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Ultrashifter™

V2.300 Upgrade for the 4000 series
User Manual

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Contents

This upgrade adds three Banks with 18 presets and 23 new modules to the 4000 or 4500. 4000 users without the optional sampler (standard in the 4500) will see sampler presets in Banks 32-34 but will not be able to use them.
The Ultrashifter[tm] is the first of a new generation of pitch shifters specially designed for vocal use. It may give interesting results on other material but this cannot be guaranteed.

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Presets

95 Ultrashifter Presets

1. Ultra AutoCorrect

This preset is a *diatonic* ultrashifter set as a pitch corrector, allowing you to choose which of the 12 notes are to be quantized (corrected). There is a meter displaying your source (input) as well as the output of the analysis correction.

> A *diatonic* pitch shifter shifts the musical pitch of an audio signal while maintaining the proper harmonic relationship to a desired key. The pitch shifter takes care of finding out what note is being played and automatically adjusts the amount of pitch shift so that the shifted note remains in key. Alternatively, it could be viewed as 'quantizing' the pitch, or 'pulling' it to the nearest note in the scale.
> A normal or non-diatonic shifter will shift each note by the same interval, putting some notes out of key.

2. Ultra Cents

This preset allows you to choose the amount of shift as a value in *cents* (100 cent to a semitone). It has an automatic <formant> parameter, which will get you in the ballpark, but you should be aware that all signals are different and the automatic value is meant only as a guideline. The automatic formant value will be displayed, allowing it to be manually overridden, but will revert to its automatic formula as you change the shift amount. So - choose the shift amount first, and then fine tune the <formant> value for best results.

3. Ultra Cents 2

This preset is the same as 'Ultra Cents,' but has an purely manual <formant> parameter.

4. Ultra Interval

This preset is similar to 'Ultra Cents,' in that it has an automatic <formant> parameter, but differs in that the shift amount is set as an *interval*. Note that the three Interval presets are non-diatonic and therefore will not keep an interval within a 'scale' - for example, shifting up a 'perf5' means that the output will always remain 700 cents above the input.

5. Ultra Interval 2

This is the same as 'Ultra Interval,' but has a manual <formant> parameter.

6. Ultra Interval 3

This version adds the <formant #> and <tune #> parameters, giving possible formant and tuning values for each possible interval choice over the entire range. These allow you to pre-select the perfect formant and tuning for each interval, enabling you to vary the interval on the fly and know that the color of each will sound as consistent as possible.

Presets

7. Ultra Diatonic

This preset has an automatic <formant> parameter. Being *diatonic*, it allows the chosen <interval> to remain in the selected scale and key. There is also a <temper> parameter, which allows you to select scales that are not *equal tempered*.

8. Ultra Diatonic 2

The same as 'Ultra Diatonic,' but with a manual-only <formant> parameter.

9. Ultra Diatonic 3

The same as 'Ultra Diatonic,' but this version adds the <formant #> and <tune #> parameters.

10. Ultra UserScales

This version has an automatic <formant> parameter. In an effort to keep these presets unencumbered with too many parameters, we split off these three 'user scale' presets for those who want to create their own custom scales. To define a scale you must use at least five or more notes where the first becomes the 'key'. They must be in ascending order within an octave range from lowest note to the highest. If there are less then five notes, or more than seven, the user scale will be ignored and a major scale interval pattern used. You have been warned !

11. Ultra UserScale 2

This is like 'Ultra UserScale,' with a manual <formant> parameter.

12. Ultra UserScale3

This version has the <formant #> parameters.

13. RoboticVoice

This preset requires a shift amount in *cents*. There is a manual <formant> parameter, with, in the addition, a <robotic> parameter. This new parameter reduces the possible range of inflection, giving a machine-like character to the output.

Ultrashifter preset parameters:

<shift> <interval>	this chooses the amount of shift, expressed in *cents* or as an *interval*, depending on the preset..
<mix>	The wet/dry signal mix.
<delay>	The amount of delay on the shifted signal including the built-in 50mS processing delay.
<dry>	The amount of delay added to the dry signal. Note that setting this higher than <delay> makes the shifted voice occur first, tricking the ear when you are adding harmonies.

