the cutoff frequency of the filter, like the FREQUENCY knob in the FILTER section of the front panel.

OSC1PW, OSC2PW, OSC3PW the LFO controls the pulse width of the square wave output of OSC1, OSC2, or OSC3, like the PULSE WIDTH knob in the OSC BANK section of the front panel.

VOLUME the LFO controls how loud the SE-1X is.

When both an LFO and an ENV (and a static setting, and the way a knob is positioned) are assigned to control the same part of the SE-1X, they both have an effect, not just one of them. However, you can not set two LFOs to control the same thing.

There are six possible LFO shapes, TRI, SQR, SAWUP, SAWDN, NOISE, and S/H. To get a sense of how these sound, especially NOISE and S/H, assign an LFO to VOLUME, turn DEPTH all the way up (clockwise), and listen to the results.

6.7 Stray Settings Page

This page looks like this.

12DB	TYPE	LP
ENV	INVERT	OFF
ENV	CURVE	EXP
OSC	BOUNCE	ON1

The 12db filter has both a low pass (“LP”) and band pass (“BP”) mode. This is selected on this page.

Envelopes 1 and 3 can be inverted. In the case of ENV1, instead of making the filter cutoff frequency go up and then down, it makes the filter cutoff frequency go *down and then up*. On this page, you can select whether either ENV1, ENV3, neither, or both are inverted in this way.

The envelopes can be set to move through the ADSR stages in a straight line, or in a more curvy way. In mathematical terms, the curve of the envelopes can be “linear” or “exponential”. Selecting LIN or EXP on this page effects all of the envelopes. You cannot set ENV1 as linear and ENV2 as exponential, for example.

6.8 MIDI Control Page

This page looks like this.

MOD	LF01	17%
TOUCH	MIX2	0%
CON 1	PW1 # 2	0%
CON 2	PW3 # 0	0%

Each line in this page sets how a particular MIDI control influences part of an SE-1X patch. See below for more of a description of MIDI. The first two lines are devoted to the MIDI “mod” wheel control (CC #1) and MIDI keyboard aftertouch (channel pressure). The last two lines can be set so that the SE-1X responds to any MIDI continuous controller, with the exception of CC #1, #5, #7, #64, #65, and #121-127. CC#1 is always the MOD controller on this page. CC#5 always controls glide time, just like the GLIDE knob. CC#7 controls the main volume, just like the VOLUME knob. CC#64 can be used like a sustain pedal on a piano – check the documentation for your MIDI keyboard for details. Just as CC#64 is always assigned to sustain, CC#65 is always assigned to turning glide on and off.

MIDI controllers can be assigned to any of the following things.

LFO1, LFO2, LFO3 depth of one of the three LFOs.

LF1R, LF2R, LF3R rate of one of the three LFOs.

OSC2, OSC3 pitch of OSC2 or OSC3.

PW1, PW2, PW3 pulse width of the square wave outputs of one of the three oscillators.

VCF filter cutoff pitch.

RESO filter resonance.

MIX2, MIX3, MIXR, MIXN volume of OSC2, OSC3, the ring modulator, or the noise generator (or external input).

ENV1, ENV3, ENV4 envelope amount. Use MIDI CC#7 to get the same effect as ENV2 here.

6.9 Pitch Bend Page

This page looks like this.

```
BEND: RANGE:
PITCH   2 SEMITONES
CUTOFF  0 SEMITONES
TRANSPOSE      MID
```

MIDI pitch bend messages are special, and this page controls what effect they have on the SE-1X.

On this page, PITCH can be set from 0 to 24 semitones (half-steps). This raises or lowers the pitch of all the oscillators by that amount when you move the pitch bend lever on your MIDI keyboard. Your MIDI keyboard may not have a pitch bend lever – check its documentation.

The CUTOFF setting on this page works similarly to (and at the same time as) the PITCH setting, but instead of changing the oscillator frequency it changes the filter cutoff frequency.

The TRANSPOSE setting on this page can be used to raise or lower the entire SE-1X by one octave. HIGH is up one, MED is no change, and LOW is down one octave.

