Resynthesis

Making a resynthesized timbre

A resynthesized timbre is a waveform that has been sampled, analyzed segment-by-segment and then reconstructed using the resynthesis facility. Unlike a sampled sound, the resynthesis timbre can have its harmonic structure further altered, including the addition of frequency modulation.

Timbre frames

In the resynthesized timbre, each segment of the original sound becomes a **timbre frame** with its own harmonic content. Like the separate frames of a motion picture, timbre frames give a resynthesis sound realistic movement as they change over time.

When you program a partial timbre with timbre frames, you construct a series of timbres, each with its own harmonic structure and volume envelope, and splice them together one after the other to produce a series of sounds.

Each spliced-in waveform, or timbre frame, consists of a set of harmonics, a delay time, a splice time and shape and a peak volume level. In addition, a timbre frame can have a pitch envelope, so that fluctuations in pitch can be programmed into the partial timbre.

Any number of timbre frames can be added to a partial timbre. Each partial timbre in a timbre can have its own set of timbre frames. Because of the crossfading between waveforms, each partial timbre with timbre frames uses two FM synthesizer voices.

You usually use the timbre frame programming described in this section to modify a resynthesis timbre. You can, however, set up a complex time-varying waveform by programming each timbre frame from scratch. Either way, the resulting waveform can follow the timbral variations of an acoustic sound while remaining accessible to special harmonic adjustment.

The sound of a resynthesized timbre

As the resynthesized partial timbre is played, the original partial timbre, **frame 0,** and the succeeding frames are spliced together smoothly and evenly.

The sound starts with the attack of the waveform programmed for the original partial timbre. When peak volume is reached, splicing of the first timbre frame begins. When peak volume of the first timbre frame is reached, splicing of the second timbre frame begins. After all specified timbre frames have been performed, the initial decay of the original partial timbre begins, followed by the programmed sustain level and finally the final decay.

This sequence of events occurs only if the key is held longer than the programmed length of the timbre frames. Whenever you release the key, the note immediately goes into final decay using the waveform of the current timbre frame.

Making a resynthesized timbre (con't)
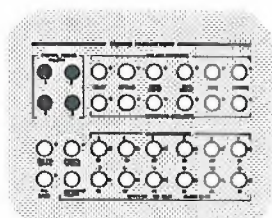
partial timbre select panel 1

Selecting timbre frames

If the partial timbre you are working with already has timbre frames, you can access them from the keyboard using the **partial timbre select** buttons and the control knob.

1. Hold down the **partial timbre select** button.

2. Turn the control knob until the desired frame number appears in the display window.

When the number of the desired frame appears in the display window, the frame has been accessed and can be listened to, programmed or copied.

On the terminal you can select a timbre frame on the **timbre frame display** by moving the cursor with the arrow keys. The number of the selected timbre frame appears in the display window as above.
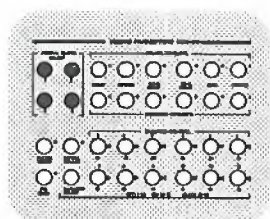
Soloing timbre frames

You can listen to the waveform and pitch of a single timbre frame by soloing it and holding down a key.

1. Select the timbre frame you wish to solo.

2. Continue to hold down the **partial timbre select** button while you play a note.

The attack of the original waveform is played and then the splice to the selected timbre frame begins. When the waveform of the selected timbre frame reaches its peak volume, it stays there until you release the key.

Making a resynthesized timbre (con't)

partial timbre select panel 1
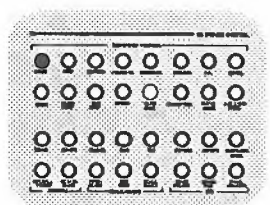
start panel 2

Adding timbre frames

The original partial timbre is called **frame 0**. Each added timbre frame is numbered starting with 1.

1. Press and hold down the desired **partial timbre select** button.

2. Press the **start** button under **recorder control** in the second panel.

    A timbre frame with a sine wave waveform, a peak volume level of 100, and a splice time of 1000 milliseconds is added to the selected partial timbre.

    The number of the timbre frame inserted appears in the display window.