Presets

<image>	The combined left/right panning of shifted and dry signal. 100%=shift left/dry right.
<formant>	A percentage value that will globally alter the formant or 'character' of the shifted signal.
<form #>	A percentage value that alters the formant for a specific interval chosen.
<tune>	In non diatonic 'Interval' presets, this is an global offset added to the <interval> parameter.
<value>	The final displayed value of <formant> and <form #>, <tune> and <tune#>, or the cent value of an <interval> selection.
source	
<low> <hi>	Optimises the shifter by selecting upper and lower (source) limits.
<input>	The type of source material. Default, Male Speaking, Male Singing, etc. This gives an automatic selection of <low> <hi> params.
<dampen>	Can be used to tune the vocal characteristics for troublesome material such as telephone or radio sources.
scale/calibration	
<range>	In a *diatonic* shifter, this is the amount below which no quantization or 'pulling' of the note occurs.
<speed>	How fast quantization responds in a diatonic shifter. Measured as mS per 100 cents.
<scale>	Selects the type of scale desired.
<key>	Selects the first or *tonic* note of the scale.
<temper>	Selects the type of tempering. Our normal western tuning is *equal-tempered*, where the octave is split into 12 equal steps of 100 cents each. This control allows other schemes to be selected.
<tune>	In *diatonic* presets, this chooses the pitch of A= measured in Hz (The normal modern standard is A-440).
<port>	*Portamento*, or how much time it takes to glide from one interval to another, measured as mS per 100 cents. The greater the change, the longer it takes to get there.
<quantize(notes) on-off>	In the 'AutoCorrect' preset, this parameter allows you to choose whether or not you want to quantize (correct) for each of the 12 notes,

<userscales>	In the 'UserScale' presets, this is where you create your scale.

96 Midiclock Presets

1. Midiclock Test

This is a simple program to illustrate the use of the MIDICLOCK module described on page 14.

2. Midiclock Delays 2640

These *bpm* style delays have stereo input and output. Midiclock sets the *bpm*, and you select a note value for each delay as a rhythmic value (whole note ~ 1/32 note) which is then also displayed as a time in mS. Global <level>, <feedback> and <image> parameters make control easy, while the <glide> parameter lets you set the glide speed so that tempo changes can be glitch free.

3. MidiClock FM Panner

This stereo panner is extremely easy to use and very colorful. 'FM' refers to frequency modulation, which is where one *lfo* (low frequency oscillator) modulates the frequency of a second *lfo*. To tune it, you select a <value> for the panning (which is then also displayed as a frequency value in Hz), an <fm depth> parameter selecting the amount of secondary modulation and lastly the <mod> or frequency of the secondary modulation, also as a rhythmic value. It is a great way to spice up foreground or background tracks.

4. MidiClockTremPong

This one combines a tremolo effect (selected as a rhythmic value) with a simple but powerful delay scheme. The delay consists of a predelay feeding the ping-pong, which has a clean feedback path outputs through a pair of ring modulators. You choose the delay time as a rhythmic value and the pre<delay> and <pong> times are displayed as time values in mS. Because of the structure, the first delay heard is twice the time of the subsequent 'pongs'. The <ring> and <ringmix> params are set up for a natural chorus or beating effect to color the delays. The result is very easy to use, and a powerful combination effect.

97 Dither Presets

1. Dither Test

This simple program allows you to dither its output to 16,18 or 20 bits. Either rectangular or triangular dither may be selected. Preset designers may want to include this program’s functionality as part of a larger preset, especially for mastering purposes.

C_FTOP **GROUP: CONTROL MATH**

Frequency to pitch converter **ftp**

This module converts its input signal from frequency (Hz) to pitch (cents). An input of 440.0 (Hz) produces an output of 5700.0 (cents), because A-440 is 7 semitones (700 cents) above C5 in the octave below.

signal	min	max	description
Control inputs			
in	16	32767	Numeric frequency input to be converted.
Control outputs			
out			The corresponding pitch cent value of the numeric frequency input.