6.10 MIDI System Page

This page looks like this.

```
MIDI CHANNEL:      1
MEMORY PROTECT:   OFF
SYSX:SEND PROGRAM(S)
SELECT,SAVE-SEND # 4
```

The SE-1X can be set to respond to MIDI messages on channel 1-16. It does not have an OMNI mode, where it would respond to any message on any channel.

There are two MEMORY PROTECT modes. ON1 means you can't save over patches. ON2 means you can't save over patches, nor can you change the current patch. Most of the time, you will want MEMORY PROTECT OFF.

With the cursor on the number after SAVE-SEND on this page, press SAVE to send the patch as system exclusive MIDI data. This is how you can “back up” your SE-1X to an external device. Notice that you can make the area above the cursor here say ALL, in which case all of the patches in memory will be sent as a long system message when you press SAVE, rather than just the numbered one.

6.11 Name Program Page

This page looks like this.

```
* SE-1X *
NAME PROGRAM
#01 BASIC RECORD
BANK ! ROM   V.0.75
```

This is very similar to the bank and patch selection page, however the arrow keys, cursor, and Q dial allow you to change the name of the patch in memory. Notice that the name of the patch is just another patch setting, and must be saved like any other part of the current patch.

7 Condensed Instructions

If you're already familiar with analog synthesizers and how they work, this section will tell you nearly everything that isn't probably immediately obvious to you.

- Hold down SHIFT and use the arrow buttons to move between editor pages. Many parameters are bound to knobs. Moving a knob switches to that parameter's editor page. Use the arrow keys to move the cursor around an editor page, and the Q knob to change the parameter above the cursor. Q does not mean resonance on this front panel!
- See the MIDI section of this manual for a table of continuous controller numbers and what knob's function they control. The front panel knobs send MIDI too.
- There are two MEMORY PROTECT modes. ON1 means you can't save over patches. ON2 means you can't even change the active patch.
- The MULTITRIGGER parameter selects whether the the filter envelope (ENV1) will re-trigger when a key is already down.
- NOTE PRIORITY controls which pitches are held during legato playing. LOW and HIGH means the lowest and highest note played are the ones held. LAST means the last note played is held. In any case, there is only one note of memory. So, when holding down three notes, the first note of the three played is discarded.
- ENV1 is always bound to the filter frequency. ENV2 is always bound to amplitude. ENV3 and ENV4 are assignable.
- The audio input on the back panel, if you have it, takes the place of the noise generator when a plug is inserted in the jack.
- To save a patch, hit SAVE, select a patch to save over, then hit SAVE again. To cancel without saving, hit SHIFT. SAVE then SHIFT is also useful to bring you back to the editor page for bank and patch selection. Don't save to bank 8, it has a special random function.

8 Subtractive Synthesis

Without getting too far into the history of synthesizers, we can say that most early synthesizers had the same basic organization: an oscillator, fed into a filter, into a volume control. You can think of it as three guitar effects pedal boxes in a chain (only with no guitar). The first box makes sounds, the second box modifies the sound, and the third box controls the loudness of the sound, turning it on or off.

The SE-1X has this organization as well. The idea of filtering a harmonically rich and interesting sound to create different tones is usually called "subtractive synthesis". By understanding the principles of subtractive synthesis, you will gain a broader understanding of how to make your SE-1X do different things, as well as a greater appreciation for any other synthesizers you may encounter.

When you sing a note or pluck a guitar string, you are making the air vibrate. An oscillator makes an electric signal vibrate. This electric signal, when amplified and used to drive a speaker, will cause the air to vibrate in the same way. If you were to listen to a tuning fork for the note A4 ("concert A"), exactly 440 perfect little curvy waves of air pressure would hit your ear every second. The shapes of the waves of the oscillators in a synthesizer are usually not perfectly curvy like this, but when you make the oscillators play A4 it still sounds like A4 note. Different combinations of square, triangle, and saw shapes give an oscillator its unique tone or timbre. To really understand oscillators (and their interactions with filters), you need to understand the mathematics of harmonic analysis. For most synthesizer players, it is enough to know that different wave shapes give the sound of an oscillator different tone, but that no matter what the tone or

timbre it will still have a strong fundamental frequency. This strong fundamental frequency is what makes it sound like a musical note, able to be part of a melody or harmony.