To insert a timbre frame into the middle of a series of timbre frames:

1. Select the timbre frame preceding the point where you want the new timbre frame inserted.

2. Press and hold the **partial timbre select** button.

3. Press **start.**

    The new frame is inserted after the selected frame. All subsequent frames are automatically renumbered.
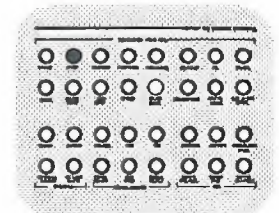
Deleting a timbre frame

1. Select the timbre frame you want to delete.

2. Continue to hold down the **partial timbre select** button.

3. Press the **stop** button under **recorder control** in the second panel.

   The number of the preceding timbre frame appears in the display window. All subsequent frames are re-numbered.
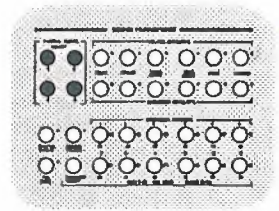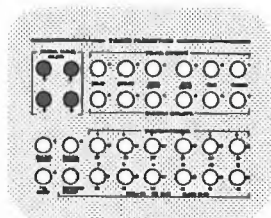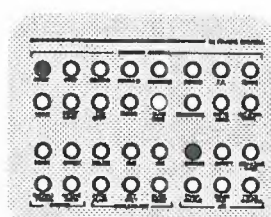

partial timbre select
panel 1

stop
panel 2

partial timbre select
panel 1

start, bounce
panel 2

Copying timbre frames

You can also create a timbre frame by bouncing an already programmed timbre frame to a newly created one. Bouncing timbre frames makes programming a gradually changing partial timbre easier, since some parameters may not change greatly from one timbre frame to the next.

1. Select the timbre frame you want to bounce.

2. Hold down the **partial timbre select** button.

3. Press the **bounce** button under **recorder control** in the second panel.

   The **track select** buttons blink.

4. Continue to hold down the **partial timbre select** button.

5. Press **start.**

   A timbre frame immediately following the timbre frame selected for bouncing is created with the values of the source timbre frame. The original timbre frame is not affected by the bounce, since it has been duplicated, not moved.

   The number of the new timbre frame appears in the display window.

Copying timbre frames to other partial timbres

You can bounce a timbre frame from one partial timbre to another. To do this, both partial timbres must be active within the keyboard timbre.

1. On the destination partial timbre, select the timbre frame preceding the point where you want the copied frame.

2. On the source partial timbre, select the frame you want to copy.

3. Press and hold the source **partial timbre select** button.

4. Press **bounce.**

   The **track select** buttons blink.

5. Press and hold the destination **partial timbre select** button.

6. Press **start.**

   The number of the newly copied timbre frame appears in the display window.

Repeat the above procedure to bounce the frame back to a different position in the first partial timbre. Remember, the copied frame is always placed after the selected frame.

Note: Although you can bounce information from frame 0 to any other frame, you cannot bounce information from another timbre frame to frame 0. You can skip over frame 0 by setting its **ve peak** to 0.1 and its **ve attack** to 0 milliseconds. However, this procedure requires a significantly greater amount of computer time to begin new notes.
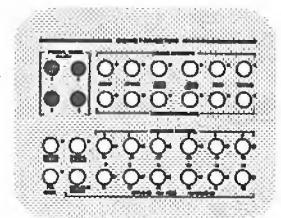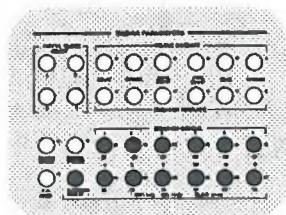

partial timbre select
panel 1
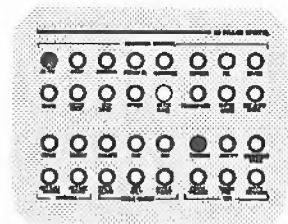
start, bounce
panel 2

harmonic select,
harmonic control
panel 1

Setting timbre frame waveform and phase

The **waveform** of the timbre frame is specified by setting the relative volume levels of the 24 harmonics. The first harmonic of the default timbre frame is set at 100.0; the others are set at 0.

