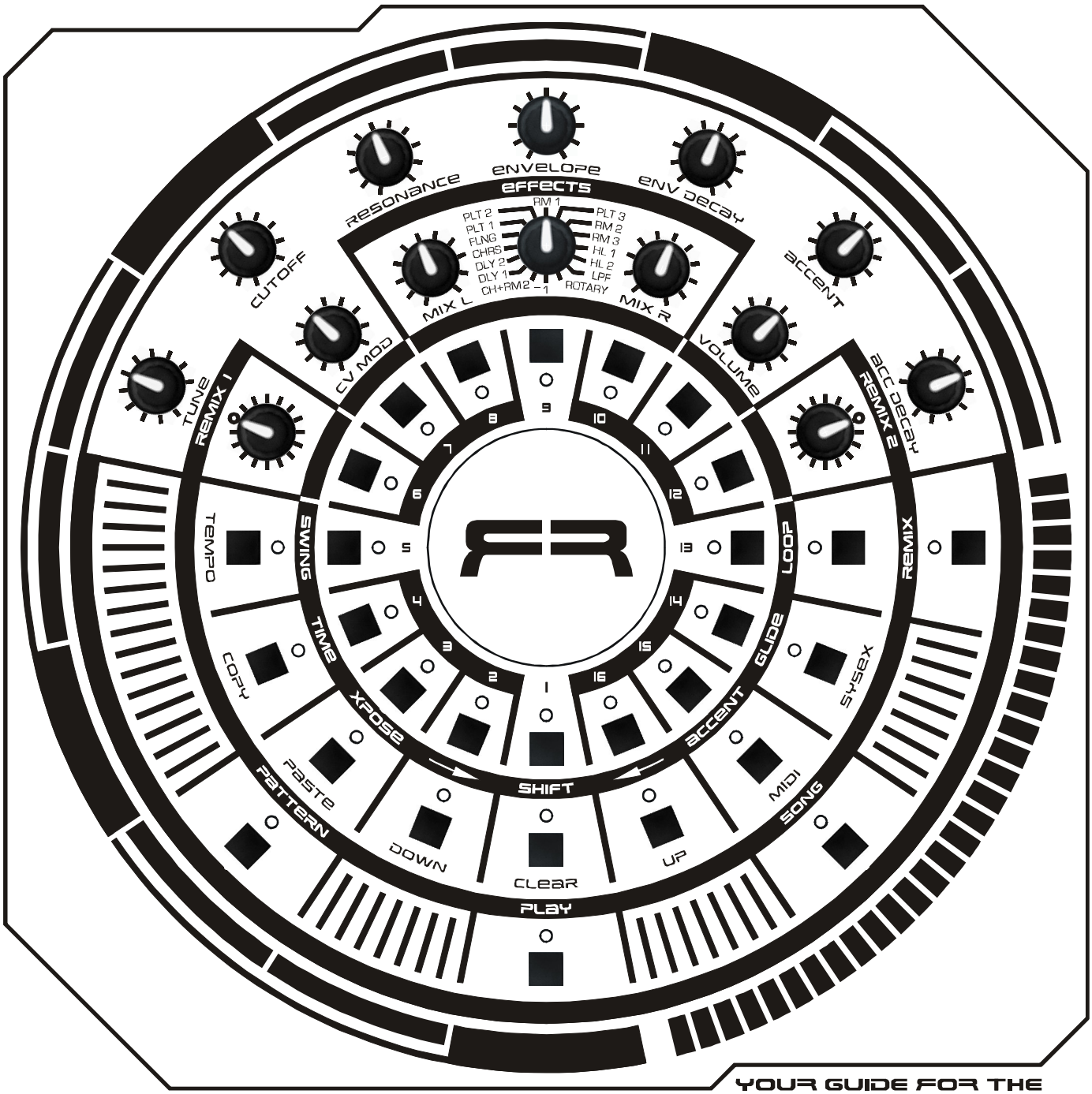
# FUTURERETRO




YOUR GUIDE FOR THE

# REVOLUTION

FUTURERETRO

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# INTRODUCTION

**WELCOME TO THE REVOLUTION!**
Thank you for purchasing the Revolution.

**OVERVIEW**
The Revolution is a true monophonic analog synthesizer, which includes analog and DSP effects, along with a programmable digital sequencer section and multiple interfacing features. We've gone to great lengths to ensure that the Revolution is fully capable of the most accurate reproduction of the original TB303's sound, and in many ways surpasses its signature liquid tones and capabilities.
The step-based sequencer provides 256 storable patterns which users can create and edit in real-time while the unit plays. Patterns may be selected and played in any order live, or prearranged into one of the 16 song locations stored in memory. In addition, the Revolution provides our new Remix feature which provides 256 variations for every pattern and song, for more than 65,000 possible patterns right out of box.
The Revolution can be used to play other MIDI sound modules and CV/Gate type synthesizers, sync the playback with other MIDI sequencers, or be played live with a MIDI keyboard. This unit can also act as a MIDI to CV/Gate converter, and a MIDI to Din Sync converter, as well as process external audio.

Please be sure and read through the entire manual for a full understanding of the features and functions the Revolution is capable of.

**PHILOSOPHY**
The Revolution is our new concept synthesizer designed to illustrate loop-based music in a much more natural way than has been provided in the past with traditional instruments. Think about it. The basis of music is time. Time is nothing more than our perception of the heavenly bodies spinning through their celestial orbits.
From ancient sundials to modern analog clocks time has been represented as the circle, a cycle which never ends, illustrating the infinite within a finite amount of space. So why not use this same knowledge to represent music?
Consider the sine wave, which is the fundamental tone in all sound. It's shape circular. Consider the cyclic patterns of the rhythm, melody, and harmony, and how one could best represent the infinite possibilities of music within a finite amount of space, and you will begin to see the importance of this circular theme throughout music.

May the Revolution inspire you!

# MAINTENANCE

**POWER**
Use only the 12 volt AC/AC 1 Amp output power supply provided with this unit. If you should ever lose this power supply, please contact us for a replacement.

**CARE**
Avoid exposing the unit to smoke, damp, dusty, or extreme hot and cold environments. To clean the unit, use a soft damp cloth. Do not use any abrasive cleaners, as these may harm the surfaces and finish of the unit.

**BACKUP BATTERY**
The Revolution does contain an internal 3.6 volt backup battery for the sequencer's RAM. This battery will last for years. However at some point in the future this battery may need to be replaced. As a general rule always back up your patterns and songs using the sysex dump feature to prevent the accidental loss of your work. And definitely save your work before the battery is replaced, as all information will be lost when the battery is removed.
To replace the battery yourself, use the following procedure. Gently pull up on the 14 control knobs to remove them. Remove the 3 hex screws on the bottom/front of the unit, and the 3 hex screws on the rear jack panel of the unit. Lift the front panel off the unit and locate the battery on the front right-hand side of the main PC board. Desolder the old battery and replace only with a TL-5140/P type lithium battery of 3.6 volts rated at 2,100 mAh. Once the battery has been replaced reinstall the front panel, screws and knobs.
If you would prefer that we do this service for you, please contact us for more information.

**FUSE**
Should the fuse in the Revolution need replacing, use the following procedure to change the fuse. Gently pull up on the 14 control knobs to remove them. Remove the 3 hex screws on the bottom/front of the unit, and the 3 hex screws on the rear jack panel of the unit. Lift the front panel off the unit and locate the fuse near the power switch. Remove the old fuse and replace with only a 1 amp fast-acting fuse. Once the fuse has been replaced reinstall the front panel, screws and knobs.

**PRODUCT WARRANTY AND SUPPORT**
The Revolution comes with a 1 year limited warranty covering any mechanical or electrical defects. This warranty does not cover damage due to misuse or abuse of this product. To validate your warranty, fill out the warranty card included with your unit and return it within one month of the original purchase date. Should you experience problems with your machine, please contact us by phone or email. You must have an authorization to return a unit to us for repairs.
Our office is open Monday through Friday, 10am to 6pm central standard time zone.
Phone: 785-827-9278
Email: support@future-retro.com
Product support can be found online at www.future-retro.com

# GETTING STARTED

**I WANT TO PLAY NOW!**
I know, you just got this cool new machine and don't really feel like reading the entire manual before you at least get to hear what it sounds like, right?

To play the Revolution follow these directions in order.

1. Connect the Revolution to an audio system, or headphones as shown below.
2. Set the Tune control to it's mid position, and turn the volume all the way down (counter clockwise).
3. Turn the Revolution's power on by pressing the power switch located on the back of the unit. The display will light up indicating the unit is now on. The display shows the current pattern bank selected, and keys 1-16 are used to select one of the 16 patterns in each of the 16 banks, when the Pattern key indicator is on.
4. Press the Play key and the pattern currently selected will begin playing. The Play key indicator will blink at the rate of quarter notes. Raise the Volume control until you hear audio in your speakers or headphones. You can select patterns by pressing step keys 1-16. To change the pattern bank you are selecting patterns from, use the Up/Down keys and the display will show the current bank selected.
5. You can change the tempo patterns are currently playing at by pressing and holding the Tempo key, and using the Up/Down keys to change the tempo. While the Tempo key is held, the display will show the current tempo setting.
6. Feel free to tweak the knobs in the analog section to vary the sound being played.
7. Press the Play key again when you want to stop playback.

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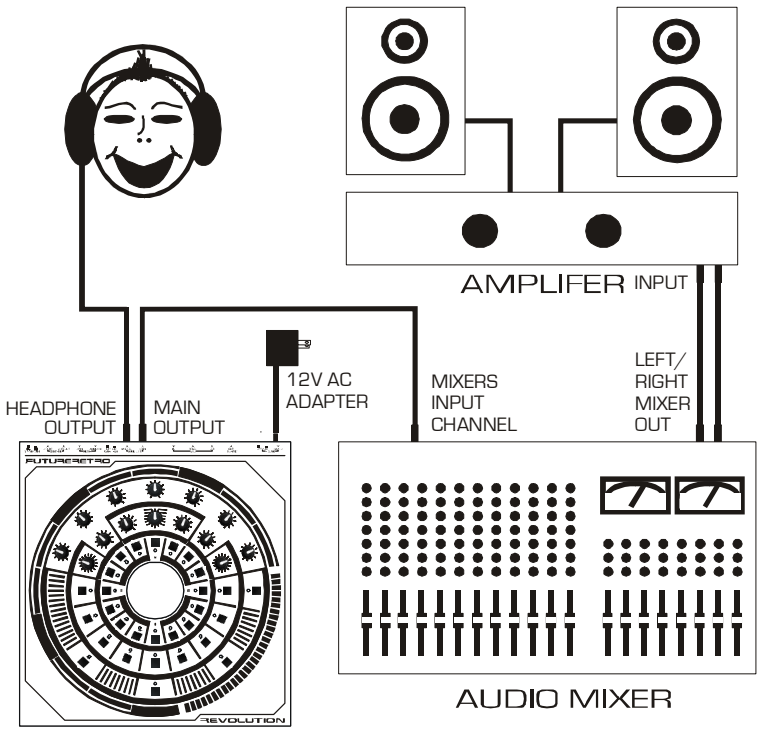
For most live or studio work you will want to connect the MAIN OUTPUT to a mixer, amplifier, and stereo speakers. The audio outputs of the Revolution are stereo 1/4" jacks. You can use either mono or stereo cables to run the output into your mixer. For personal monitoring, you can connect headphones to the PHONES OUTPUT.

As a general rule, turn the Revolution on first, then mixer, then amplifier. When shutting everything off, turn the amplifier off first, then proceed with turning off the rest of your equipment. This will help prevent any power surges to your amplifier and speakers.



# CONNECTIONS

Always remember to turn the power off before making new connections.

**12V AC** Connect the power supply provided with your unit here. Use only 12V AC output power supplies rated at 1 Amp to power the unit.

**POWER ON/OFF** This is the main power switch. Push this to turn the unit On and Off.

**DIN SYNC OUT** Use a MIDI cable to connect this output to the Din Sync Input of other devices to sync their playback with the Revolution.

**MIDI OUT** Use a MIDI cable to connect this output to another devices MIDI Input, so that the other device can be played by, or sync its playback to, the Revolution. You may also use this connection when performing a sysex dump of patterns and songs to another device.

**MIDI THRU** All information being received by the Revolution's MIDI input will be sent out the MIDI THRU output. Use a MIDI cable to connect this output to another devices MIDI Input for creating a daisy chain between multiple units.

**MIDI IN** Use a MIDI cable to connect this input to another devices MIDI Out, so that the Revolution can be played, or sync its playback to the other device. You may also use this connection when performing a sysex dump of patterns and songs from another device.

**MAIN AUDIO OUT** Use either a stereo or mono 1/4" cable to connect this output to the input of your audio system, or mixer. Sound generated by the analog section will be output here.

**PHONES AUDIO OUT** Connect your stereo headphones here to monitor the sound of the main audio output.

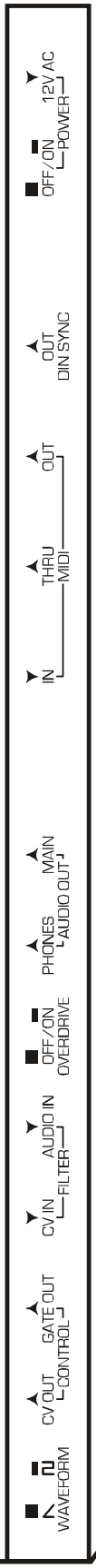
**FILTER AUDIO IN** Use a 1/4" cable to connect the output of a line level audio source to this input, so that the audio source can be filtered, gated, distorted, or processed with the DSP effects. When a cable is plugged half way in to this input, the external audio will be summed with the sound of the oscillator. When a cable is plugged all the way in to this jack, you will only be able to hear the external audio.

**FILTER CV IN** Use a 1/4" mono cable to connect this input to the output of any control voltage source from 0 to +5.33volts, to modulate the filter's cutoff frequency.

**GATE OUT** When notes are played in the Revolution, a +12 volt (positive polarity) gate signal is generated at this output for controlling other analog equipment.

**CV OUT** When notes are played in the Revolution, a 1 volt per octave control voltage is generated at this output for controlling other analog equipment.

*Please read over the analog controls section on the next page to learn about the, WAVEFORM SELECT and OVERDRIVE ON/OFF switches.*



# INTRODUCTION TO ANALOG

The Revolution is a true analog monophonic synthesizer, designed to accurately recreate the classic sounds of the original TB303 Bassline and more. All of the elements of a sound can be changed instantly by the dedicated control knobs and switches.

These controls are not digitized in any way  for the storing of sound patches or transmitting knob movements as MIDI CC messages. Instead we have chosen to keep these controls true analog just as the original TB303. This prevents problems such as stair-stepping and jumping of parameters common in most of today's digital synthesizers. After all it's analog, and its controls should be as smooth as the sound it creates. You should find the unit is very simple to use, and is just begging to be tweaked live.