The sound of the oscillator is further shaped by the filter. A low pass (“LP”) filter removes the brightness from a sound, allowing low frequencies to pass, filtering out higher frequencies. A high pass (“HP”) filter does the opposite, removing the bass from a sound, allowing only higher frequencies to pass. The bass and treble controls on a stereo are filters. A “band pass” (“BP”) filter is like a low and high pass filter applied at the same time. Each of these filters has a “cutoff frequency” – the frequency below which is bass and above which is treble. If you’ve ever listened carefully to what the equalizer knobs on a mixer do, all of this should sound familiar, because it is essentially the same. Unlike what you would find on a mixer or equalizer, the filters in most subtractive synthesis systems are “resonant”, meaning they not only reduce bass or treble, but enhance the part of the sound near the cutoff frequency. Filters can have a beautiful, almost magical effect on the sound made by a synthesizer, and different kinds of filters give synthesizers different kinds of sound.

The final part to this model of subtractive synthesis is amplification, which is just electronics jargon for volume or loudness control. Each note you play may be loud or soft, it may start out loud and get softer, or it may have even more texture.

So we have one box that is an oscillator, one that is a filter, and one that can control the volume. Let’s say instead of having switches that you stomp on, these boxes have just knobs. The oscillator has a knob that controls the fundamental frequency of the sound it’s making. The filter has a knob that controls its cutoff frequency, and the amount of resonance at that frequency. The volume box has a knob that directly controls volume. The trick now is to twist all of these knobs in time with the music. There are too many knobs to do it with our hands, and we can’t turn the knobs fast enough to play something complicated. So to control most of the settings on these boxes, we replace or enhance the knobs with *more electronics*.

At this point, we’ll stop thinking about them as guitar pedals and call them by their given names, the Voltage Controlled Oscillator (“VCO”), Voltage Controlled Filter (“VCF”), and Voltage Controlled Amplifier (“VCA”). That each of these is under Voltage Control is really the genius behind synthesizers. Instead of a knob to control pitch, volume, or whatever, we just take in the control signal made by another bunch of electronics.

Think about what you want the VCA to do when you press a key on the keyboard. When you are pressing none of the keys on the keyboard, you generally want no sound to be happening - it is the VCA that will make this quiet. Pressing a key makes a sound play. If it is a sustaining sound, it plays until you release the key. We can talk about the loudness of a sound as four things: the Attack, which is how quickly the sound reaches its full volume, the Decay, which is how quickly the sound settles after it has reached its full volume, the Sustain, which is the level at which the sound settles, and the Release, which is how quickly the sound goes away after the key is released. This is called an “ADSR” (sometimes also called an “envelope”). In most synthesizers, there is a circuit that generates an electronic signal in this ADSR shape as keys are pressed. The ADSR is connected to the VCA. In this way, the volume of the sound is shaped. Generally, the ADSR itself has A, D, S, and R knobs which control its shape. So you set the knobs on the ADSR, and then the ADSR automatically shapes the volume according to the knobs as you play keys. The A, D, and R knobs represent amounts of time, and the S knob represents a level or amount of something. If you wanted a sound that took a long time to build up, and had no sustain, you would turn the A knob to a longer setting (usually clockwise), and the S knob all the way to zero (usually counter-clockwise).

In early “modular” synthesizers, the ADSR, VCO, VCF, and VCA were all separate little boxes (“modules”) that you had to connect together with patch cables. This is why the settings of synthesizers are called “patches”, even when no patch cables are involved. The ADSR could be connected to any of the other modules, so instead of the sound getting louder and softer as the keys are pressed and released, the sound could rise and fall in pitch, the filter could open and close, and so forth, depending on what the patch cable connected the ADSR to. It became clear that most musicians wanted the same interconnections between most of their modules, so for some synthesizers the patch cables were wired in as permanent connections. The A, D, S, and R settings can be found on nearly all synthesizers, even synthesizers that exist only as computer software. The usual subtractive synthesizer will have one or two envelopes which you can use to

control the VCA and perhaps the VCF. Controlling the VCF with the ADSR means the sound gets brighter, then darker, stabilizes, and then darkens further after you release the key. Having separate ADSRs for the VCA and VCF allows a wide variety of interesting sounds to be created.

