# novation

Understanding and overcoming distortion with the Supernova & Supernova II series synthesisers

A voice in the Supernova consists of up to 3 oscillators, 2 ring modulators and a noise source. The oscillators, ring modulators and noise sources are mixed together at the mixer stage and are fed through a filter block. The output of the filter is then fed through an amplifier and the output of the amplifier is fed into the effects section.

The signal path diagram for a Program in the Supernova
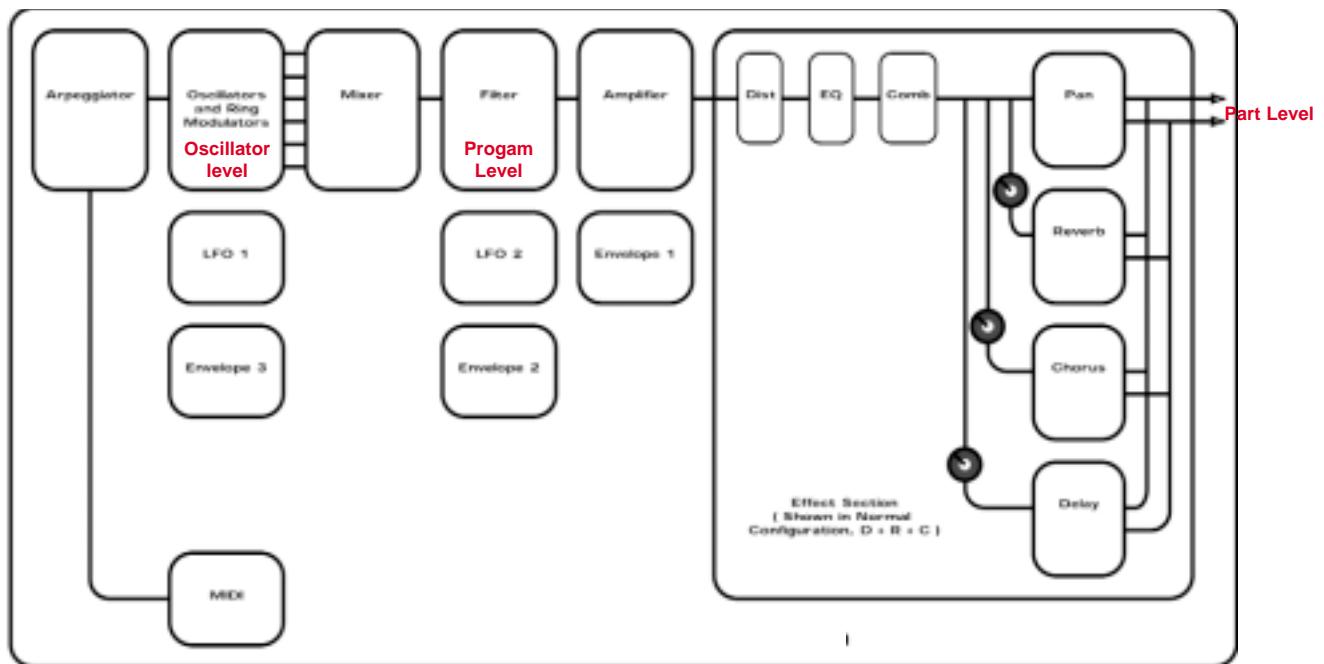
The important gain stages in the Supernova / Supernova II signal path are:

1) Oscillator level
2) Program level
3) Part level

The Supernova and especially the Supernova II synthesisers are able to greatly boost the gain of a signal at various points in the signal path. If too much gain is applied at any one of these points, distortion will be introduced. To remove the distortion you must reduce the gain of the signal to below clipping level at the point the distortion is being introduced.

Oscillator level

The oscillator levels (and ring modulator levels and noise source levels) are set by the modulation sources acting on the oscillator mix parameters and also by the overall oscillator level settings. If all three oscillators are in use, it is not necessary to have oscillator levels for each oscillator set to maximum, indeed you may only need a setting of 010 or 020 for each oscillator to produce the desired result. High oscillator gains can introduce unwanted distortion at the filter stage of the signal path.