The analog control locations should be very familiar to those who have already used a TB303, as we kept the layout of the original controls and added our own little twist to things. Those who are not already familiar with using a TB303, will be up and running in no time.

The analog section of the Revolution contains a voltage controlled oscillator capable of generating both sawtooth and square waveforms over a 5 octave range. This oscillator, an external audio source, or both, can be connected to the input of the 18db 3pole resonant low pass filter. The filter is used to shape the overall tone of the sound. The filter's frequency can be adjusted manually with the cutoff control, swept by the dedicated filter envelope, modulated by the internal control voltages (generated by the sequencer) or any external control voltage source, as well as the unique brightening effect that accent has on the filter. Once the sound passes through the filter, it can then be overdriven and gated by the amplifier section. Accent will also affect the overall volume of the Revolution's amplifier. And finally the sound can be processed by the internal DSP effects, before being sent to your audio system.

# ANALOG CONTROLS

These analog switches are located on the rear of the unit.

**WAVEFORM SELECT**

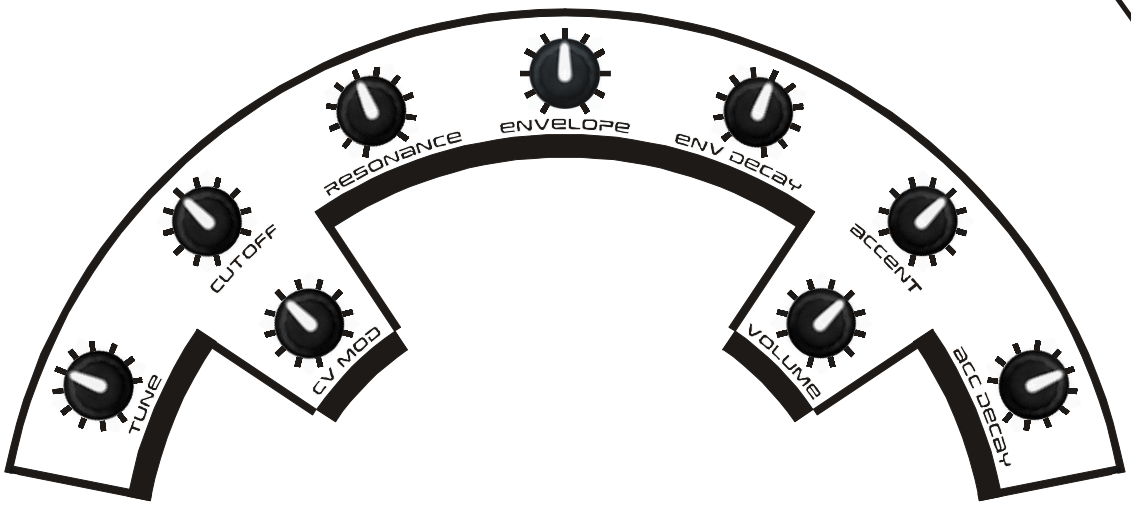

When this switch is pressed in, the square wave shape will be selected for the oscillator. When this switch is in the out position, the sawtooth wave shape will be selected for the oscillator. The square waveform contains only odd harmonics, and has a very hollow sound. The sawtooth waveform contains all harmonics creating a very full and sometimes raspy sound.

**OVERDRIVE OFF/ON**


When this switch is pressed in, the internal audio signal will be overdriven by an analog distortion stage.  When this switch is in the out position, overdrive will be turned off, and the original clean signal will be heard. The overdrive stage is a nice way to add harmonics to a sound. This distortion will provide an aggressive edge to the sound. You may notice that there is no overdrive amount control. The overdrive stage in the Revolution is dynamic, in the sense that the amount of resonance in the filter determines how overdriven the sound will be. At lower resonance settings, sounds will be mildly clipped. Higher resonance settings will cause the sound to become more distorted with emphasis on the high end for clarity and cutting through.

# ANALOG CONTROLS






**TUNE** This is a fine tune control for the pitch of the oscillator. It has approximately a +/- 1 semitone range. When this control is in the mid-position, the oscillator should generate the correct pitch programmed into the sequencer. Use this control to fine tune the Revolution with other equipment. If larger changes in frequency are required, you can transpose the patterns within the sequencer.

**CUTOFF** The cutoff control adjusts the point at which high frequencies become reduced in the lowpass filter. Turning this control clockwise will allow more high frequencies to pass through the filter. When this control is turned counter-clockwise, high frequencies will be attenuated and only lower frequencies will be heard.

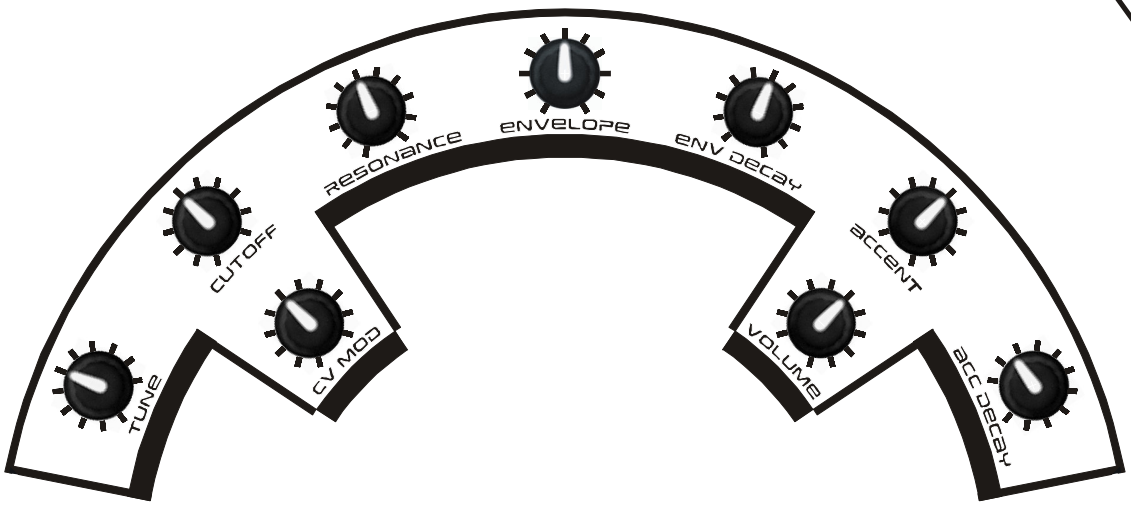
**RESONANCE** The resonance control is used to accentuate the frequencies closest to the filter's cutoff frequency. Turning this control clockwise will cause the sound to become thinner with more of a liquid quality. When this control is turned counter-clockwise, the sound will become full and no resonance will be heard.

**ENVELOPE** The envelope control adjusts the amount of affect the filter's envelope signal will have on the filter's cutoff frequency. As you turn this control clockwise, the envelope will sweep the cutoff frequency over a greater range. When turned counter-clockwise, the filter's envelope will have very little affect on the filter's cutoff frequency.

**ENV DECAY** This is the filter's envelope decay control, which will vary the decay time for the filter's envelope. Turning this control clockwise will create longer envelope decay times, allowing high frequencies to pass through the filter for a longer amount of time. Turning this control counter-clockwise will shorten the amount of time high frequencies can pass through the filter.

*Note: The total decay time for the filter's envelope is actually the sum of the ACCent DECAY time and the ENVelope DECAY time. As you increase the ACCent DECAY time, the filter's ENVelope DECAY time will also increase. The ACCent DECAY time simply sets the shortest possible decay time for the filter's envelope.*

# ANALOG CONTROLS



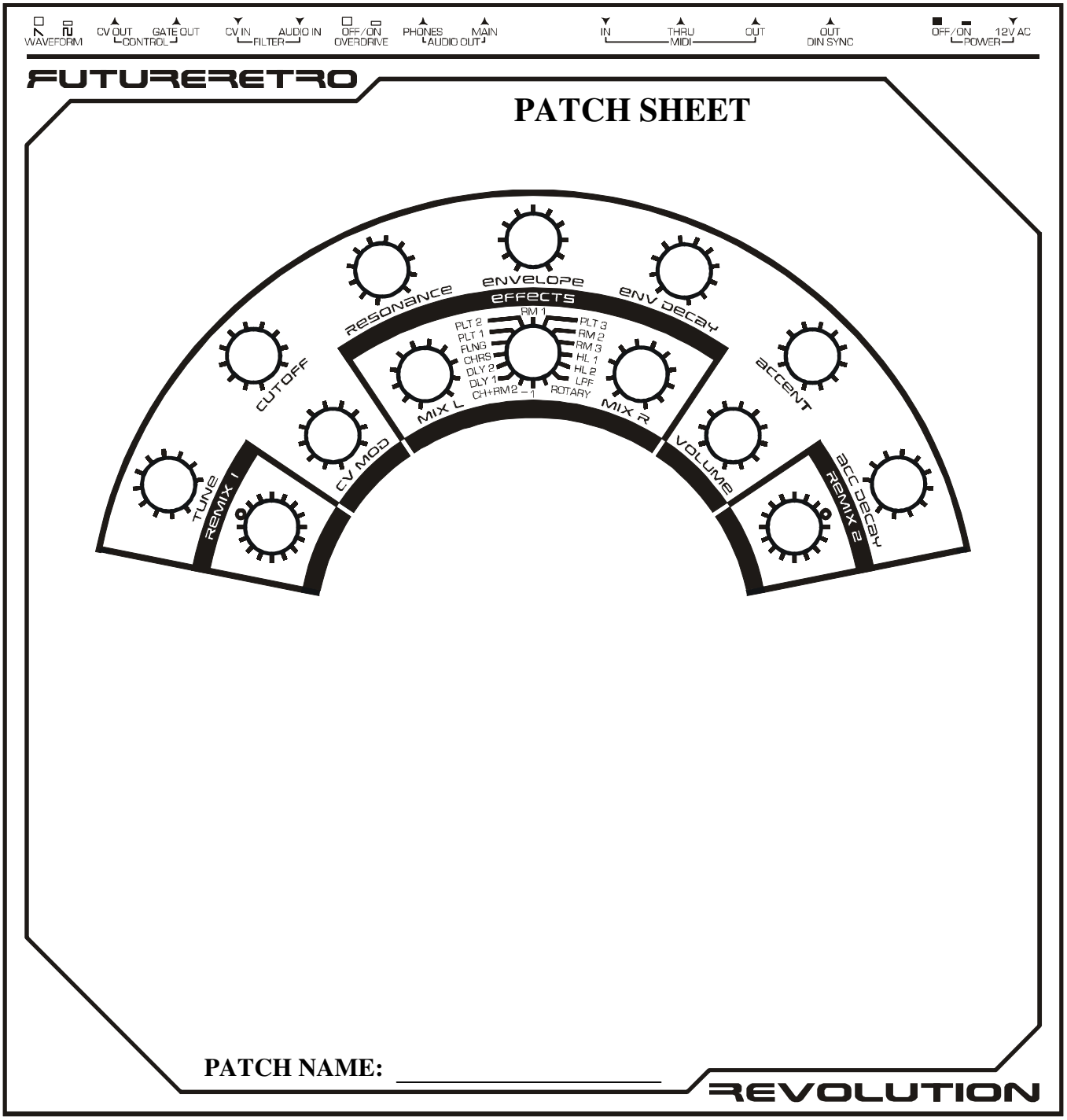

**ACCENT** The accent control adjusts the amount of affect the filter's envelope will have on both the filter's cutoff frequency and the amplitude of the sound when notes are programmed with an accent in the sequencer. When this control is turned clockwise, the filter's cutoff frequency will sweep up for the duration of the accent decay, and the overall amplitude for accented notes will increase accordingly with the setting of this control and the accent decay time. When this control is turned counter-clockwise, accented notes will play at normal volume, however the filter's envelope decay will still jump to the shortest possible decay time set by the accent decay control.

**ACC DECAY** The accent decay control sets the shortest possible time for the filter's envelope. When notes are programmed with an accent in the sequencer, the filter's envelope will use this accent decay time to sweep the filter's cutoff frequency, as well as boost the amplitude of the overall sound. When this control is turned clockwise, the filter sweep time becomes longer, and accented notes will play at a louder amplitude for a longer period of time. When turned counter-clockwise, the filter envelope will be capable of creating short tight blips, and you may hear little or no affect on the amplitude of the sound.

*Note: We have increased the range of this control to provide shorter and longer accent decay times than the TB303 was capable of. To recreate the original accent decay time of the TB303, set the accent decay control to the approximate position shown in the picture above.*

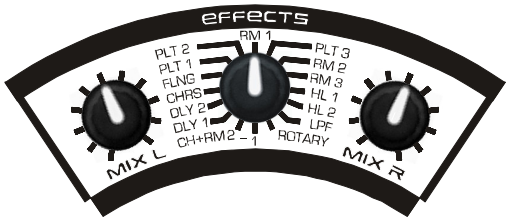
**CV MOD** This control-voltage modulation amount control is used to make the filter's cutoff frequency follow the pitch of notes programmed into the sequencer. When an external modulation signal is inserted into the CV IN jack on the rear panel, this external signal can then modulate the filter's cutoff frequency instead of following the pitches programmed into the sequencer. Turning this control clock-wise allows the internal pitches, or external modulation signal to have a greater affect on the filter's cutoff frequency. When this control is turned counter-clockwise the internal or external control voltages will have little or no affect on the filter's cutoff frequency.

**VOLUME** The volume control adjusts the amount of audio signal sent to both the MAIN OUTPUT and PHONES OUTPUT.




*Here is a blank patch sheet which you can photocopy and use to record knob and switch settings, make notes, and document how the Revolution is connected with other equipment.*

# DSP EFFECTS




The Revolution provides 16 preset stereo 24 bit DSP effects for processing both internal and external sounds. Although the internal sound section of the Revolution is mono, these stereo effects can be used to widen the stereo field of the sound as well as provide more depth.

**CH+RM1** This effect provides chorus with reverb creating a nice smooth and spatial sound.

**CH+RM2** This effect provides an auto-wah guitar effect with reverb for lead type instrument sounds.

**DLY 1** This effect provides a 141ms slap-back delay to the sound. This effect is best used with tempos in the area of 53, 106, and 212 BPM (beats per minute) when the 4/4 time signature is used for a pattern. When the time signature of a pattern is set for 3/4, this delay will work best with tempos in the area of 70, and 141 BPM.

**DLY 2** This effect provides a 107ms delay to the sound. This effect is best used with tempos in the area of 70, and 140 BPM when the 4/4 time signature is used for a pattern. When the time signature of a pattern is set for 3/4, this delay will work best with tempos in the area of 93, and 187 BPM.

**CHRS** Chorus is a stereo chorus for making audio rich and full sounding.

**FLNG** Flange is a stereo flange for metallic sweeping effects.

**PLT 1** Plate 1 is a classic plate reverb which may be best used to process instruments and vocals.

**PLT 2** Plate 2 is another plate reverb with added brightness and sizzle which may be best used to process instruments, drums, and vocals.