ADSRs are not the only kind of voltage control signal generator. The other most commonly found is the Low Frequency Oscillator (“LFO”). An LFO just goes back and forth on it’s own, unlike the ADSR, which acts in lock step with keys. Some LFOs can take on different shapes, smoothly changing curvy waves, or choppy on-off-on-off square waves. Typically an LFO is set to control the pitch, making the patch sound like the player is using “vibrato”, as a guitar player would if he or she bent the string over the fret or shook a tremolo bar to add interest to a note. Applying an LFO to other parameters can be used to make sound effects, space sounds, or other strangeness. The usual subtractive synthesizer will also have one or two LFOs, which can be assigned to the pitch control of the VCO and perhaps other things. LFOs may be able to change shapes according to a switch or dial, and their rate and depth are usually controlled by knobs. “Depth” means the amount the LFO will effect whatever it is controlling, so you may have subtle shimmering or radical police siren changes. “Rate” of course means how fast the LFO goes back and forth. It’s only called a “low frequency” oscillator because it is meant to go much more slowly than a regular VCO. If the LFO is the tremolo bar, the VCO is the vibrating string itself.

Finally, the keyboard itself generates voltage control signals that tell the oscillator what to do. In more modern synthesizers, MIDI messages are converted into control voltages for the oscillators, but the principle of voltage control is still there.

9 MIDI

A full discussion of MIDI would make this this manual five times bigger! Deep understanding of MIDI is not needed to make music with a synthesizer. Most people who want to play a synthesizer don’t need to understand any more than how to connect MIDI cables from OUT to IN jacks. MIDI was designed to be easy for musicians and studio engineers to use, and a basic understanding of it can expand the possibilities you have with a synthesizer.

You probably have a MIDI keyboard, although you might instead have a sequencer. For our purposes in this manual, they’re basically the same, but we’ll use the keyboard as the basic analogy.

MIDI works in short messages that it sends one way over a MIDI cable. When you press down a key on the keyboard, a MIDI NOTE ON message is sent, which tells the synthesizer what key you pressed. If your keyboard is velocity sensitive, it also tells the synthesizer how hard you pressed the key. When a synthesizer gets a NOTE ON message, it starts playing that note according to it’s present settings. Similarly, when you release the key, a MIDI NOTE OFF message is sent. If your keyboard is velocity sensitive, the NOTE OFF message also tells the synthesizer how quickly you let up on the key.

With your keyboard connected to the SE-1X, hold down a key. Watch the MIDI light flash once as you press it down. It flashed because it received a NOTE ON message. Now release the key, and watch the MIDI light flash again. This time it flashes because it received a NOTE OFF message. Press the key again, then without letting go of the key, reach behind the keyboard or SE-1X and disconnect the MIDI cable from one or the other. Now release the key. Although the NOTE OFF message was generated by the keyboard, it never reached the SE-1X. You have just generated a “stuck note”. Notice that the note is still being played, even though the keyboard or sequencer is completely disconnected from the SE-1X. To unstuck the note, press the same key as you did to make the stuck note, plug the cable back in, and then release the key. This will send the proper NOTE OFF message, and the note will finally stop playing.

There are a wide variety of other MIDI messages beyond NOTE ON and NOTE OFF. Some of the messages indicate that you have twisted a knob, or moved a slider or joystick on your keyboard. You will need to refer to the documentation for your keyboard or sequencer to see what it can do.

Another very useful kind of MIDI message you may wish to send to the SE-1X is a bank or program change message. These instantly will call up saved patches from memory by number. The SE-1X has patches numbered from one to 99 in each of its eight banks.

Still another kind of MIDI message is the continuous controller (“CC”) message. This is what is usually generated when you twist a knob. You will find that the SE-1X generates CC messages when you twist the knobs on the front panel, and that the SE-1X will behave as if you twisted a knob in response to those same CC messages. This allows you to record what you do to the front panel into a MIDI sequencer. When you play back a sequence, what you did with the knobs will be reproduced. So, you can record not just what you play on the keyboard, but also how you twist the FREQUENCY knob, for example. If you have a sequencer that can record MIDI, try it!