1. Press a **harmonic control** button to select a harmonic for programming.

2. Turn the control knob to set a relative volume between 0 and 100.0.

Except for the first harmonic of frame 0, all harmonics of all timbre frames can be adjusted for **phase.**

1. Press and hold a **harmonic control** button.

2. Press the **harmonic select** button.

   The **harmonic control** button blinks.

3. Turn the control knob to set the phase of the selected harmonic between 0 (0 degrees) and 63 (360 degrees).

For complete instructions on setting harmonics and phase, see the section "The steady-state waveform."

Setting the timbre frame splice

A **splice delay** added to the front end of the timbre frame postpones the splice by maintaining the previous waveform for the specified length of time.

1. Press **ve delay.**

   The display window shows the default value of 0.

2. Dial in a splice delay between 0 and 20,000 milliseconds.

During the **splice time,** which begins after the splice delay, the previous waveform fades as the new one rises to its peak volume. Short splice times create very real attack transients. Long splice times of 1000, 2000 or 3000 milliseconds create slow moving harmonic shifts.

1. Press **ve attack.**

   The display window shows the default value of 1000 milliseconds.

2. Dial in a splice time between 0 and 20,000 milliseconds.

You may select a linear or logarithmic crossfading pattern. Since what you hear is on a decibel scale, a linear splice is heard as a nonlinear change and a logarithmic splice is heard as a gradual, linear change.

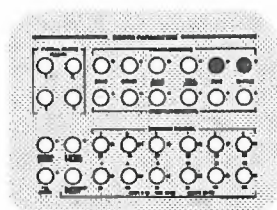1. Press **ve initial decay.**

   The display window shows the default value of 500.

2. Dial in a splice shape value between 0 (fully exponential) and 1000 (fully linear).
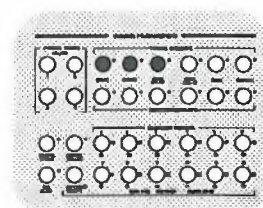
ve delay, attack,
initial decay
panel 1

*ve peak, sustain
panel 1*

Setting timbre frame volume

Each timbre frame has its own **peak volume level** which
is reached at the end of the splice.

1. Press **ve peak.**

    The display window shows the default value d00.0.

2. Dial in a peak volume setting between 0.0 (no
    volume) and 100.0 (full volume).

The partial timbre volume control parameter allows you
to quickly adjust the peak levels of all the timbre frames
in a partial timbre by changing just one value in one
timbre frame (usually frame 1). In this way, you adjust
the total loudness of the partial timbre. This makes it
easy to adjust the relative volumes of partial timbres,
each with a long chain of timbre frames, within the same
timbre.

1. Press **ve sustain.**

    The display window shows the default value of
    180.0.

2. Dial in a value between 0.0 (no volume) and
    100.0 (full volume).

When you change partial timbre volume, all the volume
levels in the frames are changed by the same amount.

Setting the timbre frame pitch envelope

The entire partial timbre can be given a pitch envelope by setting each timbre frame to a pitch that differs from the pitch of the previous frame by the amount of a pitch offset.

1. Press **he peak.**

    The display window shows the default value of 0.

2. Dial in a pitch offset value between -48.00 and +48.00 semitones.

You can also change the pitch offset in semitone intervals by pressing **he peak** repeatedly.

The starting pitch of the partial timbre is determined by the frequency of the note being played, the partial tuning setting (explained in the section "Partial timbre modifications") and the overall tuning setting (explained in the manual *Memory Recorder*).

When the splice to timbre frame 1 begins, the starting pitch starts to glide up or down by the amount of the pitch offset. The glide is completed at the moment the new waveform reaches its peak level.

If an additional pitch offset is specified for timbre frame 2, the pitch starts to glide from the pitch reached at the previous peak level, again up or down by the amount of the pitch offset in timbre frame 2.