**RM1** Room 1 models a hardwood studio room, for a natural reverb sound.

**PLT 3** Plate 3 is a short vintage plate reverb, as typically used on snares and guitar sounds.

**RM 2** Room 2 is another reverb effect, which can be used to add ambience to instruments.

**RM 3** Room 3 provides a warm reverb sound for instruments.

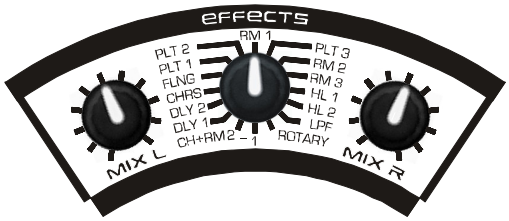
**HL 1** Hall 1 is a bright hall reverb typically used for instruments, drums, and vocals.

**HL 2** Hall 2 is a warm hall reverb typically used for acoustic instruments, drums, and vocals.

**LPF** Low Pass Filter is an effect which can be used to remove the high frequencies from instruments.

**ROTARY** Creates a stereo rotary speaker effect.

# DSP EFFECTS




The Revolution provides 16 preset stereo 24 bit DSP effects for processing both internal and external sounds.

**SELECTING EFFECTS** To select an effect, rotate the center control switch to the desired effect.

**MIX L** This is the dry/wet control for the left output channel. Turning this control clockwise will increase the amount of processed signal heard on the left output channel. When this control is turned fully counter-clockwise, the DSP effects will be bypassed and only the dry analog audio signal will be heard on the left output channel. The mix ratio for this control is 100% dry to 100% wet.

**MIX R** This is the dry/wet control for the right output channel. Turning this control clockwise will increase the amount of processed signal heard on the right output channel. When this control is turned fully counter-clockwise, the DSP effects will be bypassed and only the dry analog audio signal will be heard on the right output channel. The mix ratio for this control is 100% dry to 100% wet.

Using different combinations of dry/wet settings for each channel will help place the audio within the stereo field.

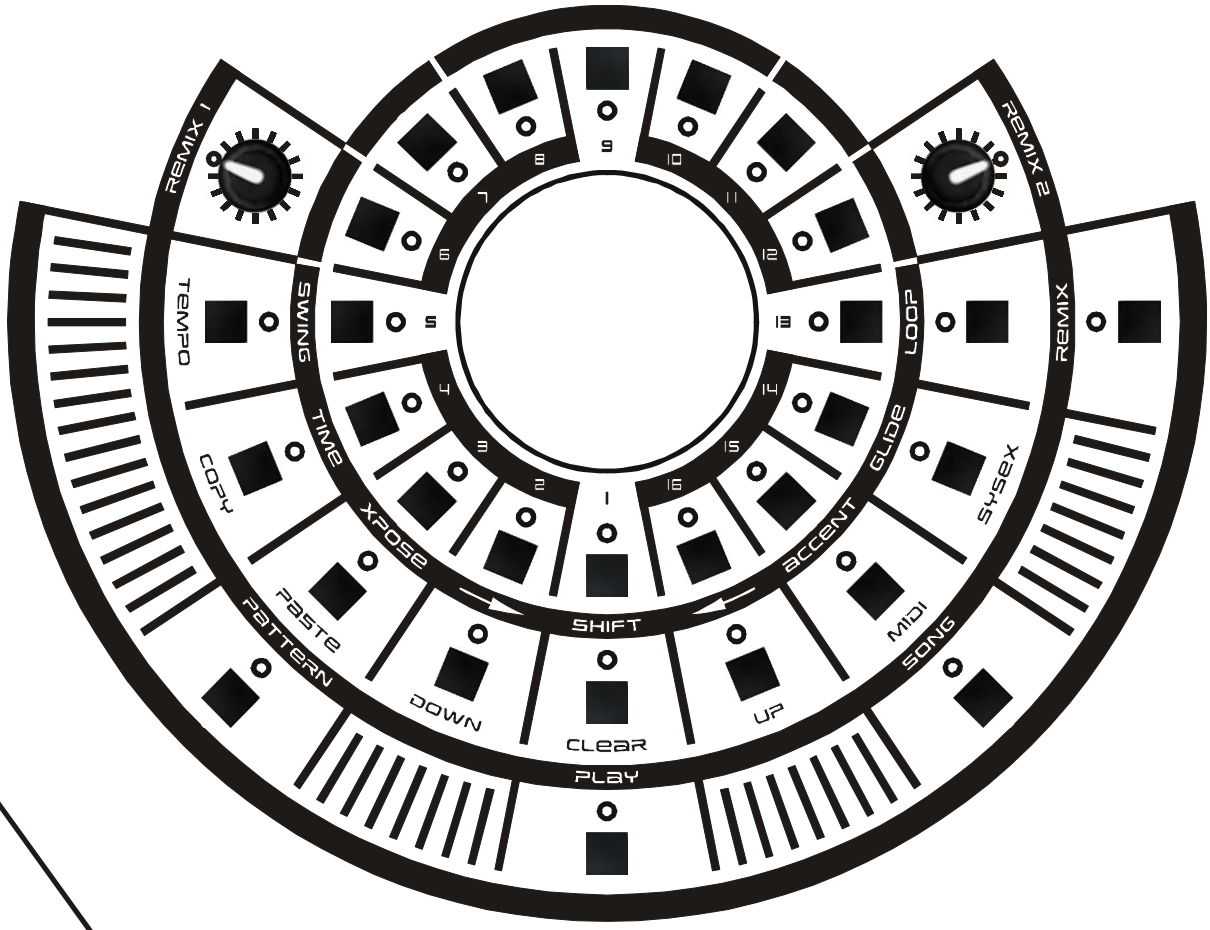
You could set one channel to dry and the other to wet when recording so that you can come back later when mixing those tracks to get the perfect balance of dry and processed signals for the overall mix.

With some effects, the output level may decrease as the mix controls are turned clockwise. You may need to make adjustments to the Volume control to make up for this attenuation.

# SEQUENCER INTRODUCTION

The Revolution contains a programmable digital sequencer for recording and playing back musical patterns and songs. All the information for a pattern can be edited while the sequencer is either playing or stopped. The sequencer automatically saves all changes made to patterns and songs. This allows users to create and manipulate patterns live and hear the changes as they are made.
With the Revolution's sequencer, you can play the internal analog sound section, external MIDI sound modules, as well as the older CV/Gate type synthesizers.

**STRUCTURE**
There are 256 user writable patterns arranged as 16 banks of 16 patterns. Each pattern can be up to 1 measure in length, which is then divided into 12 or 16 equal steps depending on the time signature. Each pattern records the time signature, notes, pitches, accents, glides, loop point, and swing amount. Patterns can also be copied and pasted, shifted in time, transposed, and remixed, as well as be played forward or in reverse.
These patterns can be selected and played live in any order while in the Pattern mode. Patterns can also be prearranged into one of the 16 song locations. Each song will record the order patterns will play, along with the transpose setting for each pattern, and the loop point for the song. Each song can arrange up to 3580 measures worth of music. Songs can also have their patterns remixed or be played forward or reverse for all sorts of interesting variations.

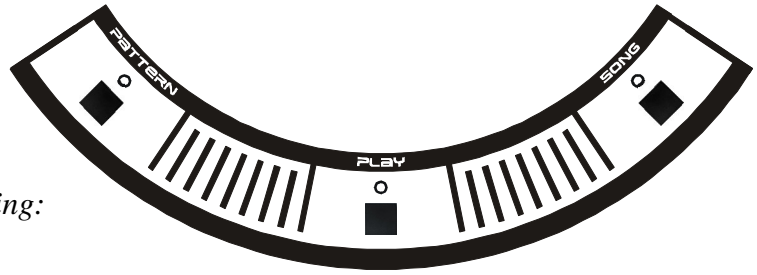


**USING THE SEQUENCER**

The Revolution's sequencer has two main modes in which you will work with. This is what we call the Pattern mode and Song mode. When the Song key indicator is on, the machine is in Song mode. When the Song key indicator is off, the machine is in the Pattern mode. To change from one mode to the other, the sequencer must first be stopped, then by pressing the Song key you can change modes.

*In the song mode you can do the following:*

*Select a song
*Edit and arrange patterns to form a song
*Play a song
*Change a song's tempo
*Set up the global MIDI parameters
*Perform a sysex MIDI dump




*In the pattern mode you can do the following:*

*Select patterns
*Edit a pattern
*Play patterns
*Adjust the global tempo setting for patterns
*Set the global transpose setting for all patterns

**PLAYING PATTERNS**

The Play key is used to start and stop the playback of patterns and songs. To play a pattern or song forwards, simply press the Play key. The Play key indicator will blink at the tempo the sequencer is playing at. To stop playback of the sequencer, press the Play key again. The Play key indicator will be off showing that the sequencer is stopped.

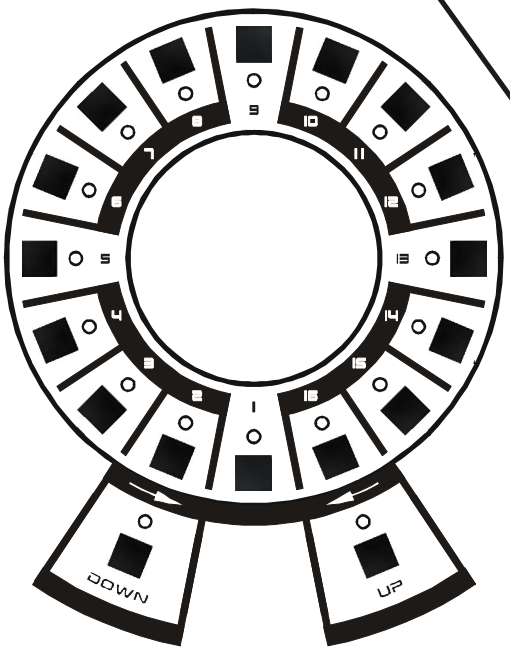
Patterns can also be played in reverse or backwards. If the unit is stopped and you wish to play a pattern backwards, hold the Shift/Clear key and then press the Play key. The pattern will now be playing backwards. To stop the sequencer, press the Play key.

While a pattern is playing you can change its direction to play forward or backwards by using the same technique as above. Hold the Shift/Clear key and then press the Play key. When the loop point for the pattern currently playing is reached, the sequencer will change the playback direction.

*Note: If the Revolution's MIDI has been set to EXTernal, when the play key is pressed its indicator will light up and stay on, showing that the unit is cued up and waiting for an external MIDI sequencer to send a start command.*

# SEQUENCER OPERATIONS

## SELECTING PATTERNS




Patterns are arranged as 16 banks of 16 patterns for a total of 256 patterns in all.
Before selecting a pattern, you must first make sure you are in the Pattern mode. This is shown by the Song key indicator being off. To enter the Pattern Select mode, press the Pattern key so that its indicator turns on. The main display (in the center of the unit) will now show the bank number 1-16 which is currently selected. One of the 16 selector key indicators (located around the outside of the display) will be on to show which pattern is selected for the bank you are currently in. If none of the selector key indicators are on, the current pattern selected is in another bank. If this is the case, use the Up/Down keys to go through the other banks and see what pattern is currently selected. To select a different pattern, use the Up/Down keys to select the bank and then press one of the 16 selector keys that represents the pattern within that bank.

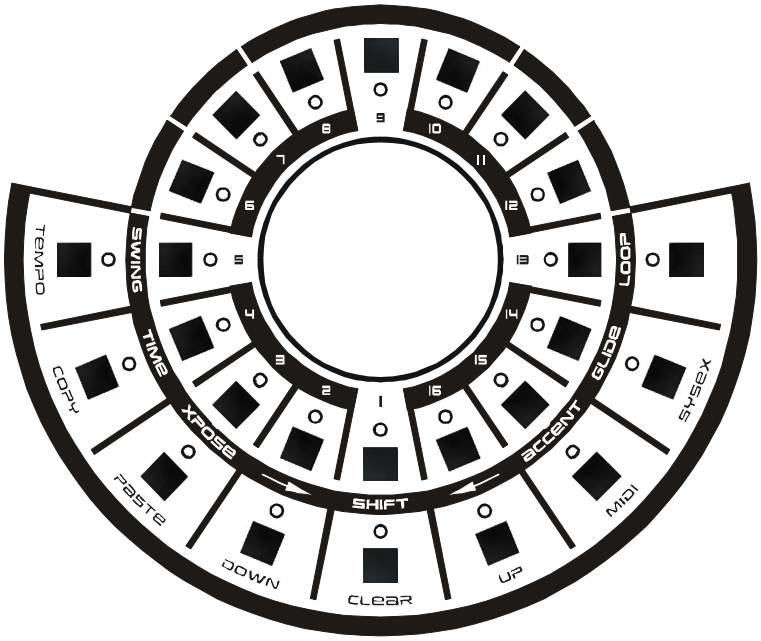
Selecting a pattern can be done while the sequencer is playing. If one pattern is currently playing and you select another, the new pattern's key indicator will be on at half the brightness than that of the pattern currently playing. This shows that the pattern is cued and waiting until the pattern currently playing has reached its loop point. Once the loop point has been reached, the cued pattern will begin its playback. You can change the pattern that is cued and ready to play next at any time until the current pattern reaches its loop point. Each pattern will play continuously until either a new pattern is selected or the sequencer is stopped.

Patterns may also be selected remotely from another MIDI device by setting up the Revolution to respond to MIDI program change messages. Please refer to the MIDI section about program change messages on page 33 for more details on how to do this.

## MULTIPLE PATTERN CUEING

It is possible to chain up to 16 patterns in a bank to create longer looping arrangements. To do so, enter the Pattern Select mode as you normally do when selecting patterns. Press and hold the first pattern you wish to play and then press the last pattern that is to be included in the loop.
Notice that patterns will be played sequentially from the lowest pattern number to the highest pattern number. The first pattern selected to play in the arrangement must have a lower pattern number than that of the last pattern selected to be included in the loop.

Once multiple patterns have been cued and are playing, you can select another group of patterns to play when the first group reaches its last step. When cueing up a second group of patterns, you can select patterns in any bank and even partially overlapping those patterns currently playing.




**EDITING PATTERNS**

Pattern Edit mode is where one measure of music can be recorded or edited for each pattern. These patterns can later be arranged into a song. Each pattern records the note durations and their pitches, accents, glides, loop point, time signature, and swing amount. Every time a pattern is edited, the changes are automatically saved by the sequencer.

*You must make sure not to change a pattern you wish to keep. By doing so you will overwrite the old pattern with new data. To avoid this, use the Copy/Paste function described later in this manual.*

To edit patterns, you must be in the Pattern mode (Song key indicator will be off). First select the desired bank and pattern for the pattern you wish to edit. Once the pattern is selected, press the Pattern key to enter Pattern Edit mode (Pattern key indicator will turn off).
All pattern editing can be done while the sequencer is stopped or playing, which allows you to hear the changes you make. In this way you can select a pattern, edit it, and then select another pattern to play or edit while the sequencer continues to play. Instant live improv! Since the sequencer automatically saves all changes made there is no need to stop the music.