The following table shows which CC numbers are associated with which functions in the SE-1X. This is probably only interesting to you if you have a MIDI application more advanced than what can be covered in this document, such as controlling the SE-1X with a remote knob box, or writing a computer program to edit the SE-1X (so you don’t have to reach over and twist the knobs by hand).

54	OSC1	F
55	OSC1	TRI ON/OFF
56	OSC1	SAW ON/OFF
57	OSC1	SQR ON/OFF
58	OSC1	PW
59	OSC2	F
60	OSC2	TRI ON/OFF
61	OSC2	SAW ON/OFF
62	OSC2	SQR ON/OFF
63	OSC2	PW
70	OSC3	F
71	OSC3	TRI ON/OFF
72	OSC3	SAW ON/OFF
73	OSC3	SQR ON/OFF
74	OSC3	PW
80	LFO1	RATE
81	LFO1	DEPTH
82	LFO2	RATE
83	LFO2	DEPTH
85	LFO3	RATE
86	LFO3	DEPTH
87	OSC1	MIX
88	OSC2	MIX
89	OSC3	MIX
90	NOISE	MIX
91	RM	MIX
92	VCF	F
93	VCF	Q
94	VCF	TRACK
95	ENV1	AMT
102	ENV1	A
103	ENV1	D
104	ENV1	S
105	ENV1	R
106	ENV2	A
107	ENV2	D
108	ENV2	S
109	ENV2	R
110	ENV3	A
111	ENV3	D
112	ENV3	S
113	ENV3	R
114	ENV3	AMT
115	ENV4	A
116	ENV4	D
117	ENV4	S
118	ENV4	R
119	ENV4	AMT

If you're new to MIDI, don't worry about this table too much. In essence, what's going on is that the turning of the knobs on the front panel of the SE-1X can all be done remotely, or recorded into a sequencer, via MIDI.

10 Modifications

Some people modify their synthesizers by opening them up and replacing some of the electronic components. Information on doing this is provided here only so that you have it. Don't modify your SE-1X. You could kill yourself. You could hurt yourself. You could wreck your SE-1X for good. You have been warned.

A common criticism of the SE-1X is that the envelopes are too slow. If you are comfortable making circuit board modifications to synthesizers, you might try changing R44 to a 47K, 1/2W, 5% resistor to make the envelopes snappier. Be sure to unplug the SE-1X before you even open the case, and know that you have only yourself to blame if you break it. If you need more instructions than these to perform the modification, it's probably better if you find someone knowledgeable to do it for you. Many places that repair musical equipment will be happy to make modifications like this for a reasonable fee.

At the time this is written, upgrades to the internal SE-1X software are available via the Internet. Follow the instructions you receive with the upgrades very carefully.

11 Reviews

If you are reading this manual, there is a good chance you are considering buying an SE-1X, either new or second-hand. Therefore, included here are some common concerns regarding the SE-1X as they appear to a collector of analog synthesizers.

The Minimoog is a very important synthesizer, both musically and historically. Because Studio Electronics began their business selling the service of modifying Minimoogs to be keyboardless MIDI synthesizers, many are looking for the SE-1X (and SE-1) to be exactly like the Minimoog, and it isn't. It is *similar* to the Minimoog, but experts and collectors can tell the difference easily. The SE-1X has a lot of big and important features the Minimoog doesn't, most notably patch memory and automatic tuning. Patches on the Minimoog were saved by drawing them on a piece of paper. Tuning a Minimoog is a chore, and changes in temperature (especially from stage lights) can cause a Minimoog to go out of tune. The SE-1X does not require such tuning at all. Of course, the instability of tuning in the Minimoog colors the tone in such a way that many find sounds good.

Although the electronics to produce the sounds made by the SE-1X are all analog circuitry, these circuits are ultimately under MIDI control. Although only the Q dial feels like you are switching between separate settings, all the rest of the knobs only feel smooth, and smoothly change their controls from one setting to another. Each thing under MIDI control can only take on one of 128 values, or fewer. When you turn the knob, it feels smooth, and it sounds smooth, but the synthesizer inside is settling into one of these 128 possibilities as you stop moving the knob. This disappoints a lot of analog synthesizer enthusiasts, since having analog knobs with infinite possible settings is part of what they claim makes an analog synthesizer so wonderful. Many musicians find MIDI control more useful than not, but it lowers the desirability and value of the synthesizer to some collectors.