Order

C_FTOP, modulename, in

C_GRAPH **GROUP: CONTROL MATH**

Graphical control input array editor ***gph v2.2***

This module allows you to edit an arbitrary number of points (up to 32) on a display graph control. It also provides an offset control input to add/subtract a value from all numbers before results are output. The screen width of the control is also variable. Displayed label (x-values) can be specified on control inputs created for each point.

signal	min	max	description
Specifiers			
screen width	2	4	Screen width of control in quarters. (2=half screen, 4=full)
8 char name	{string}		Control name; appears in first line of graph display
arrow text	{string}		Text to be displayed between point x and y. The '^' character will cause a down-arrow to be displayed in its place.
format labels	{string}		These are formatting strings for the x and y values displayed. The standard
format points	{string}		"%.0f" style formatting applies.
number points	1	32	Number of control inputs (and outputs) = points on the graph.
point min	-32768	32767	Min & max values for editing & outputting points.
point max	-32768	32767	
point res	0	1	Point resolution. (in .001 increments)
point 1..N	point min	point max	The default y-values for the points.
Control Inputs			
offset			Value added to points before being displayed & outputted. The internal value of the point does not change.
label1..N	-32768	32768	Label (x-value) to be displayed by the format labels string when that point is being edited.
Control Outputs			
out1..N			(internal y-value N + offset) bound by point min & max.
User Object			
obj			Actual displayed graph control

Order

C_GRAPH, modulename, screen width, 8 char name, arrow text, format labels, format points, number points, point min, point max, point res, point1…point N, offset, label 1…label N

Modules

C_LIN2DB **GROUP: CONTROL MATH**

Linear to dB conversion **ldb** **v2.3**

This module converts a linear valued control signal to its corresponding dB value. It is intended to replace the resource-intensive log module for low bandwidth applications, such as on-screen display. An input of 1.0 gives 0 (dB) out.

	signal	min	max	description
Control inputs				
	linvalue	0.0001	32768	Linear input value.
Control outputs				
	dbvalue	-90	90	dB output value.

Order

C_LIN2DB, modulename, linvalue

Demonstration Sigfile:

```
HEAD "adc" adc-null adc-null "C_LIN2DB test" "Empty" 1 menupage-obj
KNOB "knob" "in: %4.2f" "in" 0.0001 32767 10 1
C_LIN2DB "c_lin2db" knob-out
MONITOR "monitor" c_lin2db-dbvalue "out %4.2f" "out"
MENUPAGE "menupage" "display" "display" 2 knob-obj monitor-obj
    TAIL "njr"
```

C_MANY **GROUP: CONTROL MATH**

This module takes one control input and produced a number of outputs, each being a scaled representation of the input. The relationship between the input and each output is:

outputn = inputn * multn + offsetn

This module may be used in place of c_master. Either of these modules is useful when a single knob is used to control a number of differing parameters.

	signal	min	max	description
Specifiers:				
	noutputs	1	32	the number of control outputs
	inmin	-32767	+32767	the minimum value for the input
	inmax	-32767	+32767	the maximum value for the input
Control Inputs:				
	in	-32767	+32767	master control input
	mult 1..n	-32767	+32767	multiplier for output 1..n
	offset 1..n	-32767	+32767	offset for output 1..n
Control Outputs:				
	output 1..n	-32767	+32767	slave control outputs
Userobjects				
	obj			A userobject to display the in and out values, suitable for placing on a menupage.

Order

C_MANY modulename noutputs inmin inmax in mult1..multn offset1..offsetn

Resource Usage

low, unless very many outputs.

C_MASTER — GROUP: CONTROL MATH

Master control math scaling module **mst** **v2.2**

This module allows a single knob to generate a number of linked outputs, each one of which has a different relationship to the input. The aim of this module is to allow a single knob or input to control many different parameters in a controllable way.