When multiple patterns have been cued and are playing you can enter the Pattern Edit mode to edit individual patterns. To edit a cued pattern, wait until the desired pattern is playing and then enter the Pattern Edit mode by pressing the Pattern key. The current pattern will loop by itself so you can hear all the changes you are making. Once the pattern has been edited as desired, you may exit the Pattern Edit mode. Now the cued patterns will continue playing sequentially as before.

When the sequencer is playing and a pattern is being edited, you will notice that the 16 Step key indicators will blink to show the current step being played. You can use this as a quick way to pin point steps you wish to edit. It can also serve as a visual indication of where the loop point is set for that pattern.

# SEQUENCER OPERATIONS

**ENTERING NOTES**
When in the Pattern Edit mode the 16 Step key indicators will be used to display where notes are placed in that pattern. The brightness of the indicators will determine where notes start, the length of their duration, and where rests occur.

1. A note-on (where a note begins) will be shown by a Step key indicator being on at full brightness.
2. The sustained portion for a note will be shown by the Step key indicator being on, but only half as bright as a note-on.
3. A rest is shown by the Step key indicator being off.

**NOTE-ON** To enter notes you must be in the Pattern Edit mode (Pattern key indicator off). Placing $16^{th}$ or $12^{th}$ notes (depending on which time signature is selected) is done using the same method. By using the 16 Step keys, simply press the keys one at a time where you wish notes to exist. The indicators for the notes you enter will now be on at their brightest state.

**SUSTAIN** To place sustained notes, press and hold the Step key where the note is to start and then press the Step key that represents the last step you want this note to sustain to. The first Step key indicator of a sustained note will be on at full brightness showing that is where the note starts. The sustained portion of the note will cause those Step key indicators to be on at half brightness.
As an example, place and hold a $16^{th}$ note and press the next Step key in the clockwise direction. Doing this just wrote an $8^{th}$ note. Use this method to create notes of various durations.

*Notice that the last step of a sustained note must be higher in value than where the note starts. For instance a note may start on step 1 and sustain to step 16. A note can not start at step 9 and sustain to step 5. If you need a note to sustain past step 16, you will need to use the glide function discussed later in this manual.*

**REST** Placing rests is done by just leaving notes off, or clearing notes that appear in the position you want to be a rest. Rests will be shown as the Step key indicator being off. To write a rest to a step where a note already exists, press and hold the Shift/Clear key and then press the Step key where you want the rest to be placed.

There is a way to write new notes without having to clear previous notes. For instance, if you place a new note in the sustained portion of a note, the new note will now be in the position you selected. This now shortens the previous sustained note, and it will sustain until the step the new note was written. The Step key indicators for these positions will also change to show how the previous sustained note was shortened. By writing a sustained note over previous notes, the previous notes will no longer be heard. You can use this method to change a sustained note's duration. Any new notes written over a sustained note's note-on will override the entire sustained note. The only exception is that you can not write a $16^{th}$ note over a sustained note's note-on. To do this you must first clear the sustained note and then write the $16^{th}$ note.

**CLEARING NOTES**
There are two ways to clear previous note data that exists within a pattern. You can either clear all the notes at once or individual notes one at a time.

To clear all notes from a pattern, first make sure you are in the Pattern Select mode (Pattern key indicator on). Select and hold the pattern's Step key you wish to clear all the notes from, and then press the Shift/Clear key. You can press the Pattern key and enter Pattern Edit mode to verify that all the Step key indicators are now off.

To clear individual notes, enter the Pattern Edit mode (Pattern key indicator off). Press and hold the Shift/Clear key and press the Step key that represents the note-on for the note you want to clear. You can clear as many notes as you want while holding the Shift/Clear key. Once you are done clearing individual notes you may release the Shift/Clear key. All the notes you cleared will be shown with their Step key indicator being off.

*Notice that clearing notes only erases where notes are placed and their durations. Other pattern information such as the step's pitches, accents, glides, loop point, time signature, and swing amount will still retain their values. This is a safety in case you accidentally erase notes or an entire pattern by mistake. You then only need to re-enter where notes are located and their duration.*

**CHANGING A NOTE'S PITCH**
Once notes exist in a pattern you can change the pitch each one is to play. Select a pattern you would like to edit and enter the Pattern Edit mode. When in the Pattern Edit mode, one of the 16 Step key indicators will be flashing to indicate that it is the current step selected and ready to be edited. You can select a different note to edit by pressing the Step key where that note starts.

*Notice that by pressing any Step keys other than where a note starts will write a new note as described in the previous section.*

Once a note is selected, the display will show the pitch of that note, ranging from C1 to D#6. Notice that the display will show an = sign for sharp notes. Using the Up/Down keys select the desired pitch for the currently selected step. When the sequencer is playing and you change a note's pitch in this way, each time the pattern reaches this step the new note pitch will be played. If you hold a note's Step key while you change the note's pitch, the new pitch will not take affect until you release that note's Step key. You can use this method to ensure that only the desired pitches will be heard while the sequencer is playing.

*Notice that pitches programmed into the sequencer can actually range from C1 to C9. However the sequencer will only play back pitches in the range of C1 to D#6. The extended range of E6 through C9 is provided only to retain the original pitches of a pattern when it is transposed up to +36 half-steps.*

# SEQUENCER OPERATIONS

**RECORDING ACCENTS**
Accents written into the sequencer are used to modify the cutoff frequency of the filter, and Increase the amplitude of a step's volume.
To record or place accents for notes, first select the pattern you want to edit and enter the Pattern Edit mode. One of the Step key indicators will be flashing to show the current step selected to be edited. Select any note by pressing the Step key where that note starts. When a note is selected the Accent key indicator will be on if an accent is written for that step, or off if no accent has been placed on the step. By pressing the Accent key, you can turn accents on or off for that step. Placing accents can be done while the sequencer is playing or stopped.

**CLEARING ACCENTS**
To clear all of the accents in a pattern, press and hold the Shift/Clear key and then press the Accent key.

**RECORDING GLIDES**
Glides written into the sequencer will allow the pitch of one note to smoothly transition to the pitch of the following step.
To record or place glides for notes, first select the pattern you want to edit and enter the Pattern Edit mode. One of the Step key indicators will be flashing to show the current step selected to be edited. Select any note by pressing the Step key where that note starts. When a note is selected the Glide key indicator will be on when a note is set to glide, and off when no glide is written for that step. By pressing the Glide key, you can turn glides on or off for that step. Placing glides can be done while the sequencer is playing or stopped.
*Notice sustained notes can not extend beyond step 16. If you want a note to seamlessly carry over from step 16 to step 1, place a glide on step 16, and set step 1's pitch to the same value as step 16.*

**CLEARING GLIDES**
To clear all of the glides in a pattern, press and hold the Shift/Clear key and then press the Glide key.

**SETTING THE LOOP POINT**
Each pattern has its own loop point that is used to set the number of steps a pattern will play before it loops and begins playing from the beginning again. A pattern using 3/4 as the time signature can play as many as 12 steps. A pattern using 4/4 as the time signature can play as many as 16 steps.
To set the loop point, select the pattern you wish to edit and enter the Pattern Edit mode. Select the Step key which represents the last step you wish the pattern to play in its loop. You can then press the Loop key to place the loop point at that step. The Loop key indicator will be on showing a loop point is set for this step. To change the loop point, select another step of the pattern and press the Loop key.

**CLEARING THE LOOP POINT**
The loop point can be cleared in one of two ways. The first method is to select the step where the loop point exists and press the Loop key, turning the Loop key indicator off.
You may find the second method easier to use, which is to press and hold the Shift/Clear key and then press the Loop key. This will remove the loop point from whatever step it was previously written to.

**SELECTING THE AMOUNT OF SWING**

The Revolution's Swing function will delay the playback of all even numbered steps. This can be used to add a more human feel to patterns.

To change the swing amount, first select the pattern you want to edit and enter the Pattern Edit mode. Press and hold the Swing/Tempo key and the display will show a value ranging from 0-3. While holding the Swing/Tempo key, use the Up/Down keys to select a new value of swing. A swing value of 0 means no swing will occur. A swing value of 1 will have a small amount of affect while a swing value of 3 will have the greatest affect.

**SELECTING A TIME SIGNATURE**

There are two time signatures to choose from when writing a pattern, which are 3/4 and 4/4. Each time signature simply divides the measure of a pattern into 12 (3/4) or 16 (4/4) equal parts. The artwork around the Step keys best illustrates the divisions of the 4/4 time signature. You may also notice the outer most ring of artwork surrounding the sequencer and sound section will illustrate the divisions of the 3/4 time signature.

To change the time signature for a pattern, select the pattern to edit and enter the Pattern Edit mode. Press and hold the Time/Copy key and the display will show the current time signature as either 3/4, or 4/4. While holding the Time/Copy key, you can use the Up/Down keys to select the appropriate time signature. Once the time signature is set you can release the Time/Copy key. You can change this time signature setting while the unit is playing or stopped.

**TRANSPOSING PATTERNS**

When playing patterns in the Pattern mode, the transpose function has a global affect on all the patterns. The transpose function allows you to shift all of a patterns notes up or down 36 half-steps from the pitches originally programmed into the pattern.

To change the transpose setting, first enter the Pattern Edit mode. Press and hold the Xpose/Paste key and the display will show the current value (-36 to 36) of transposition. While holding the Xpose/Paste key you can use the Up/Down keys to change the transpose setting. *The range of notes the Revolution can play is C1 to D#6. If a pattern's notes are transposed beyond this range, the notes will be interpreted as rests.* Once the Xpose/paste key is released the new transpose value will take affect. This transpose setting will be saved even when the unit's power is turned off. If you want to reset the transpose setting to 0 while in the Pattern Edit mode, hold the Shift/Clear key and press the Xpose/Paste key.

As an alternative method, you can also latch the transpose function on or off by quickly pressing the Xpose/Paste key. When this key is pressed quickly its indicator will remain on, and again the Up/Down keys are used to select the transpose value. Changes made to this transpose setting will be updated once a pattern loops and begins playing the first step again. When you are done changing the transpose value, quickly press the Xpose/Paste key again to exit the transpose mode.

You can permanently transpose all the notes for a pattern. First select the correct transpose setting for a pattern, then while holding the Xpose/Paste key press the Time/Copy key. The pattern's notes will be rewritten to the new pitch values and the transpose setting will automatically clear itself to 0.

# SEQUENCER OPERATIONS

**SHIFTING PATTERNS**
It is possible to shift all the contents of a pattern forward or backwards in time from where they currently are. This is a useful feature if you have already created a pattern, but need to offset the notes so that they are aligned with the beat correctly.

To shift a pattern, first select the desired pattern to be edited and enter the Pattern Edit mode. Press and hold the Shift/Clear key and then use the Up/Down to shift the pattern Up/clockwise or Down/counter-clockwise. If pattern shifting is done while the sequencer is stopped, you will shift the pattern one step for every key press of Up/Down keys. If pattern shifting is done while the sequencer is playing, the pattern will shift one step every time a new step is played, as long as the Up/Down key is held.

**CHANGING THE TEMPO**
When in the pattern mode, the tempo setting will determine the rate at which all patterns will be played. To adjust the tempo, first make sure you are in the Pattern Select mode (Pattern key indicator on). Press and hold the Swing/Tempo key and the display will show the current tempo selected. While holding the Swing/Tempo key, you can use the Up/Down keys to adjust the tempo from 20 to 250 beats per minute or B.P.M.. When the tempo is changed and a sequence is playing, the tempo change will have an immediate affect on the rate at which a pattern plays. This tempo setting is saved even when the unit's power is turned off.

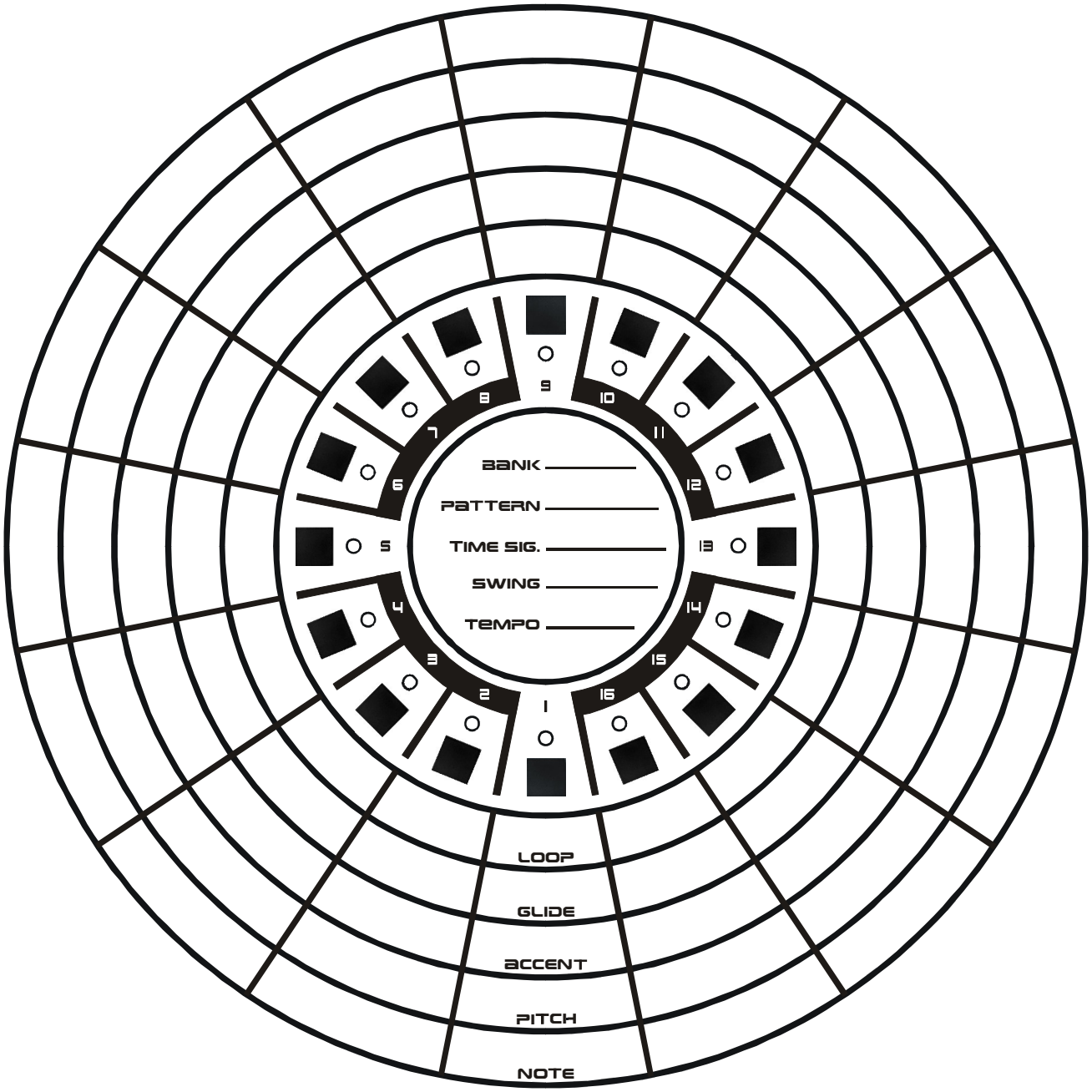
**COPYING AND PASTING PATTERNS**
Before editing a pattern you like, it would be wise to copy it to another location to be edited. Copying patterns can also be useful when creating several patterns with slight variations.