Both the "24db" and "12db" filters are faithful reproductions of Moog and S.E.M. circuits. Being able to switch between the two is an excellent feature. Being able to route external sounds through one of these filters is also a desirable feature. The multi-mode oscillators and filters are where the SE-1X really shines, at least from the standpoint of most analog synthesizer fans.

Aside from the tone of the oscillators and the character of the filters, the thing which tends to most define the sound of a synthesizer are the envelopes. Very fast envelopes are not possible on the SE-1X without modification (see the section on Modifications, above). Even as modified, most claim there is a "punchy" quality to the envelopes on a Minimoog that the SE-1X (and SE-1) does not match.

If you're not collecting but making music, and comparing several synthesizers, there are different things to look for. Find out what kind of Internet communities there are for the synthesizer. Are there friendly people who are comfortable with what they own, who share their patches and techniques? Do new users get their questions answered? Do the users have good relations with the manufacturer's customer support services? Can you get software and documentation updates over the Internet? Are there parts inside the

synthesizer they don't make any more? Commenting on these issues with regard to the SE-1X is not for this manual, but if you're shopping around for any synthesizer, it's a good thing to check on your own.

There is no one best synthesizer. Synthesizers can be expensive. Without years of experience, it is impossible to understand all of the features and nuances of several synthesizers so that you can compare them properly. Many will defend their beloved Minimoog, Oberheim Xpander, or SE-1X with great violence, because spending "that kind of money" is a big decision, and they don't want to be wrong. For some, it's also a matter of nostalgia, trying to obtain the synthesizer they had around the time they made their own music for the first time. The best strategy for a newcomer is probably to keep an open mind, dive in without too much hesitation, and to try new things. Music technology always requires patience and clear thinking. If you're open minded and original enough, you may even stumble upon the next big thing.

12 Epilogue

If this document has helped one musician play one more song, then it was worth the effort. It took one person about one week of part-time work to write and typeset this entire document, spread out over about a month and a half.

It is not enough to make great music technology. Great technology must also come with clear explanations and instructions. As a musician, or especially as an engineer for musicians, you should feel it is your right to know how things work. If you ever feel like the person providing you with technology is talking down to you, or trying to sell you something, you should stop them. You should tell them respectfully that they are standing in the way of music, and that it is wrong to do so. Music is very important. *Your* music is very important. Do not compromise.

13 LICENSE

Attribution-ShareAlike 2.5

License

THIS WORK (AS DEFINED BELOW) IS PROVIDED UNDER THE TERMS OF THIS CREATIVE COMMONS PUBLIC LICENSE ("CCPL" OR "LICENSE"). THE WORK IS PROTECTED BY COPYRIGHT AND/OR OTHER APPLICABLE LAW. ANY USE OF THE WORK OTHER THAN AS AUTHORIZED UNDER THIS LICENSE OR COPYRIGHT LAW IS PROHIBITED.

BY EXERCISING ANY RIGHTS TO THE WORK PROVIDED HERE, YOU ACCEPT AND AGREE TO BE BOUND BY THE TERMS OF THIS LICENSE. THE LICENSOR GRANTS YOU THE RIGHTS CONTAINED HERE IN CONSIDERATION OF YOUR ACCEPTANCE OF SUCH TERMS AND CONDITIONS.