The variable number of outputs are scaled numbers, between outStartN and outStopN (inclusive) based on the input's position between inStart and inStop (inclusive). OffsetN is added to the result, which is then forced between the boundaries of outStartN and outStopN for outputN. Thus as the input traverses its full range (between inStart and inStop) each output will traverse its full range (between outStartN and outStopN) with an optional OffsetN.

As an example, if the input is at instart, the value of output3 will be outstart3 + offset3. If this value is lower than outstart3 it will be set to outstart3, similarily if is is higher than outstop3 it will be set to outstop3.

signal	min	max	description
Specifier			
•noutputs	1	32	Specifies how many units are to be created.
•instart	-32768	32767	start of input value range.
•instop	-32768	32767	end of input value range.
Control inputs			
•input	-32768	32767	master input to be scaled and fed to outputs.
•outstart1..N	-32768	32767	start of output value range.
•outstop1..N	-32768	32767	end of output value range.
•offset1..N	-32768	32767	Offset values to be added after scaling but before bounds checking.
Control outputs			
•output1..N	-32768	32767	scaled outputs.

Order

C_MASTER, modulename, number outputs, instart, instop, in, outstart1..outstartN, outstop1..outstopN, offset1..offset1N.

The following is a sigfile which demonstrates the functioning of this module:

```
HEAD "adc" adc-null adc-null "C_MASTER demo" " " 1 menupage-obj
KNOB "input" "in: %3.0f" "in" -100 100 1 0
KNOB "outstart" "start: %3.0f" "instart" -100 100 1 0
KNOB "outstop" "stop:  %3.0f" "outstop" -100 100 1 50
KNOB "offset" "off: %3.0f" "offset" -100 100 1 0
C_MASTER "c_master" 1 0 50 input-out outstart-out outstop-out offset-out
MONITOR "output" c_master-output1 "out: %3.1f" "out"
MENUPAGE "menupage" "" "" 5 input-obj outstart-obj outstop-obj offset-obj output-obj
TAIL "njr"
```

C_PTOF — GROUP: CONTROL MATH

Pitch to frequency converter **ptf** **v2.2**

This module converts its input signal from pitch (cents) to frequency (Hz). An input of 5700.0 (cents) produces an output of 440.0 (Hz), because A-440 is 7 semitones (700 cents) above C5 in the octave below. This module is the converse of c_ftop.

signal	min	max	description
Control inputs			
in	0	13162	Incoming numeric pitch.
Control outputs			
out			The corresponding frequency Hz value of the incoming numeric pitch

Order

C_PTOF, modulename, in

Modules

C_RANDOM — GROUP: CONTROL MATH

Random number generator rnd v2.2

This module produces a specified number of random numbers. The numbers on each output are unique and range from 0 to the maximum number specified. A reset input is provided to allow the sequence to be restarted from the beginning.

signal	min	max	description
Specifier			
noutputs	1	32	Specifies how many outputs are to be created.
min number	-32768	32767	Lowest random number generated.
max number	-32768	32767	Highest random number generated.
Control inputs			
reset	-32768	32767	When this number changes from 0 to 1, the random sequence is restarted from the beginning.
delay	0	32767	Control cycles between random numbers generated. 0 means no delay, 32767 is max delay (a really long time between generated numbers.)
Control outputs			
rand1..N			A random number between min number and max number, inclusive.

Order

C_RANDOM, modulename, number outputs, min number, max number, reset, delay, rand1, rand2 … randN

C_RELAY — GROUP: CONTROL PROCESS

Rear panel control access rly v2.3

This module will allow direct control of the rear panel relays, as well as direct output of the status of the rear panel SW (jack) input.

signal	min	max	description
Control Inputs:			
relay1	0	1	will make the tip relay when 1.0
relay2	0	1	will make the ringrelay when 1.0
Control Outputs:			
tip	0	1	the status of the tip SW input.
ring	0	1	the status of the ringSW input.
Userobjects			
obj			A userobject to display the in and out values, suitable for placing on a menupage.

