RMI

KEYBOARD COMPUTER

MODEL KC-II OWNERS MANUAL

Dear KC-11 Owner:

Congratulations! You have chosen a unique instrument that will no doubt cause you to stand out as a musician.

Your decision to purchase the Keyboard Computer was probably based on the sounds you heard either on the demonstration record or in person at a live demonstration. We would agree that the sound of an instrument is its most important quality. Instant-action Presets controlling the most popular sounds allow you quick access to a wide variety of effects, however, the potential of this instrument extends far beyond the Presets. We would like to see you realize the greatest return on your investment by exploring the total potential of your Computer.

This Owner's Manual is a comprehensive collection of data gathered over a period of years beginning in 1974. Contributions in the form of Set-Up Sheets and ideas have been made by owners like yourself. Blank Set-Up Sheets are provided for your convenience to jot down new sounds. If you create some new Set-Ups you feel are unique, please send them our way - the Owner's Manual is loose-leaf and we up-date it from time to time.

Finally, if you are to realize the full potential of your KC-11 you must give the Owner's Manual a thorough reading - at least once. There is much more to the Computer than meets the eye from the front panel. Should you get in a bind understanding some part of the instrument, we are as near as your phone (no collect calls, please).

Enjoy the knowledge that your sounds will eventually affect the music business as have synthesizers. Good luck.

Sincerely,

Clark A. Ferguson
RMI Performing Artist

TONE CARDS

Each RMI Keyboard Computer owner is provided at purchase (original ownership only) with a carefully-selected group of 15 Tone Cards. These cards have been selected to provide most of the sounds required to accomplish the Set-Ups contained in the Owner's Manual and allow as much further creative flexibility as possible. As Set-Up additions to the loose-leaf Owner's Manual occur or as new sounds, effects or Tone Cards, are created the selection of these 15 initial cards may change. As the performer becomes familiar with the card sounds and their use in the instrument, additional cards may be ordered directly from the factory. Two Tone Card Libraries are published periodically. They are the RMI Library, containing the sounds frequently used by Keyboard Computer performers, and the Allen Organ Library, containing sounds usually associated with pipe organs. There is, however, some duplication between the two. A copy of either library can be obtained by writing the factory in Macungie, Pennsylvania. The list also serves as an order blank. The owner places a check mark beside the desired cards and encloses payment for the total. A copy of the current library will be returned along with the cards.

Spend a lot of time listening to each card individually. Categorize the sounds - mellow and fat, brilliant and thin, nasal, flute-like, bell-like, etc., close-spaced harmonics such as the Spanish Trumpet or wide-spaced harmonics like the Jaw Harp. Close-spaced harmonics sound coherent, while wide-spaced harmonics can be picked out individually by the ear. Be absolutely sure that you are using a flat audio system to audition the cards, otherwise you will get a false idea of their sound.

Tone Cards - R.M.S. Values

The two digit number appearing to the left of the following card identification numbers is called an intensity index or R.M.S. value (Root Mean Square). An example is 32 R1184. RMS values currently range up to 64. Generally speaking, the higher the number, the louder the tone, however, a bright reed tone, indexed at 15, will sound "louder" than a simple flute tone similarly indexed at 15. This is a natural phenomenon caused by the greater efficiency of the upper harmonics in the bright reed as heard by the human ear.

Within a particular family of tones (brass, strings, reeds, etc.) the index numbers or RMS values should be both helpful and accurate. When using only one sound at a time, it is best to have the highest possible RMS value on the card in order to maintain a good "signal to noise ratio." One way of achieving a high RMS value is to "double up" the card, or insert it into two adjacent Alterable Voices such as 1 & 2 or 3 & 4. When a card is "doubled", its RMS value doubles. Most of the cards listed in the RMI library have high values. Some cards may be loud enough not to require doubling.

A performer can use the RMS values to advantage when seeking a specific balance between two sounds, such as an organ sound with percussion like the "B-3 type sound." The card used for the percussion tone is the 2-2/3' "B" having an RMS value of 44. Each tone color has an inherent limit on the amplitude that can be achieved while still maintaining the same tone color. The 2-2/3' "B" is at its fullest value. If a greater contrast is desired between the percussion and organ tone, merely lower the value of the organ tone (the French Horn card from which there are four values to choose) and turn up the amplifier gain, returning the organ tone to the previous level, while raising the level of the percussion tone. Of course you will notice that the percussion tone is already "doubled" in Alterable Voices 3 & 4 (see Set-Up Sheet for Electric Organ Preset).

Tone Cards - Custom Cards Policy

From time to time we receive requests for tone card sounds other than just RMS value variations of existing cards, such as a real piano, trumpet, guitar, Electric Piano, etc. What must be realized about these instruments and similar sounds is that all have the unique characteristic of changing their tone color upon the attack and/or decay of the note. Of all the many unique, realistic, and phenomenal things that the RMI Keyboard Computer accomplishes, dynamic tone coloring is not one of them - it would seem amazing enough that it has high reliability in returning precisely to a specific sound when desired.

All of this is not to say that dynamic tone coloring "effects" cannot be created. Example: A mellow tone can be programmed in Division "B" while a brilliant tone is programmed in Division "C" with a percussion envelope. As the key is played, both tones are heard, then the brilliant percussed tone slowly dies away leaving only the mellow tone from Division "B".

WAVEFORMS

If a specific sound is to be duplicated or generated, the harmonic content of its waveform must be duplicated. Simply, to control the sound is to control the waveform. Analog synthesizers start with an oscillator that generates geometric waveforms such as a sawtooth or square or pulse wave. These waveforms are rich in their own inherent series of harmonics. Control over the harmonic content is exercised by filtering out frequencies above or below certain points or both, and sometimes resonating certain frequencies or bands of frequencies. Although it has been proven that a wide assortment of sounds can be generated in this manner (in fact, the analog synthesizer takes on a familiar sound in the hands of most players) precise control of particularly the more complex waveforms is just about impossible. Another problem plaguing analog circuits is their ability to be infinitely-variable. Infinitely-variable circuits, of course, allow infinitely-variable tonal possibilities, however, the problem is a human engineering one - people cannot remember settings. It becomes highly difficult to recreate sounds achieved earlier. The Keyboard Computer uses an entirely different method void of audio oscillators and filters.

Instead of modifying an already existing waveform, the KC generates a new and independent waveform for each sound. The concept is similar to an artist's palette where a large number of discrete colors are mixed, but never actually altered. Because of this sys em, any sound ever created on the KC can be readily and precisely recreated at any time without guesswork. The KC principle of waveform generation is similar to that of an artist's reproducing an enlarged picture on a billboard employing a grid of squares to aid their accuracy. The waveform to be reproduced is analyzed on a graph. Points where the waveform intersects the grid are assigned numbers and the numbers are stored in the computer. Reading this group of numbers o"t at the frequency of a given musical pitch regenerates the waveform. Although without an infinite number of intersection points on the grid absolutely precise resolution is not possible, this system definitely provides a substantial improvement in accuracy of waveshape control over any other commercially-available system.

Changes in tonal color are accomplished by changing waveforms, adding waveforms together, or cross-fading between opposite channels having different waveforms. Dynamic changes in tone color (changes during attack or decay) are accomplished by assigning different waveforms to different envelopes. Example: a percussive bright sound can decay to a mellow sustained sound by percussing a brilliant waveform while at the same time sustaining a mellow waveform. This procedure may not be as flexible as VCF modulation by an envelope generator, however, it is highly repeatable and predictable.