To copy a pattern from one location to another, stop the sequencer and enter the Pattern Select mode. Select and hold the Step key for the pattern you wish to copy, and then press the Time/Copy key. This places a copy of that pattern in a temporary memory location where it will remain until either a new pattern is copied, or the power is turned off. Since a copy of the pattern is placed in temporary memory, you can now go and play other patterns to find a location to paste the pattern to. When you have found a location stop the sequencer, hold the Step key for the pattern you wish to paste to, and then press the Xpose/Paste key. The pattern you had copied will now be written in this location. You can continue to place the copied pattern in as many locations as you want by selecting each location individually and pressing the Xpose/Paste key.

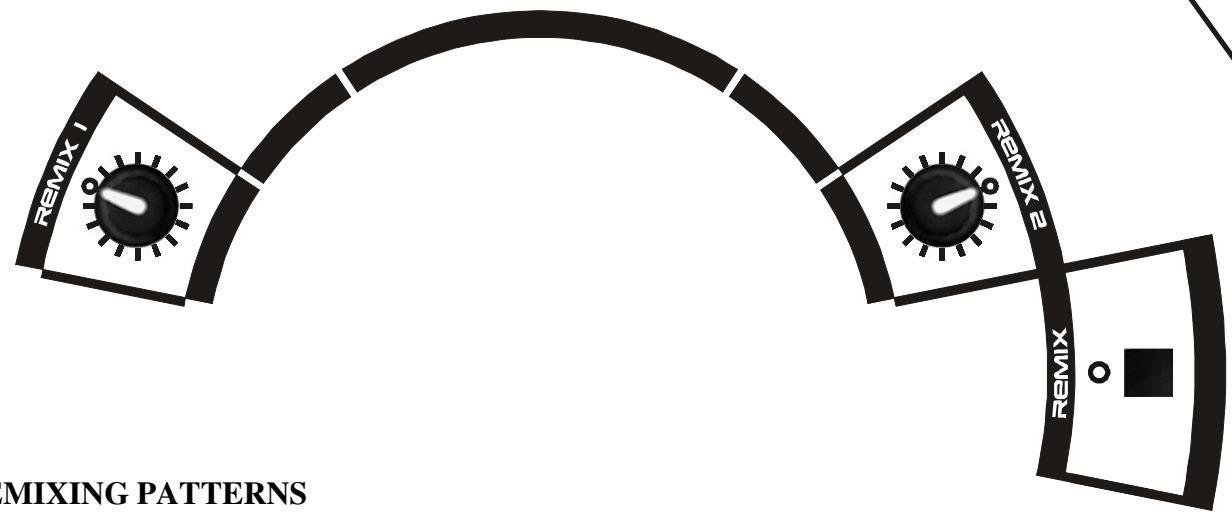
*A blank pattern sheet is provided on the following page. Photocopy the pattern sheet and use it to write down the contents of a pattern, as well as make notes.*

# PATTERN SHEET





# SEQUENCER OPERATIONS




**REMIXING PATTERNS**

The remix feature provides 256 variations for playing patterns.
This is not just some randomization of the original patterns either. It is a mathematical process which creates new ways of stepping through a pattern's information to create variations of that pattern.
When the remix feature is used, you may want to consider the information programmed into the steps of a pattern as possibilities. Remix can use any of the 16 steps of a pattern to create new patterns. In some cases a remix will play the same step multiple times within one measure of music.
There is one basic rule a remix will always follow. That is, whatever information is programmed into step 1 will always play as the first step of a remix.

The Remix function can be activated at any time, whether in Pattern Edit mode, Pattern Select mode, or Song mode. In addition, the remix can be turned on or off while the unit is stopped or playing. If the unit is playing and remix is activated or a new remix is selected, the change will take affect as soon as the next step plays.

To turn the remix function on, press the Remix key. Its indicator will light showing that remix has been activated.
When the remix function is on, the two rotary switches labeled Remix 1 and Remix 2 will be used to select different remix patterns. If you enter the Pattern Edit mode you can see the new order in which the remix is selecting steps of the pattern to play. When remix controls 1 and 2 are both set to the position of the circle, remix will have no affect on the original pattern even if the Remix key indicator is on. This is the default remix pattern which will play a pattern sequentially from step 1 through 16 as normal.

The best way to understand what happens when patterns are remixed is to play around and experiment. The results a remix provides will be different for every pattern you have created. You might try looping a pattern and turning the remix feature on for only the last couple steps of a pattern to create a transitional fill. Or you might just want to create variations of a melody line you've already programmed, which can be further transposed and used for other parts of the same song. For playing different remixes live, you might take the DJ approach to selecting new remixes where you let one remix play for a while so the listener becomes familiar with it. Select a new remix every now and then to create a fill, or start introducing the next remix which will soon play all the way through.

**SELECTING SONGS**
Selecting a song is done in the same way patterns are selected, except you must be in the Song mode. To enter the Song mode, first stop the playback of the unit and press the Song key. The Song key indicator will turn on showing Song mode is currently selected.

To select a song, press the Step key indicator (1-16) to select one of the 16 songs locations. If the sequencer is already playing a song and another song is selected, the newly selected song's Step key indicator will be on at half brightness showing that it is cued up and will begin its playback as soon as the first song reaches its loop point.

**PLAYING SONGS**
You must be in the Song mode to play songs. Select a song to play by pressing one of the 16 Step keys. Press the Play key to begin playback of the song. The display will show the current step of the song playing. If you press the Play key while the song is playing, playback will stop but remain on the current step of the song. Pressing the Play key again will resume playback from the current step. If you want to start playback from the beginning of the song, press the Shift/Clear key before starting playback.

**EDITING SONGS**
All song editing is done in the Song mode. To enter the Song mode, stop the sequencer, and press the Song key so that its indicator turns on. All song editing must be done while the sequencer is stopped. Song editing is used to arrange your patterns into a song. There are 16 song locations available and each is capable of arranging up to 3580 measures of patterns. Each song step records the pattern that will play for that step, how much the pattern is to be transposed from its original pitch, and whether or not it will be the last pattern played in the song before it starts over again or loops. Each song also records the tempo that it will play at.

**SELECTING PATTERNS FOR A SONG STEP**
When in the song mode, the display will show the current step being edited or played. You can select the desired song step by using the Up/Down keys. You can also reset the song to step 1 at any time by pressing the Shift/Clear key.

To edit a song, you simply select the patterns in the order they are to play in the song, change the transpose setting if needed, and set a loop point on the last step you wish to play in the song. To change the pattern a song step will play, select the song step you wish to edit, and then press and hold the Pattern key. The display will now show the bank and Step keys 1-16 are used to select the a pattern within that bank. While holding the Pattern key, use the Up/Down keys to select the bank and then press the Step key to select a pattern within that bank. Release the Pattern key once you have made your selection. Select the pattern for each step in this way until all the patterns are in their correct order.

To see how your song sounds so far, press the Shift/Clear key to reset the song to step 1 and press the Play key to begin playback. Press the Play key again to stop the song's playback when you are finished. If you need to make changes to the song, use the Up/Down keys to select the step to edit and make the necessary changes.
All changes you make when editing the song are automatically saved by the sequencer.

# SEQUENCER OPERATIONS

**TRANSPOSING A SONG STEP**
The pattern for each song step can be transposed up or down 36 half-steps in pitch from the notes originally programmed into that pattern.

To transpose a song step, select the song step and then press the Xpose/Paste key. While holding the Xpose/Paste key, the display will show the current transpose setting for that step's pattern. Use the Up/Down keys to change the transpose setting for that song step. Release the Xpose/Paste key when you are done and the sequencer will automatically save your changes.

To reset the transposition to a value of 0 for all the song steps, press and hold the Shift/Clear key, then press the Xpose/Paste key. This will allow all of the patterns in the song to play at their original programmed pitches.

**SETTING THE LOOP POINT FOR A SONG**
A loop point is recorded into a song step to indicate this will be the last step played before the sequencer goes back to the beginning of the song and starts playing it again. If you want to find what song step is set to loop, you can use the Up/Down keys to step through the song and see which step is set to loop. This is indicated by the Loop key indicator being on for that step of the song.

To set a loop point for a step, use the Up/Down keys to first select that step and the press the Loop key. In the same way, if you wish to remove a loop point from a song step, simply press the Loop key to remove the loop point. You may also clear all of the loop points from a song by pressing and holding the Shift/Clear key, and then pressing the Loop key. This will be most useful when creating new songs rather than finding the existing loop points one at a time and clearing them out.
All changes you make to the loop point settings are automatically saved by the sequencer.

**SETTING A SONG'S TEMPO**
Each song records the tempo it will play back at. Select the song you wish to change the tempo of, and then press the Swing/Tempo key. As you hold the Swing/Tempo key the display will show the current tempo setting. Using the Up/Down keys you can change the song's tempo from 20 to 250 beats per minute B.P.M.. Once the tempo is correct, release the Swing/ Tempo key and the sequencer will automatically save your changes.

**ADVANCED SONG EDITING**

It is possible to jump from the currently selected song step to the Pattern Edit mode and edit the pattern used for that song step. If a song is at any point other than the first step and you exit the Song mode, the pattern used for the current song step will automatically be selected with all its song parameters, for editing in the Pattern mode.

To clarify, let's say you are on step 3 of a song and that song step uses pattern 16 in bank 16 with a transpose value of +12. If you exit the Song mode, pattern 16 of bank 16 will be automatically selected in the Pattern mode. If you hold down the Xpose/Paste key while in the Pattern Edit mode, you will notice it is set for +12, just as it was for the song step. In addition, the tempo the pattern plays at in the Pattern mode will also be the same as the song was set for. This allows you to easily edit a pattern and hear exactly what it will sound like for the song. You can now make changes to the pattern or even select a different pattern you would like to use for the current step of the song. If you change the tempo while in the Pattern mode, it will change the entire song's tempo as well.

Once you are through editing the pattern for the current song step, return to the Song mode and all the changes will be accepted and saved by the sequencer automatically. If you are in the Song mode and wish to return to the Pattern mode without the sequencer automatically selecting the current song step's pattern, press the Shift/Clear key before you exit the Song mode.

*Note: To access the MIDI and Sysex modes you must enter the Song mode. Once changes are made in either of these modes if the current song selected is at any location other than step 1, you will activate the advanced song editing function. In this case, it would be a good habit to always hit the Shift/Clear key before you exit the Song mode, which will return you to where you previously were in the Pattern mode before making adjustments to the MIDI and Sysex parameters.*

*A blank song sheet is provided on the following page. Photocopy it and use it to arrange patterns into songs.*

FUTURERETRO

| SONG NAME: | TEMPO: |
|---|---|

| STEP | BANK | PATTERN | TRANSPOSE | STEP | BANK | PATTERN | TRANSPOSE |
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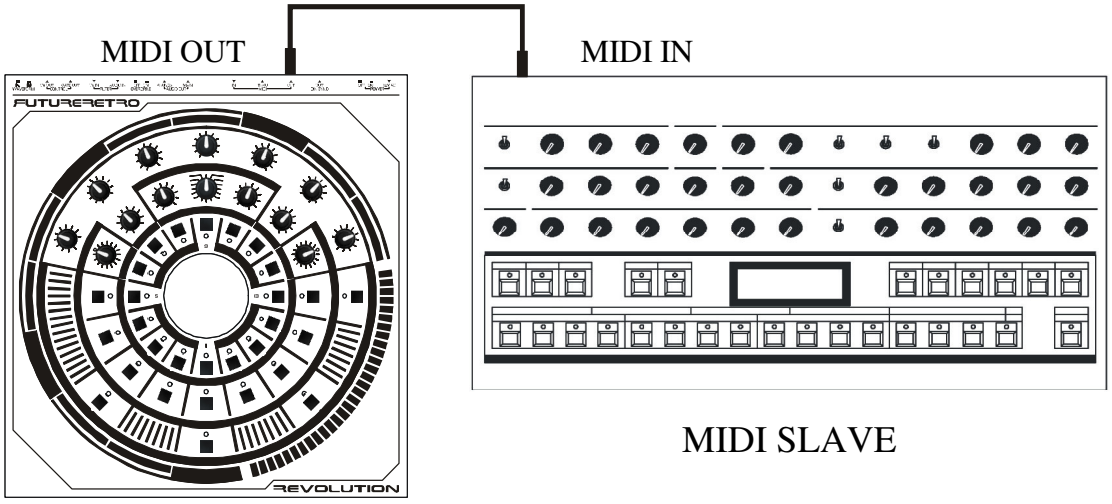
REVOLUTION

**USING THE REVOLUTION AS A MASTER CLOCK**

Using the Revolution as a master clock allows other sequencers and drum machines to synchronize their playback to the Revolution. In this configuration the Revolution acts as the master device which allows it to control the start, stop, and tempo for all the sequencers connected.

For this setup, connect the MIDI OUT of the Revolution to the MIDI IN of the devices you wish to synchronize. To set up the MIDI parameters in the Revolution, press the Song key (Song indicator should turn on) to enter the Song mode. Now press the Accent/MIDI key. This key's indicator will turn on when you are in the MIDI mode. At this point the display will show INT or EXT. Use the Up/Down keys to select INT. This indicates that the Revolution will operate under it's own INTernal MIDI settings. Now press the Accent/MIDI key again. The display will now show which MIDI channel (1-16) the Revolution sends and receives information on. You can change the MIDI channel setting using the Up/Down keys. It does not matter which channel is selected for this configuration as the start, stop, and tempo information of the Revolution is sent as a global message which is not specific to any one MIDI channel. Press the Accent/MIDI key again, and the display will show the MIDI program change page. For more information on using MIDI program change messages please read page 33. Press the Accent/MIDI key once more to exit the MIDI mode. The Accent/MIDI key indicator will now be off.

Now you will need to refer to the device's owners manual you wish to sync or slave to the Revolution. You will need to set the devices MIDI parameters to respond to an external MIDI clock. When this has been done, starting and stopping playback of the Revolution will start and stop playback of the slaved device. The tempo of the slave device is now controlled by the Revolution's tempo.