Order

C_RELAY, modulename, relay1,relay2

Resource Usage

low

C_TIMER — GROUP: CONTROL PROCESS

Real time clock/timer tim v2.2

This module will produce an output in seconds showing how long the RUN input was 1.0. If RESET goes from below 1.0 to 1.0 the output will be set to zero. It will be found useful for timing external events with reasonable accuracy, such as tap-tempo controls.

signal	min	max	description
Control Inputs:			
run	0	1	count when equal to or above 1.0
reset	0	1	set count to zero on +ve edge
Control Outputs:			
Out	0	32767	The count in seconds

Order

C_TIMER modulename run reset.

Resource Usage

Low

Example Sigfile:

```
HEAD "adc" adc-null adc-null "Stopwatch" "" 3 texttrigger-obj reset-obj monitor-obj
TEXTTRIGGER "texttrigger" 2 c_flop-out "run" "stop"
C_FLOP "c_flop" 0 0 texttrigger-out
TRIGGER "reset" "reset" "reset"
C_TIMER "c_timer" c_flop-out reset-out
MONITOR "monitor" c_timer-out "Time: %4.2f secs" "time"
TAIL "njr"
```

COMPRESSOR **GROUP: DYNAMIC**

Soft Knee Compressor **cpr**

This a dynamic range compressor with separate inputs for the signal whose gain is to be processed and for the the detection (sidechain) input. It features a 'soft knee', giving a smooth translation or gain around the threshold point.

signal	min	max	description
Specifiers:			
none			
Audio Inputs:			
In	-1	1	The audio input to be compressed.
Sidechain	-1	1	The audio input whose level is measured and is used to alter the dynamics of the "in" audio input.
Audio Outputs:			
out	-1	1	The output of the compressor.
Mod outputs:			
lingain	-1	1	The gain applied to the signal. Includes additional gain set by control.
loggain	-1	1	The gain in logarithmic terms. Does include the additional gain.
Control Inputs:			
threshcntl	-100	0 dB	The threshold at gain reduction begins taking place. For sidechain below this threshold, the gain of the input is not affected.
kneecntl	0	24 dB	The width (in dB.) of the soft knee. The soft knee is a region, above the threshold, over which the ratio transitions from 1:1 to the selected ratio.
ratiocntl	1	100	The amount of gain reduction that occurs the sidechain input has gone above the threshold. The value entered selects how many dB of gain reduction occur for every dB the sidechain input is above the threshold.
gaincntl	0	24 dB	This control allows gain to be added to the output signal to make up for the gain lost by gain reduction.
attackcntl	0	10.0 secs.	This control determines how fast the compressor will respond to increasing level at the sidechain input.
decaycntl	0	10.0 secs	This control determines how fast the will respond to decreasing level at the sidechain input.

Order:

COMPARATOR modulename in sidechain threshcntl kneecntl ratiocntl gaincntl attackcntl decaycntl

Modules

DITHER — GROUP: MATH

Dithering/Requantization **dit** **v2.3**

This module is intended to reduce the word length of an audio signal, with minimum reduction in quality.
The requested dither signal is added to each of the stereo input channels, and the samples are then re-quantized to the desired resolution (word length).

signal	min	max	description
Audio inputs			
leftin			Left input Audio stream to be dithered.
rightin			Right input Audio stream to be dithered.
Audio outputs			
leftout			Left dithered Audio stream.
rightout			Right dithered Audio stream.
Control inputs			
wrdlen	0	3	The new resolution to quantize the audio to. 0 – 16 bits 1 – 18 bits 2 – 20 bits 3 - 24 bits (Off)

Choosing 24 bits doesn't affect the input audio stream and therefore it appears as if the module is turned off, even though the processing still takes place, using the same amount of DSP resources.

dither	0	1	Controls the distribution of the dither noise. The user can choose between rectangular (uniform) or triangular distribution. Triangular distribution being more common, it is set as default. Rectangular noise distribution can be used for audio streams that have already been processed with a rectangular dither noise. 0 – Rectangular dither 1 – Triangular dither
Userobjects			
obj			All of the parameters arranged in a menupage.