1. Definitions

- "Collective Work" means a work, such as a periodical issue, anthology or encyclopedia, in which the Work in its entirety in unmodified form, along with a number of other contributions, constituting separate and independent works in themselves, are assembled into a collective whole. A work that constitutes a Collective Work will not be considered a Derivative Work (as defined below) for the purposes of this License.
 - "Derivative Work" means a work based upon the Work or upon the Work and other pre-existing works, such as a translation, musical arrangement, dramatization, fictionalization, motion picture version, sound recording, art reproduction, abridgment, condensation, or any other form in which the Work may be recast, transformed, or adapted, except that a work that constitutes a Collective Work will not be considered a Derivative Work for the purpose of this License. For the avoidance of doubt, where the Work is a musical composition or sound recording, the synchronization of the Work in timed-relation with a moving image ("synching") will be considered a Derivative Work for the purpose of this License.
 - "Licensor" means the individual or entity that offers the Work under the terms of this License.
 - "Original Author" means the individual or entity who created the Work.
 - "Work" means the copyrightable work of authorship offered under the terms of this License.
 - "You" means an individual or entity exercising rights under this License who has not previously violated the terms of this License with respect to the Work, or who has received express permission from the Licensor to exercise rights under this License despite a previous violation.
 - "License Elements" means the following high-level license attributes as selected by Licensor and indicated in the title of this License: Attribution, ShareAlike.
2. Fair Use Rights. Nothing in this license is intended to reduce, limit, or restrict any rights arising from fair use, first sale or other limitations on the exclusive rights of the copyright owner under copyright law or other applicable laws.
3. License Grant. Subject to the terms and conditions of this License, Licensor hereby grants You a worldwide, royalty-free, non-exclusive, perpetual (for the duration of the applicable copyright) license to exercise the rights in the Work as stated below:
- to reproduce the Work, to incorporate the Work into one or more Collective Works, and to reproduce the Work as incorporated in the Collective Works;
 - to create and reproduce Derivative Works;
 - to distribute copies or phonorecords of, display publicly, perform publicly, and perform publicly by means of a digital audio transmission the Work including as incorporated in Collective Works;
 - to distribute copies or phonorecords of, display publicly, perform publicly, and perform publicly by means of a digital audio transmission Derivative Works.

The above rights may be exercised in all media and formats whether now known or hereafter devised. The above rights include the right to make such modifications as are technically necessary to exercise the rights in other media and formats. All rights not expressly granted by Licensor are hereby reserved.

4. Restrictions. The license granted in Section 3 above is expressly made subject to and limited by the following restrictions:

1. You may distribute, publicly display, publicly perform, or publicly digitally perform the Work only under the terms of this License, and You must include a copy of, or the Uniform Resource Identifier for, this License with every copy or phonorecord of the Work You distribute, publicly display, publicly perform, or publicly digitally perform. You may not offer or impose any terms on the Work that alter or restrict the terms of this License or the recipients' exercise of the rights granted hereunder. You may not sublicense the Work. You must keep intact all notices that refer to this License and to the disclaimer of warranties. You may not distribute, publicly display, publicly perform, or publicly digitally perform the Work with any technological measures that control access or use of the Work in a manner inconsistent with the terms of this License Agreement. The above applies to the Work as incorporated in a Collective Work, but this does not require the Collective Work apart from the Work itself to be made subject to the terms of this License. If You create a Collective Work, upon notice from any Licensor You must, to the extent practicable, remove from the Collective Work any credit as required by clause 4(c), as requested. If You create a Derivative Work, upon notice from any Licensor You must, to the extent practicable, remove from the Derivative Work any credit as required by clause 4(c), as requested.
2. You may distribute, publicly display, publicly perform, or publicly digitally perform a Derivative Work only under the terms of this License, a later version of this License with the same License Elements as this License, or a Creative Commons iCommons license that contains the same License Elements as this License (e.g. Attribution-ShareAlike 2.5 Japan). You must include a copy of, or the Uniform Resource Identifier for, this License or other license specified in the previous sentence with every copy or phonorecord of each Derivative Work You distribute, publicly display, publicly perform, or publicly digitally perform. You may not offer or impose any terms on the Derivative Works that alter or restrict the terms of this License or the recipients' exercise of the rights granted hereunder, and You must keep intact all notices that refer to this License and to the disclaimer of warranties. You may not distribute, publicly display, publicly perform, or publicly digitally perform the Derivative Work with any technological measures that control access or use of the Work in a manner inconsistent with the terms of this License Agreement. The above applies to the Derivative Work as incorporated in a Collective Work, but this does not require the Collective Work apart from the Derivative Work itself to be made subject to the terms of this License.
3. If you distribute, publicly display, publicly perform, or publicly digitally perform the Work or any Derivative Works or Collective Works, You must keep intact all copyright notices for the Work and provide, reasonable to the medium or means You are utilizing: (i) the name of the Original Author (or pseudonym, if applicable) if supplied, and/or (ii) if the Original Author and/or Licensor designate another party or parties (e.g. a sponsor institute, publishing entity, journal) for attribution in Licensor's copyright notice, terms of service or by other reasonable means, the name of such party or parties; the title of the Work if supplied; to the extent reasonably practicable, the Uniform Resource Identifier, if any, that Licensor specifies to be associated with the Work, unless such URI does not refer to the copyright notice or licensing information for the Work; and in the case of a Derivative Work, a credit identifying the use of the Work in the Derivative Work (e.g., "French translation of the Work by Original Author," or "Screenplay based on original Work by Original Author"). Such credit may be implemented in any reasonable manner; provided, however, that in the case of a Derivative Work or Collective Work, at a minimum such credit will appear where any other comparable authorship credit appears and in a manner at least as prominent as such other comparable authorship credit.