Program level

The most important level to be aware of when modifying or creating sounds on the Supernova series synthesisers is the Program level. This as it's name suggests controls the amount of gain a Program has. If the Program level is set too high, distortion will be introduced at the effects stage. The Supernova and particularly the Supernova II series are capable of producing exceptionally high gains at this stage. This is intentional as this allows programs which employ severe filter levels to retain a good overall signal level. This means that a signal which does not use such filter settings will not need nearly as much gain applied at this stage. Some patches may even only need a program level of 010 or less to ensure that the signal does not distort at the effects stage.

The archietecture of the Supernova and Supernova II series synthesisers is such that the output level is dependent on the number of voices being played at one time. For every doubling in the number of voices there will be a 3dBr increase in the overall level being fed from the amplifier stage into the effects stage. For example, the difference in level between 1 voice (ie 1 note) being played and 8 voices being played (ie 8 notes) is 9dBr. If 16 notes were played simultaneously, the output would be 12 dBr higher than if only one note was played. If 48 voices were played simultaneously as is possible on a Supernova II Pro X, the difference in level between 1 note and 48 notes is 16.5 dBr.

This is why some sounds introduce distortion only when large numbers of notes are played. The solution is to reduce the program level. Similarly if a monophonic preset is changed and played as a polyphonic sound, there is a good chance that distortion will occur. (This is simply because the Program level had been factory set to be as loud as possible without introducing distortion for only one note to be played at a time).
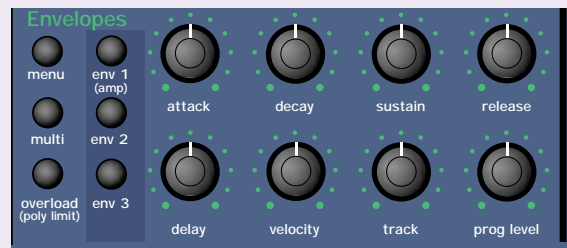
Part level

When a sound is used in Performance mode, there is yet another gain stage, the Part level. If you compare the Supernova series to a mixing desk, the Part level is analogous to the fader position on a console whereas the Program level is analogous to the gain or trim control on a console. If you imagine a signal being fed into a mixer and the gain stage is boosted so that there is distortion present, adjusting the fader postion will merely amplify or attenuate both the signal + distortion together. For the distortion to be removed, the gain / trim level must be reduced. Similarly on the Supernova, if distortion is present in a Program because either the Oscillator levels or Program level is set too high, adjusting the Part level will have no effect in removing the unwanted distortion.

To reduce the Program level on a Nova II / Supernova II is very easy - (Note if you are in Performance mode, select the particular part you wish to edit.) Simply adjust the Program level with the Program level knob found in the Envelope section of the keyboard
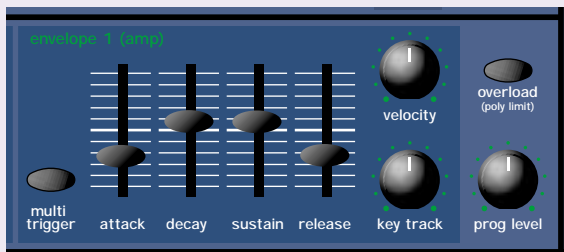
Supernova II KeyboardProgram level control

Supernova II Rack Program level control

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The original Supernova and Nova Laptop both use a slightly different method for changing the Program level. In these synthesisers, the Part level contol has a split function. In Program mode, the Part level control actually adjusts the Program level. In Performance mode, the Part level control adjusts the active Part level. So to reduce the Program level of a Program assigned to a Part, it is necessary to change modes into the Program mode, adjust the Program level, write the change to memory and then re-enter the Performance mode.

Original Supernova Part level control

Nova Laptop Part level control

steps to take to eliminate distortion:

1)   **Turn the program level down.**
2)   **Turn the part level down in the Performance.**
3)   **Reduce the level of the individual voice components - the oscillators 1,2 & 3 , the ring modulators and the noise sources.**