Order

DITHER, modulename, leftin, rightin, wrdlen, dither.

Demonstration Sigfile:

```
HEAD "adc" dither-leftout dither-rightout "Dither Test" "" 1 dither-obj
DITHER "dither" adc-left adc-right 0 0
TAIL "njr"
```

GATE2 — GROUP: DYNAMIC

Audio Noise Gate with sidechain input. **gat**

This module implements a noise gate function with a separate sidechain input, allowing the dynamics of one signal to control another. This feature will typically be used to remove background noise resulting from processing, with the sidechain input connected before the process, and the signal input being the processed signal.
If the sidechain input is below a specified threshold it will silence (gate) the output. Adjustable attack and release times control how fast the gate will turn on or off. Suitable use of these makes the gating function much less audible.

signal	min	max	description
Audio Inputs:			
In			The audio input to be gated.
Sidechain			The audio input whose level is measured and is used to alter the dynamics of the "in" audio input.
Audio Outputs:			
Out			The noise gated output.
Gain			The gain envelope used to gate the audio. This can be used to control other noise gates.

Control Inputs:

Thresh	-100	0 dB	Controls the threshold at which the gating takes place. When the input is above the threshold, the gate is turned on, allowing audio to pass. When the input is below the threshold, the gate is turned off.
Decay	0.0	10.0 secs	Controls how fast the gate transitions from the “on" state to the "off" state.
Attack	0.0	10.0 secs	Controls how fast the gate transitions from the “off" state to the "on" state.
Hysteresis	0	20 dB	Controls how much the input must drop below the trigger level before the gate can be turned on. This is used to prevent spurious triggering of the gate function.
Speed	0.001	10.0 secs	Controls the trigger sensitivity. This sets the decay rate of a peak detector used in the gate. Setting it to large values will be similar to a gate "hold" function.

Userobjects:

obj	Menupage of control inputs not connected to control signals.

Order:

GATE2 modulename in sidechain attack decay thresh hysteresis speed

---

ISWITCH **GROUP: MIXER**

Click-less input audio signal switch **isw** **v2.3**

This module selects one of N audio inputs to be passed to the output.

signal	**min**	**max**	**description**
Specifiers			
ninputs	2	1024	Specifies how many audio signals the switch will select from.
Audio inputs			
in1 in2 … inN			One input for each of the audio signals.
Audio outputs			
out			The audio signal from one and only one audio input as specified by select.
Control inputs			
select	0	ninputs-1	Controls which one of the audio inputs will be passed along to the output.
Userobjects			
obj			All of the parameters arranged in a menupage.

Order

ISWITCH, modulename, in1, in2 .. inN, select.

MIDICLOCK **GROUP: EXTERNAL**

MIDI realtime control **mck** **v2.3**

This module allows access to the following MIDI realtime functions: MIDI clock, MIDI start and MIDI stop. These allow a process to be controlled by, and synchronized to, an external MIDI sequencer or other controller.

signal	min	max	description
Control inputs			
time_in	0	10	A local time or delay setting. Will be modified according to the received MIDI clock value and sent to time_out.
start_in	0	1	a local start trigger input
stop_in	0	1	a local stop trigger input
clock_in	0	10	the value of the generated MIDI clock value (where implemented). An input of 1.0 corresponds to 120 BPM.
remote_mode	0	2	Enables/disables either the local or MIDI controls: 0: both local and MIDI effective 1: local only 2: MIDI only
Control outputs			
time_out	0	10	The value of time_in, corrected according to MIDI clocks received. At 120 BPM, time_out will equal time_in.
start_out	0	1	a start trigger output, being the combination of start_in and MIDI start.
stop_out	0	1	a stop trigger output, being the combination of stop_in and MIDI stop.
bpm_out	30	240	The BPM value currently being recieved.
Userobjects			
obj			The remote_mode parameter in a form that can be plced on a menupage..