5. Representations, Warranties and Disclaimer

UNLESS OTHERWISE AGREED TO BY THE PARTIES IN WRITING, LICENSOR OFFERS THE WORK AS-IS AND MAKES NO REPRESENTATIONS OR WARRANTIES OF ANY KIND CONCERNING THE MATERIALS, EXPRESS, IMPLIED, STATUTORY OR OTHERWISE, INCLUDING, WITHOUT LIMITATION, WARRANTIES OF TITLE, MERCHANTABILITY, FITNESS FOR A PARTICULAR PURPOSE, NONINFRINGEMENT, OR THE ABSENCE OF LATENT OR OTHER DEFECTS, ACCURACY, OR THE PRESENCE OF ABSENCE OF ERRORS, WHETHER OR NOT DISCOVERABLE. SOME JURISDICTIONS DO NOT ALLOW THE EXCLUSION OF IMPLIED WARRANTIES, SO SUCH EXCLUSION MAY NOT APPLY TO YOU.

6. Limitation on Liability. EXCEPT TO THE EXTENT REQUIRED BY APPLICABLE LAW, IN NO EVENT WILL LICENSOR BE LIABLE TO YOU ON ANY LEGAL THEORY FOR ANY SPECIAL, INCIDENTAL, CONSEQUENTIAL, PUNITIVE OR EXEMPLARY DAMAGES ARISING OUT OF THIS LICENSE OR THE USE OF THE WORK, EVEN IF LICENSOR HAS BEEN ADVISED OF THE POSSIBILITY OF SUCH DAMAGES.

7. Termination

1. This License and the rights granted hereunder will terminate automatically upon any breach by You of the terms of this License. Individuals or entities who have received Derivative Works or Collective Works from You under this License, however, will not have their licenses terminated provided such individuals or entities remain in full compliance with those licenses. Sections 1, 2, 5, 6, 7, and 8 will survive any termination of this License.
2. Subject to the above terms and conditions, the license granted here is perpetual (for the duration of the applicable copyright in the Work). Notwithstanding the above, Licensor reserves the right to release the Work under different license terms or to stop distributing the Work at any time; provided, however that any such election will not serve to withdraw this License (or any other license that has been, or is required to be, granted under the terms of this License), and this License will continue in full force and effect unless terminated as stated above.

8. Miscellaneous

1. Each time You distribute or publicly digitally perform the Work or a Collective Work, the Licensor offers to the recipient a license to the Work on the same terms and conditions as the license granted to You under this License.
2. Each time You distribute or publicly digitally perform a Derivative Work, Licensor offers to the recipient a license to the original Work on the same terms and conditions as the license granted to You under this License.
3. If any provision of this License is invalid or unenforceable under applicable law, it shall not affect the validity or enforceability of the remainder of the terms of this License, and without further action by the parties to this agreement, such provision shall be reformed to the minimum extent necessary to make such provision valid and enforceable.
4. No term or provision of this License shall be deemed waived and no breach consented to unless such waiver or consent shall be in writing and signed by the party to be charged with such waiver or consent.
5. This License constitutes the entire agreement between the parties with respect to the Work licensed here. There are no understandings, agreements or representations with respect to the Work not specified here. Licensor shall not be bound by any additional provisions that may appear in any communication from You. This License may not be modified without the mutual written agreement of the Licensor and You.