# MIDI MODES

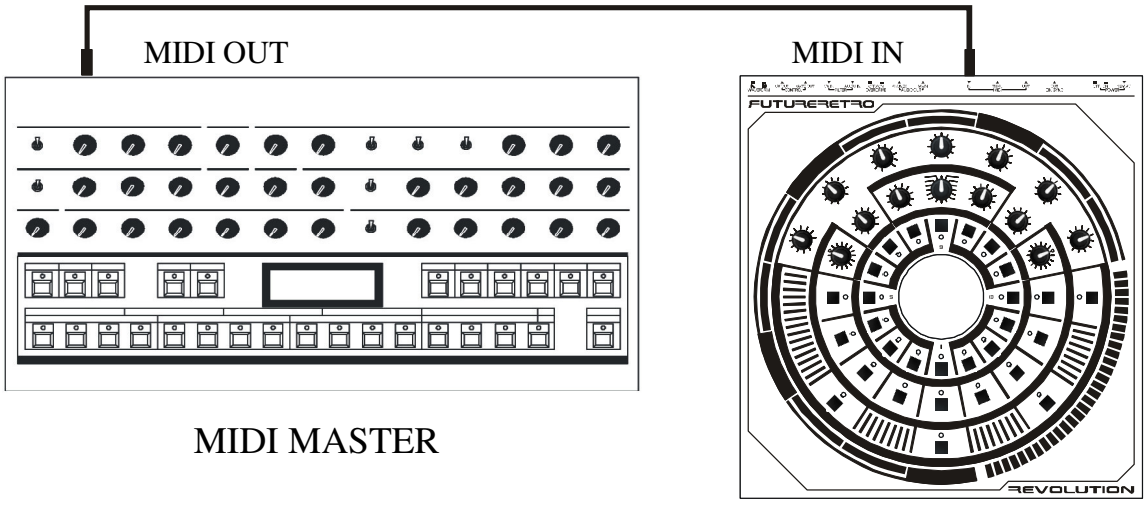
## SYNCING THE REVOLUTION TO AN EXTERNAL CLOCK

The Revolution can synchronize its playback to any other MIDI sequencer. In this setup the Revolution acts as a slave where the start, stop, and tempo are all controlled by another MIDI device.

For this setup, connect the MIDI OUT of the master sequencer to the MIDI IN of the Revolution. To set up the MIDI mode of the Revolution, first press the Song key (Song key indicator should be on) to enter the Song mode. Now press the Accent/MIDI key to enter the MIDI mode. The Accent/MIDI key indicator will now be on showing you are in the MIDI mode, and the display will show whether MIDI is set for INT or EXT. Use the Up/Down keys to change the MIDI mode to EXT. In this mode, the Revolution will respond to EXTernal MIDI messages. Press the Accent/MIDI key again, and the display will show which MIDI channel the Revolution will send and receive its MIDI information on. For the Revolution to synchronize to a master sequencer it does not matter what MIDI channel is selected, as MIDI start/stop and clock commands are a global message not specific to any one MIDI channel. Press the Accent/MIDI key again and the display will show the MIDI program change page. For more information on using MIDI program change messages please read page 33.
Press the Accent/MIDI key once more to exit the MIDI mode. The Accent/MIDI key indicator will now be off. Select the song or pattern you want the Revolution to play, and press the Play key. The Play key indicator will turn on showing the sequencer is now cued and ready to begin playback.

Make sure the master sequencer is set to a mode that allows it to act as a master and send the start, stop, and tempo information. Once this has been done, starting/stopping and changing the tempo of the master device will also control these same parameters in the Revolution.

*Note: If the Play key indicator is on, the Revolution works as a slave (syncing its playback). When the Play key indicator is off and the MIDI mode is set to EXTernal, the Revolution will receive MIDI note data on the selected MIDI channel to play the internal sound section as described on the next page.*



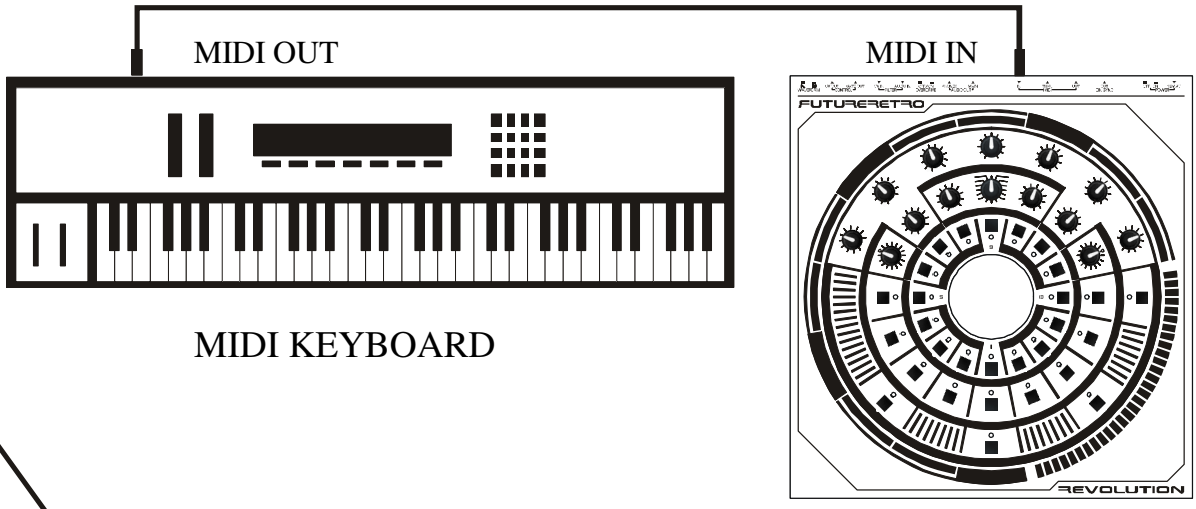

MIDI MASTER

MIDI SLAVE

**PLAYING THE REVOLUTION WITH A MIDI KEYBOARD**
You can play the sound section of the Revolution with a MIDI keyboard or external MIDI sequencer.

For this setup, connect the MIDI OUT of the MIDI keyboard or external sequencer to the MIDI IN of the Revolution. To set up the MIDI mode of the Revolution, first press the Song key (Song key indicator should be on) to enter the Song mode. Now press the Accent/MIDI key to enter the MIDI mode. The Accent/MIDI key indicator will now be on showing you are in the MIDI mode, and the display will show whether MIDI is set for INT or EXT. Use the Up/Down keys to change the MIDI mode to EXT. In this mode, the Revolution will respond to EXTernal MIDI messages. Press the Accent/MIDI key again, and the display will show which MIDI channel the Revolution will receive its MIDI information on. Select MIDI channel 1-16 using the Up/Down keys. Once this is done, press the Accent/MIDI key to select the program change MIDI page. Program change messages are used only to select different patterns to play, and for this mode we will not be playing any internal patterns. Use the Up/Down keys to select PCof to turn program change messages off. Press the Accent/MIDI key again to exit the MIDI mode.
The Revolution is now ready to play any notes that are sent on the MIDI channel it is set for. Make sure the MIDI keyboard or external sequencer is set up to send MIDI information on the same MIDI channel set in the Revolution.

Remember the Revolution's analog sound section can only play one note at a time (monophonic). If more than one note is played at a time by the external MIDI keyboard or sequencer, the Revolution's pitch will glide to the last note played. The Revolution can remember the order that the last 8 notes were pressed and held. If the last key you pressed is released , the Revolution will glide to the note you played and held just before the one you released. If only one note is played at a time no glides will be heard. To trigger the Revolution to play an accented note, the note must have a velocity value greater than 63. Any notes received with a velocity value equal to or less than 63 will not be accented.




MIDI KEYBOARD

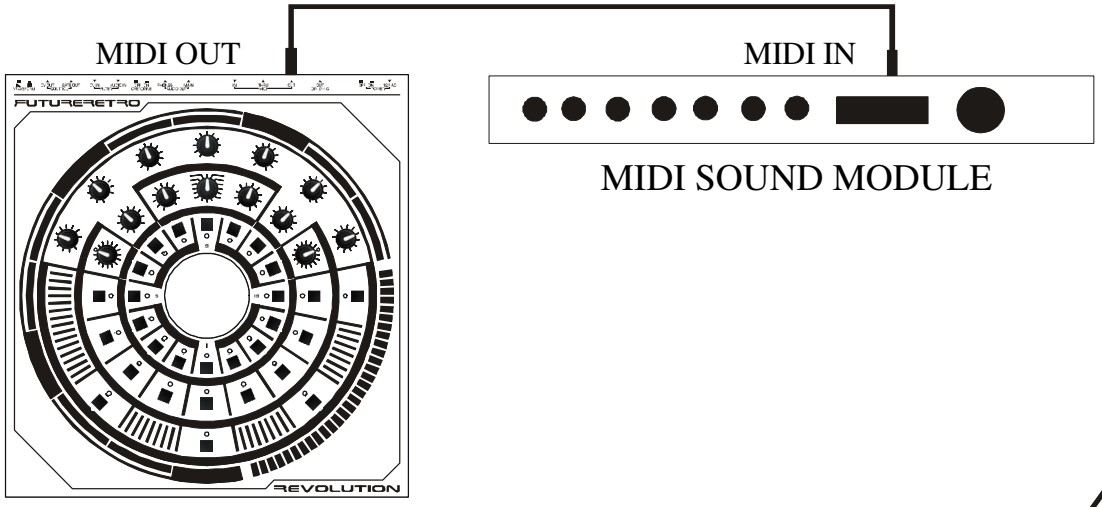
# MIDI MODES

**PLAYING AN EXTERNAL MIDI SOUND MODULE WITH THE REVOLUTION**
You can play external MIDI sound modules with the Revolution's sequencer. This allows you to take advantage of the Revolution's real-time editing and remixing of patterns, which other sequencers might not offer.

For this setup, connect the MIDI OUT of the Revolution to the MIDI IN of the external MIDI sound module. To set up the MIDI mode of the Revolution, press the Song key (Song key indicator should be on) to enter Song mode. Press the Accent/MIDI key to enter the MIDI mode. The display will show whether MIDI is set for INT or EXT. Use the UP/Down keys to select INT, for INTernal operation. Press the Accent/ MIDI key again and the display will show the MIDI channel the Revolution will send note information on. Use the Up/Down keys to select the same channel as set for the external MIDI sound module. Once this is done, press the Accent/MIDI key again and the display will show the program change page. Use the Up/Down keys to change this setting to PCof if you don't want patterns in the Revolution to select Patches remotely in the external MIDI sound module. If you would like patterns in the Revolution to select different patches in the MIDI sound module you can turn this feature on, or PCon. Press the Accent/MIDI key once again to exit the MIDI mode.

Now you will need to set up the MIDI sound module to play the sound you want on the same MIDI channel that the Revolution is sending note information on. Once this is done, select the pattern or song in the Revolution and press the Play key. The MIDI sound module should now play the notes programmed into the Revolution's sequencer. Notice if you have the MIDI program change message turned on, and the sound module responds to these messages, selecting different patterns will also select different sound patches in the sound module.

When accents or glides are programmed in the sequencer, they may have a totally different affect on the MIDI sound module's sound depending on how the module is setup to respond to velocity changes or two keys being played at the same time. When a note in the Revolution is programmed with an accent, a velocity value 127 is sent for that note. When a glide is programmed into the Revolution, the sound module will see this as the first note overlapping the second note for a short period of time.



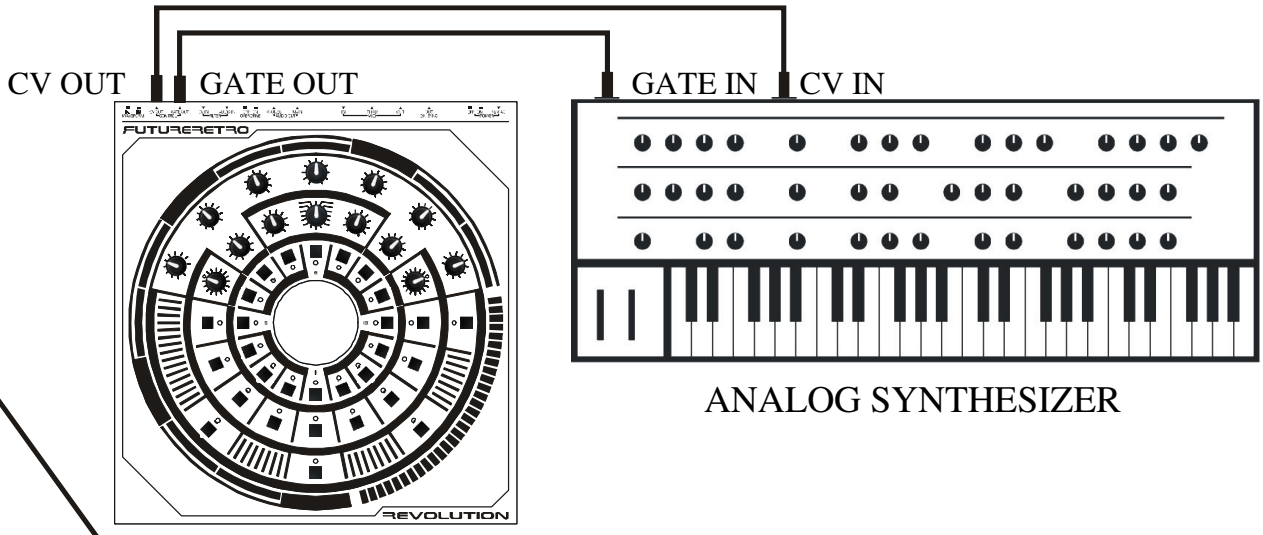
**PLAYING VOLTAGE CONTROLLED SYNTHESIZERS**

The Revolution provides a CV (control voltage) output, along with a Gate output for playing pre-MIDI and modular synthesizers. The CV the Revolution generates is the most widely used 1 volt per octave standard. The Gate signal the Revolution generates is a positive polarity type gate ranging from 0 volts (note off) to +12 volts (note on). This standard was used on the early Roland, Arp, and Sequential Circuits analog synthesizers, and is still used by today's modular synthesizer companies to control their devices.

As a general rule, always turn the power off for devices when making connections.
For this setup, first connect the CV OUT of the Revolution to the CV INPUT of the external analog device using a 1/4" mono cable. You will also need to connect the GATE OUT of the Revolution to the GATE INPUT of the external device using another 1/4" mono cable.
Most analog synthesizers will automatically use these external signals to control their circuits once they are plugged into the unit. If your device requires you to setup parameters in that module to use these external control signals, do that now.

Start playback of the Revolution's sequencer and you should hear the notes programmed into the sequencer playing the external module. You're free to select and edit different patterns within the Revolution as you normally would. Accents programmed into the sequencer will have no affect on the external analog sound module. Notes that are programmed to glide in the sequencer will cause the CV output to slew which will sound just like a note gliding in the Revolution's analog sound section. You can also sync the Revolution's playback to an external MIDI clock while playing the external analog module.

Notice that if you set the Revolution's MIDI mode to EXTernal, as you would to play the Revolution's sound section with an external MIDI keyboard or sequencer, you can then convert these external MIDI messages into the appropriate CV/Gate signals needed to control the connected analog module. This is similar to what a standalone MIDI to CV converter does.