The cumulative effect of the pitch offset for each timbre frame allows for a wide variety of special effects. Positive and negative pitch offsets that cancel each other create sounds that fluctuate around the starting pitch. All positive or all negative pitch offsets create sounds that move continuously in one direction.
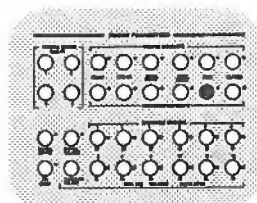
he peak
panel 1
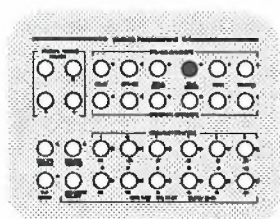
ve final decay
panel 1

Pitch randomness

Certain classes of sounds, particularly percussive timbres, are more effective if a slight, random pitch variation is applied. A random pitch variation also prevents undesirable phase cancellations which can occur when multiple notes in the same sound are played at once.

1. Press **ve final decay.**

   The display window shows the default value of 0.00.

2. Dial in a number between 0.00 and 48.00.

This establishes a **randomness range** above and below any note that is played. The pitch randomness is usually set on frame 1.

When you play a note, a random pitch is chosen from within this range and is maintained for as long as the note lasts. If the same note is played again, however, a different random pitch is chosen from within the range. By repeatedly pressing the same key, you can play a sequence of sixteen different random notes. If recorded, these notes are not necessarily played back in the original pattern of pitches.

A small **randomness range** helps create a natural sound when you are playing multiple simultaneous notes with a timbre using timbre frames. For special effects, you might try setting a large range.

Pitch randomness can only be applied to partial timbres with at least one timbre frame. If you want to set pitch randomness on a timbre without timbre frames, create a **dummy** timbre frame by "bouncing" frame 0 to frame 1.

Continued splicing function

Normally timbre frame splicing stops when the key is released. The initial decay begins from the waveform of the frame in progress. This is true for sustaining and non-sustaining timbres alike.

However, you can program a special **continued splicing function** for non-sustaining timbres that allows timbre frame splicing to continue regardless of when the key is released. This function is very effective for creating plucked sounds, such as guitar or harp, where you want to use a series of timbre frames to produce an authentic decay. With continued splicing timbres, the entire series of frames is triggered for each note even if you play very rapidly. This kind of sound cannot be damped once a note has been triggered.

To create a continued splicing timbre, you must set up two specific conditions on each active partial timbre in the sound:

- The **ve sustain level** of frame 0 in each partial timbre must be set at 0. (This is, of course, what defines a partial timbre as non-sustaining.)

- The **ve final decay time** of frame 0 must be greater than the sum of the splice times for all the timbre frames plus the initial decay time set on frame 0.

When these two conditions are met, all notes played step through the complete set of timbre frames and then decay to zero at the rate set by the initial decay setting. The final decay setting does not determine the rate of decay; it is used only to turn on the non-sustaining timbre function.
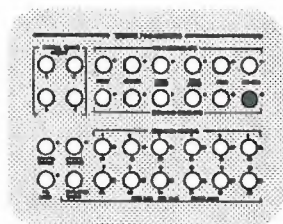
he sustain
panel 1

Timbre frame looping

You can apply a loop to a series of timbre frames so that the series of frames is played over and over so long as the note is held.

1. Select the endloop point in the series of timbre frames by holding the **partial timbre select** button and turning the control knob until the number of the desired last frame appears.

2. Turn on the looping function by pressing the **he sustain** button.

    0 FRAME NUM

    appears in the display window.

3. Turn the control knob to select a timbre frame for the **startloop point.**

4. Press and hold a keyboard key to hear the looping timbre frames.

Using a timbre frame loop

When you play a note, the system plays the frames up to the specified ending frame and then returns to the starting frame. This loop continues as long as you hold down the key.

Timbre frame looping can be used to create life-like vibrato with a sound that repeatedly fluctuates between different waveforms. It can also be combined with amplitude modulation or unusual vibrato settings for many special effects. Or, try adding a loop to a partial timbre with a pitch envelope programmed for the frames.

You can also add a timbre frame loop to a non-sustaining timbre that has been programmed for continued splicing for a number of special effects.

For example, you could program a timbre frame loop which loops from a frame other than the last frame of the partial timbre. So long as a key is held down, the note loops between the specified starting and ending frames in the loop. When the key is released, the note continues splicing through all the frames in the timbre, including those which occur beyond the endloop frame.