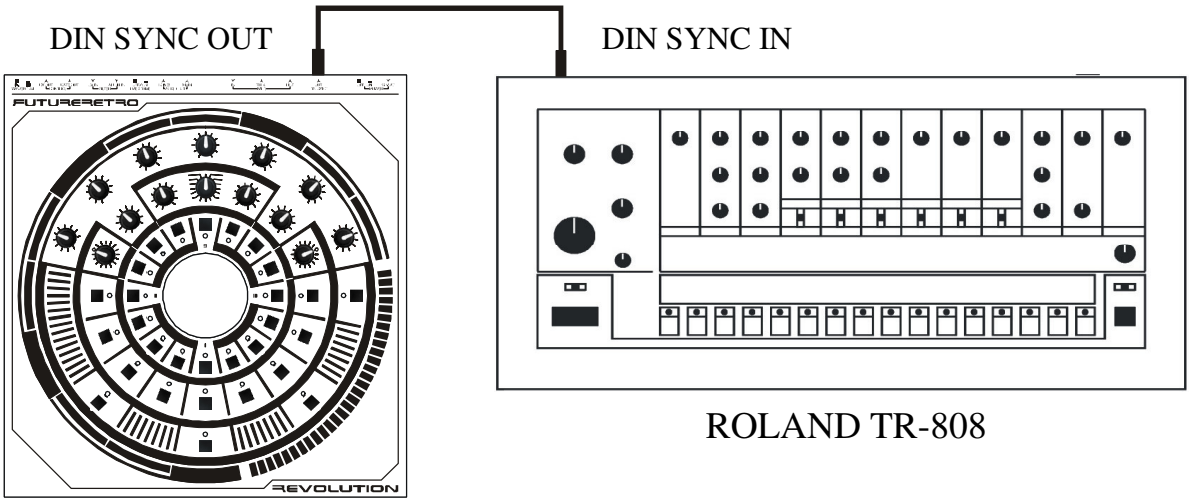
# MIDI MODES

**USING DIN SYNC**

DIN sync is a pre-MIDI standard that sends both clock and start/stop messages, to control early Roland devices with sequencers. This clock signal is equal to 24 pulses per quarter note or PPQ. With the DIN sync feature, the Revolution will be able to start and stop the playback, as well as control the tempo of a DIN sync device. These DIN sync messages are sent whenever the Revolution's sequencer is playing.

For this setup you will connect the DIN SYNC OUT of the Revolution to the DIN SYNC IN of the external device you wish to control using a 5 pin DIN or MIDI cable. Make sure the DIN sync device is set up to respond to external DIN sync data. Now as you start and stop the Revolution's sequencer, the external device will start and stop its playback as well as play at the tempo set in the Revolution.

DIN sync messages will be sent even when the Revolution is syncing to an external MIDI clock. This allows you to use any external MIDI clock to control your DIN sync device.




ROLAND TR-808

# MIDI PROGRAM CHANGE

The Revolution does support MIDI program change messages. These messages allow other MIDI sequencers to remotely select patterns to play within the Revolution, or the Revolution can select patterns remotely in other MIDI sequencers which support program change messages. The program change messages sent by the Revolution can also be used to select different sound patches in an external MIDI sound module.

If you would like the Revolution to send or respond to MIDI program change messages, you must first set up the MIDI parameters in the Song mode. Stop the unit's playback, and press the Song key (Song key indicator should turn on) to enter the Song mode. Press the Accent/MIDI key and the display will show INT or EXT. When set to INTernal, the Revolution will send program change messages to external MIDI sequencers or sound modules whenever a new pattern is selected. When set to EXTernal, the Revolution will sync its playback to an external MIDI sequencer. Program change messages sent by the external MIDI sequencer can then be used to select different patterns to play in the Revolution. Use the Up/Down keys to select the appropriate mode.
Press the Accent/MIDI key again and the display will show the MIDI channel (1-16) the Revolution sends and receives information on. Use the Up/Down keys to select the MIDI channel you wish to send or receive MIDI program change messages on. The MIDI channel must be the same as the device sending or receiving MIDI program change messages.
Press the Accent/MIDI key again and the display will show the setting for program change messages. Here there are two options being PCof or PCon. When PCof is select program change messages will not be sent or received by the Revolution. When PCon is selected, the Revolution will send and respond to MIDI program change messages. Use the Up/Down keys to select the appropriate setting. Press the Accent/MIDI key once more to exit the MIDI mode. The Accent/MIDI key indicator will now be off. Press the Song key to exit Song mode, and begin sending or responding to program change messages.

*Note: The Revolution only sends or responds to MIDI program change messages while in the Pattern mode. Song mode does not support these messages*.

To send program change messages to an external device, connect the MIDI out of the Revolution to the MIDI in of the external device. You will also need to make sure this external device is set up to respond to program change messages on the same MIDI channel selected in the Revolution. When playback is stopped, selecting different patterns in the Revolution will send the appropriate program change message to the external device. When the Revolution is playing patterns, each time a new pattern begins playback the appropriate program change message will be sent to the external device.

To allow an external sequencer to remotely select patterns in the Revolution, connect the MIDI out of the external sequencer to the MIDI in of the Revolution. Make sure the external sequencer is setup to send program change messages on the same MIDI channel selected in the Revolution. Press the Play key on the Revolution to cue up its playback to the external sequencer. Pressing play on the external sequencer will now begin playback of the Revolution (syncing its playback to the external sequencer), and any program change messages received while the Revolution is syncing can be used to select different patterns to play. The Revolution will respond instantly to any program change message received. If a pattern is at step 8 when a program change message is received, a new pattern will be selected and start playing from step 8. If you want the patterns to be selected at even measures, you will need to send a program change message at the beginning of the measure.

# SYSTEM EXCLUSIVE

The Revolution does support MIDI system exclusive messages (sysex), for saving and loading your patterns and songs to other MIDI sequencers or computer programs.

To do a sysex dump, you will need to connect the MIDI OUT of the Revolution to the MIDI IN of the computer or another Revolution you are transferring to, and the MIDI OUT of that device connected to the MIDI IN of the Revolution.

Note: Only one MIDI cable is needed to load or save information, as the Revolution does not require a hand shake with the other device. By using two MIDI cables as mentioned, loading or saving operations can be done from either machine.

Make sure the Revolution's playback is stopped, enter the Song mode, and press the Glide/Sysex key. The Sysex key indicator turn on to show you are in the Sysex mode. The display will show either "save" or "load". Using the Up/Down keys, you can specify whether the Revolution will save or load sysex data. Once you have made your selection, press the Glide/Sysex key again. The display will show either "bank" or "song". Use the Up/Down keys to select whether the type of transfer will be banks of patterns, or entire songs. Press the Sysex key again an the display will show which pattern bank or song will be transferred. Use the Up/Down keys to select 1-16 or "all". When 1-16 is selected that bank of patterns or song will be transferred. If "all" is selected, you can transfer all the patterns or songs in one process.

You are now ready to load or save sysex data with the other machine. If you are saving the sysex data from the Revolution to another device, you will first need to set that other device to a ready-to-receive mode. Once this has been done, press the Play key on the Revolution to start the sysex dump. The Play key indicator will turn on and the display will show the packet number being saved during the sysex transfer. When the transfer is complete the Play key indicator will turn off. Consecutive saves may be made without entering and exiting the Sysex mode by simply selecting the song or patterns and pressing the Play key. The receiving device must always be setup and armed before the transfer is started.

If you are loading sysex data into the Revolution, press the Play key to initiate the ready-to-receive mode. The Revolution will then be armed and waiting for the sysex information to be sent. You may now start sending sysex information from the other device. The Play key indicator will turn off when the transfer is complete. If a checksum error is encountered during the transfer, the Glide/Sysex key indicator will blink. If an error does occur, repeat the transfer again or exit the Sysex mode to clear the error.

When pattern banks or songs are loaded using sysex, they are normally placed in the location they were saved from. You may change a pattern bank or song's location by editing the sixth byte of the general header, remembering that 0=1, 4=5, 15=16 etc. The pattern bank or song can then be loaded to the new location in the Revolution.

To exit the Sysex mode, press the Glide Sysex key until its indicator turns off, returning you to the Song mode. Always exit the Sysex mode before trying to edit or play patterns and songs.

**SYSEX INFORMATION**

MFG ID=07
CHANNEL#=01
MODEL#=77
RAW DATA TRANSFER/PACKET=512 BYTES
PACKET SIZE ENCODED=604 BYTES

**GENERAL HEADER INFORMATION**

SIZE=11 BYTES
General header is sent once to identify packets to follow.

CONTENTS
F0=SYSEX START
07=MFG ID
01=CHANNEL#
77=MODEL ID
XX=BANK/SONG, 0=BANK, 1=SONG
XX=BANK/SONG#, 0-15, 16=ALL
**XX=LSB**
**XX=** ***not used***
**XX=MSB**
F7=SYSEX STOP

| PACKET SIZE INFORMATION | | |
|---|---|---|
| 1 BANK | 1 PACKET | 604 BYTES |
| ALL BANKS | 16 PACKETS | 9,499 BYTES |
| 1 SONG | 14 PACKETS | 8,313 BYTES |
| ALL SONGS | 224 PACKETS | 132,843 BYTES |

When transferring sysex data to another device, make sure the receiving device has the available buffer size before attempting downloading or saving of the files.

**PACKET INFORMATION**

SIZE=604 BYTES
Packet is sent for every 512 bytes of raw data.

CONTENTS
F0=SYSEX START
07=MFG ID
01=RECEIVE ID
77=MODEL ID
XX=PACKET COUNT (00-7F)
XX=597 BYTES OF ENCODED DATA
XX=CHECKSUM
F7=SYSEX STOP

# OTHER CAPABILITIES

**PROCESSING EXTERNAL AUDIO**

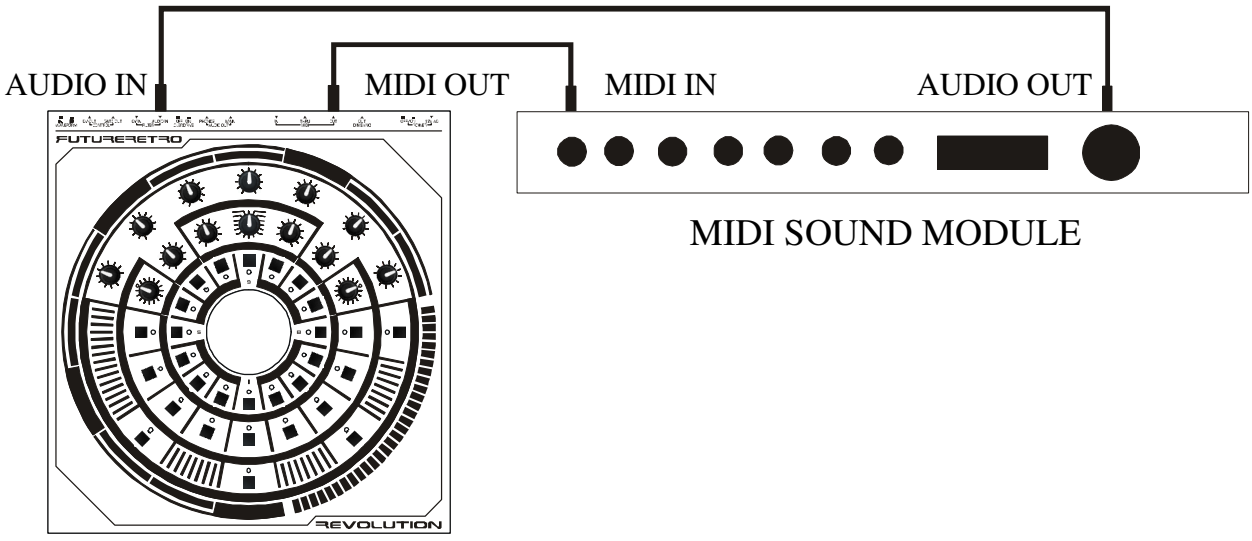
The Revolution provides an audio input for processing external sounds through the internal filter, amplifier, analog overdrive stage, and the DSP effects section.

Here we are going to filter audio coming from a MIDI sound module which is being played by the Revolution's sequencer. However you can process any external line level audio signal in the same way. If you are wanting to process turntable, guitar, or microphone sounds you will need to pre-amp the signal to a standard line level before connecting it to the Revolution's input.

For this setup, connect the MIDI OUT of the Revolution to the MIDI IN of the external sound module. Use a 1/4" mono audio cable to connect the main output of the sound module to the FILTER AUDIO IN jack on the Revolution. Setup the Revolution to play the external sound module as described on page 30.

When the Revolution's sequencer begins playing patterns, you should hear the sounds of the external sound module being processed by the Revolution. Notes must be programmed into the Revolution's sequencer in order for the amplifier to open up and allow sounds to pass through to the output. By placing a bunch of 16$^{th}$ notes into a sequence, the external audio becomes gated. If you wish to process the external audio without this gating effect, create a simple pattern with a loop point and glide set on step 1 of the pattern, and play this pattern when you want the external audio to pass through to the output.

You will notice that the audio input of the Revolution is very sensitive to normal line level signals. This is so you can overdrive the filter input easily with a line level signal. If you do not wish to overdrive the filter's input, turn down the volume of the external sound module until the processed signal is clean and without distortion.



# ADDITIONAL NOTES



This section covers a deeper perspective of the Revolution's features and capabilities.

**ACC DECAY SETTINGS**

As discussed earlier in the analog controls section, the Accent Decay time control now provides both shorter and longer decay times than the original TB303 was capable of. Please note however that when longer than normal Accent Decay times are used, and the overdrive stage is not turned on and the effects are set to dry, you may hear a slight click as the accent circuit turns off. This is normal. When effects are applied to the signal this will not be noticeable. When the overdrive stage is turned on you will not hear this either, as the overdrive stage also acts as a compressor limiting the overall amplitude for the audio signal. However you should keep this in mind when creating those classic acid lines.

**CONNECTING OUTPUTS TO INPUTS**

Some interesting sounds can occur when you start connecting the Revolution's outputs back to its inputs. For these purposes you may want to purchase a Y cable providing a stereo 1/4" connector to two mono 1/4" connectors.

So here are some things to consider and try…

Plug the stereo connector of the cable into the Phones output. Plug one of the mono connector ends half way into the Audio In jack. This allows the overall audio output of the unit to be summed with the signal from the oscillator before it goes into the filter input. The result is more resonance in the filter. The amount of resonance will be determined by the Resonance control as well as the Volume control. You might also apply some amount of effect to the output channel feeding the audio input for other unusual results. Notice if you plug the mono connector all the way into the Audio In jack, the oscillator will no longer be heard. Instead you will only hear the oscillator self oscillating. Again, play with adding some effects to the output channel feeding the Audio In jack. You might also consider plugging the other unused mono 1/4" connector into the filter's CV IN jack, so that the output signal is allowed to modulate the filter's cutoff frequency.

Another thing you might try is plugging the 1/4" stereo connector all the way into the filter's Audio In jack. The tip of this connector will feed the input of the filter. The ring of this connector will provide a small amount of the oscillator's waveform. Connect the mono connector wired for the tip to the Phones output, and the ring's mono connector to filter's CV IN jack. Now what is happening is the Phones output feeds the input of the filter causing it to self oscillate, while the waveform of the oscillator can be used to modulate the filter's cutoff frequency. Play with the CV Mod, Resonance, Volume controls as well as selecting different effects and effect amounts to generate various tones.

# ADDITIONAL NOTES

**CREATING A DEFAULT PATTERN**

As stated earlier in the sequencer operations section, clearing patterns only removes note-on and duration information. You might want to create your own default pattern and save it to a special pattern location such as bank 16 pattern 16. This pattern could then be programmed however you wish, perhaps with all 16th notes written at the pitch of C3. Something which you would consider a nice starting point for creating your other patterns. This pattern could then be copied once, and pasted every time you wish to create a new pattern with the default settings.

**SYNCING THE REVOLUTION'S PLAYBACK**

In the previous MIDI modes section we discuss how you can play external MIDI sound modules and CV/Gate type synthesizers with the Revolution's sequencer, as well as process external audio.
In the setups we describe, the Revolution is playing these external devices while using its own internal sequencer settings. You may also sync the Revolution's sequencer playback to any external MIDI sequencer while performing these same operations.

**RESETING A SONG TO STEP 1**

When in the Song mode you can reset the song to step 1 or the beginning of the song by pressing the Shift/Clear key when playback is stopped. When a song is playing, the Shift/Clear key (used in conjunction with the Play key) is used to determine the direction patterns will play, either forward or backwards. If you are syncing to an external clock while in the Song mode, when playback stops you may be at some song step location other than step 1. If the Revolution receives a MIDI continue message playback will resume from the current location of the song. However if you wish to restart the song from the beginning, or step 1, you will need to un-cue the Revolution's playback by pressing the Play key (turning the Play key indicator off), then press the Shift/Clear key to take you back to the beginning of the song, and finally re-cue the Revolution by pressing the Play key once again (Play key indicator will be on).

**THE LOGIC OF PLAYING PATTERNS BACKWARDS**

Most sequencers that allow you to play a pattern forward and backwards will start at step 1 and play sequentially to step 16, then reverse their direction playing step 16 again and followed by 15, 14, 13, all the way until step 1 is played again. The problem with this method is that it creates double hits at a measures boundaries, and can throw off the timing of a pattern's rhythm.
The Revolution is unique in the way that patterns are played backwards by always playing step 1 as the first step even when counting backwards. This then allows all the down beats to remain on down beats, and off beats to remain on off beats. You should find that this produces a much more pleasing rhythmic experience.

| Timing | ! | | * | | ! | | * | | ! | | * | | ! | | * | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Forward | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | 13 | 14 | 15 | 16 |
| Backwards | 1 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 |

The chart above shows the alignment of beats playing forward compared to how they play backwards. The "!" represent quarter notes, the "*" represents 8th notes. Notice how similar beats are interchangeable.

# ADDITIONAL NOTES

**REMIXING PATTERNS**

When patterns are remixed, if the sustained portion of a note is selected to play, nothing will be heard. This is because the Revolution stores all of a notes information in the step that represents the note-on or beginning of a sustained note. The sustained portion of a note is just there to represent the duration of that note. However if a sustained note is created by gliding one step's pitch to another step with the same pitch value, you can create the same sustaining effect. When a pattern is remixed and one of these glided notes is selected to play, it will play and even glide to the pitch of the note that follows. Remember this when remixing patterns. Both methods will produce different results so experiment to find which works best for your music.

**REMIXING SLICED AUDIO BEATS**

There are several software and hardware devices now available which allow you to sample a measures worth of music and slice it up into individual beats. If you have access to one of these devices, you may benefit by using the Revolution to remix these audio slices into new arrangements. For the best results, divide the original measure of sampled beats into 16 equal parts. Map them to a keyboard so that playing something like C2, C#2, D2, D#2, E2, F2, F#2 etc. plays them back in their original sequential order. Create a similar pattern in the Revolution to play these individual beat slices in their original sequential order.

Be sure to connect the Revolution's MIDI OUT to the MIDI IN of the device playing the sliced audio beats. Once you have your pattern created to play these slices back in their original order you can let the fun begin. First try playing the pattern forward to make sure it sounds similar to the original. Next try playing the pattern backwards. And finally go nuts remixing these beat slices using the Revolution's Remix feature. Remember that the Remix feature can be activated at any time within a measure, so you might try playing a pattern normally, and activating the Remix feature for only a specific part of the music to create variations. The key is to experiment. Have fun!

**REMIXED PATTERNS DO NOT PLAY BACKWARDS**

Whenever the Remix function is activated and you try to play a pattern backwards, it will play backwards but it will no longer be remixed. The pattern reverse feature overrides the remix feature, so that patterns will only play backwards sequentially. If the Remix feature is activated and the pattern is playing backwards, you can change the playback to forwards to resume having the pattern remixed again. This can lead to some interesting results as well so experiment!

# CALIBRATIONS

**TUNING AND CALIBRATING THE REVOLUTION**

The Revolution provides three access holes on its front panel for calibrating the CV output and tuning the oscillator. These trimmers are set at the factory but may need to be adjusted over time. To make adjustments to these trimmers, we recommend using a 5/64" flat-blade screwdriver. Before making any adjustments, turn the unit's power on and let it warm up for at least 15 minutes.

**CV OUT – T1**

T1 is the trimmer for adjusting the control voltage generated by the sequencer and sent to the CV OUT jack. Please note that if adjustments are made to this setting, you will need to recalibrate the Scale, and Offset trimmers described below.

First create two different patterns, each containing only one note. The first pattern should be programmed to play a pitch of C1, the second pattern should play a pitch of C6. If you have a voltmeter, plug a short 1/4" cable into the CV OUT jack and connect the leads of your voltmeter to the other end of the 1/4" cable. Play the pattern containing C1 and check the voltage being generated. Play the pattern containing C6 and adjust T1 until the voltage generated is 5 volts higher than that of C1. You may need toggle back and forth a few times checking the voltage of C1 and then adjusting for C6 until the difference is exactly 5 volts.

If you don't have a volt meter, connect the CV OUT and Gate OUT to a 1V/Oct synthesizer which is properly calibrated. Play the two patterns containing C1 and C6 while adjusting T1 until the external synthesizer plays the correct scaling. Note: This method is not as accurate as using a voltmeter.

**OSCILLATOR SCALE – T2**

To calibrate the oscillator's scale you should first make sure that CV OUT is calibrated properly. If you have an oscilloscope, connect a short 1/4" mono cable to the filter's CV IN jack. Notice that this jack is a stereo connector, and you will first plug the 1/4" cable all the way into this jack and then pull it out until you feel it click once. The cable will then be plugged only half way into this jack. Connect the probe of your oscilloscope to the other end of the 1/4" cable. You should now see the oscillator's waveform on the scope. You may need to increase the amplitude setting of your scope to properly sync and view the waveform. You may also want to set the sequencer's tempo to a range of approximately 50 B.P.M.. Play a pattern containing only the pitches C1 and C2, and then adjust trimmer T2 until the waveform generates a 2:1 ratio. Next play a pattern containing only the pitches C1 and C3, and adjust T2 until the waveform generates a 4:1 ratio. Play another pattern containing C1 and C4, and again adjust T2 until the waveform generates an 8:1 ratio. Use this same method for C1 and C5 (16:1 ratio) and C1 and C6 (32:1 ratio) until they generate perfect octaves.

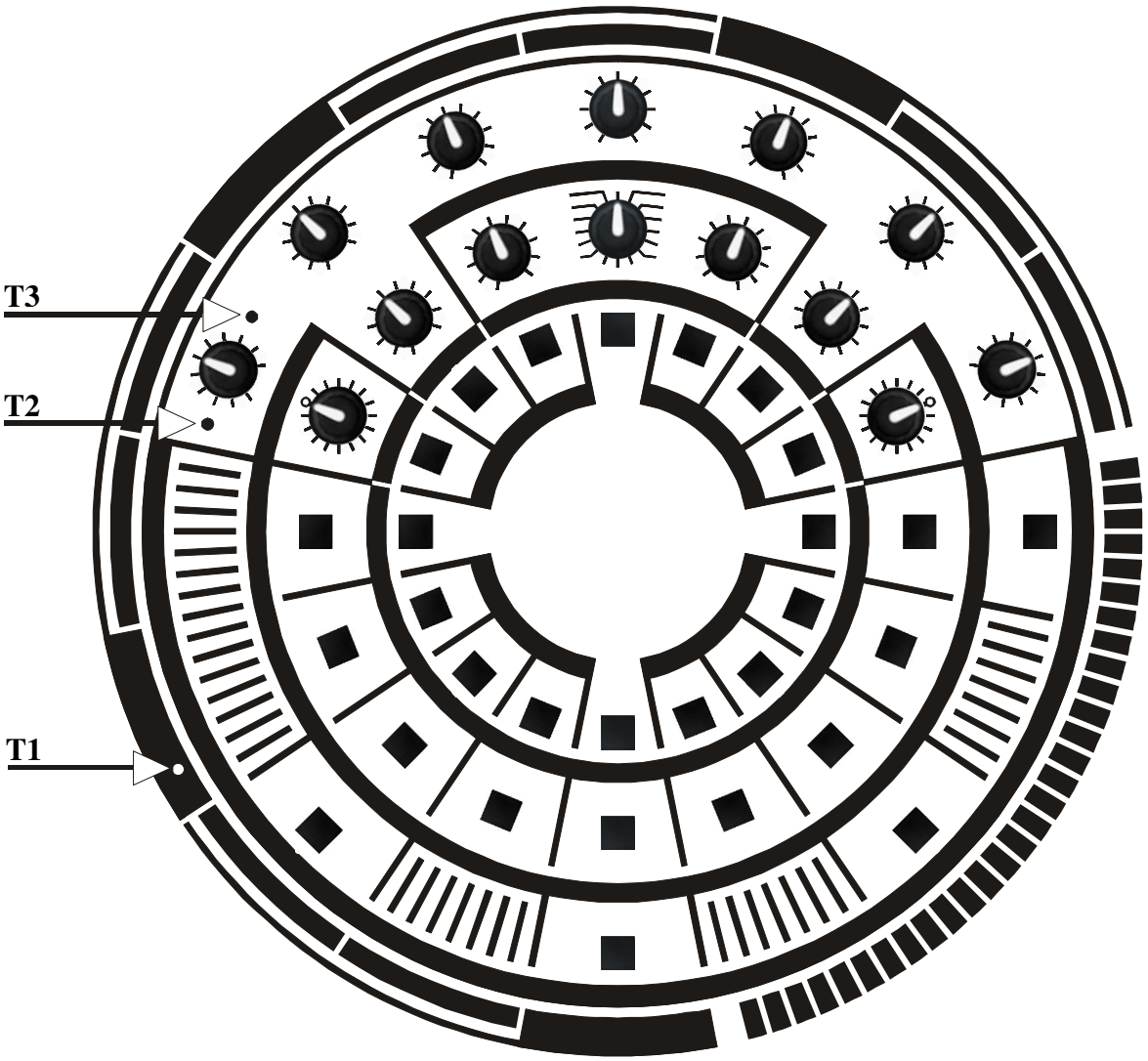
If you don't have access to an oscilloscope, you can use a digital tuner to monitor the output pitch while making adjustments so that the oscillator produces perfect octave changes.

**OSCILLATOR PITCH OFFSET – T3**

Trimmer T3 is used to offset the pitch produced by the oscillator. First make sure that the oscillator's Tune control is set to the mid position. Use a digital tuner to monitor the main output of the Revolution. Play a pattern containing only a single note, let's say with a pitch of C3. While this pattern plays, adjust trimmer T3 until the oscillator produces a true C note. Make sure that the transpose setting in the sequencer is set to 0 when making adjustments.

# CALIBRATIONS

The following diagram shows the locations of the three trimmers used to calibrate and tune the Revolution.



# SPECIFICATIONS

**ANALOG CONTROLS**

- OSCILLATOR WAVEFORM SELECT: Sawtooth, Square wave
- TUNE CONTROL: +/- 1 semitone
- FILTER: 3 pole, 18db lowpass resonant filter
- CUTOFF: Filter frequency
- RESONANCE: Amount control
- CV MOD: Amount of filter modulation
- ENVELOPE: Amount control for sweeping filter
- ENV DECAY: Envelope decay time for filter
- ACCENT: Amount of signal to modulate the filter and amplifier
- ACC DECAY: Accent decay time
- VOLUME: Master/headphone output level control
- OVERDRIVE SWITCH: Off/on

**DSP EFFECTS**

16 preset 24 bit stereo effects including:

- Chorus/room 1
- Chorus/room 2
- Delay 1
- Delay 2
- Chorus
- Flange
- Plate 1
- Plate 2
- Plate 3
- Room 1
- Room 2
- Room 3
- Hall 1
- Hall 2
- Rotary Speaker
- Low Pass Muffler

# SPECIFICATIONS



**SEQUENCER**

- NUMBER OF PATTERNS: 256 patterns (16 banks x 16 patterns)
- RECORDED PATTERN CONTENT: note duration, pitch, accent, glide, loop point, time signature, swing amount
- NUMBER OF STEPS PER PATTERN: 3/4 time=12 steps max, 4/4 time=16 steps max
- NOTE PITCH RANGE: C1 to D#6
- LOOP POINT: 1 to 16 notes per pattern to loop
- PATTERN TRANSPOSE: from -36 to +36 notes
- OTHER PATTERN FEATURES: pattern remixing, play patterns forwards or backwards, copy and paste patterns, pattern shifting, permanent pattern transposing, multiple pattern cueing, LED chase, real-time editing of pattern information while the sequencer is running or stopped, sequencer automatically saves all editing.
- REMIX: 256 variations for each pattern and song
- NUMBER OF SONGS: 16
- NUMBER OF STEPS PER SONG: up to 3580 measures
- RECORDED SONG CONTENT: tempo, bank/pattern for each step, pattern transpose for each step, song loop point
- SONG PATTERN TRANSPOSE: from -36 to +36 notes steps for each song step
- TEMPO RANGE: from 20 to 250 beats per minute
- MIDI FUNCTIONS: on/off, channel selectable from 1 to 16, program change messages for selecting patterns remotely
- MIDI SYNC: internal or external
- MIDI SYSEX: for dumping patterns and songs
- NOTE DATA: transmitted and received
- MIDI TO CV/GATE CONVERTER
- MIDI TO DIN SYNC OUT CONVERSION

**INTERFACING**

MIDI: in, thru, out
DIN SYNC: out
1/4" JACKS: 1v/oct cv out, +12v gate out, cv in, (for modulating the filter cutoff frequency), audio input, stereo headphone output, stereo master output

**POWER**

12V AC input, current rating of 1 amp or 1000mA

**DIMENSIONS**

(L x W x H) 13 x 13.5 x 2.75"

**WEIGHT**

5.4 lbs