Order

MIDICLOCK, modulename, time_in, start_in, stop_in, clock_in, remote_mode

Example sigfile

```
HEAD "adc" adc-null adc-null "Midiclock test" "" 2 menupage-obj info-obj
KNOB "knob" "time:  %2.2f" "time" 0 10 0.1 1
KNOB "knob1" "start: %1.0f" "start" 0 1 1 0
KNOB "knob2" "stop:  %1.0f" "stop" 0 1 1 0
MIDICLOCK "midiclock" knob-out knob1-out knob2-out 1 0
MONITOR "monitor1" midiclock-bpm_out "BPM:   %3.0f" "BPM"
HMONITOR "hmonitor" midiclock-start_out 0 1 "start" "start"
HMONITOR "hmonitor1" midiclock-stop_out 0 1 "stop" "stop"
MONITOR "monitor" midiclock-time_out "time:  %2.2f" "time"
MENUPAGE "menupage" "Operate" "Operate" 8 knob-obj knob1-obj knob2-obj midiclock-obj monitor-obj hmonitor-obj hmonitor1-obj monitor1-obj
TEXTBLOCK "info" 3 "This is a simple program to illustrate " "the use of the MIDICLOCK module." "Nothing in, nothing out"
TAIL "njr"
```

Modules

MULTIKNOB — GROUP: INTERFACE

Multiple value knob **mkb** **v2.3** **Interface**

This module is a knob storing a variable number of preset values, the active one being chosen by a control input. It may be useful as:
(1) a user changeable "lookup table"
(2) to allow a preset to offer a number of built-in "tweaks", typically driven by a textknob, giving the name of the tweak.
The appearance of the knob is determined by a specifier.

signal	min	max	description
Specifiers:			
numtweaks	1	50	the number of stored values
min	-32767	+32767	the minimum value for the output
max	-32767	+32767	the maximum value for the output
resolution	-32767	+32767	the change for each click of the wheel
type	0	3	the appearance of the knob 0 : normal 1 : vfader 2 : hfader 3 : round
val1..n	minimum	maximum	the stored values
Control Inputs:			
tweaknum	0	numtweaks-1	the desired stored value (tweak).
Control Outputs:			
out	-32767	+32767	
Userobjects			
obj			The remote_mode parameter in a form that can be plced on a menupage

Order

MULTIKNOB operator_name menu_statement 8_char_name minimum maximum resolution type num_tweaks tweaknum val1..valn

Resource Usage

low, unless many tweaks.

OSWITCH — GROUP: MIXER

Click-less output audio signal switch **isw** **v2.3**

This module sends a single input to any one of N outputs.

signal	min	max	description
Specifiers			
noutputs	2	1024	Specifies how many audio signals to select as output.
Audio inputs			
in			The audio input signal to be switched.
Audio outputs			
out1,2 .. outN			The audio signals the input can be switched to.
Control inputs			
select	0	noutputs-1	Controls which output the input audio will be switched to.
Userobjects			
obj			All of the parameters arranged in a menupage.

Order

OSWITCH, modulename, in, select

Modules

PEAK **GROUP: DETECTOR**

Peak Detector **pkd**

The peak detect module is an adjustable rectifier of audio data. It is typically used to get an indication of the level of an audio signal. This can then be used as a modulation source to create effects that vary with input level.
This module offers improved performance over the existing peakdetect module, and is thus recommended for new designs.

signal	min	max	description
Specifiers:			
none			
Audio Inputs:			
in	-1	1	The input to the peak detector.
Audio Outputs:			
out	0	1	The output of the peak detector.
Control Inputs:			
attackcntl	0	100 secs	This controls the speed at which the output of the peak detector responds to increasing signal level. This is usually set to a very small value.
decaycntl	0	100 secs	This adjust the speed at which the peak detector responds to decreases in signal level. This is usually set to a larger value, depending on the application.
Control Outputs:			
none			
User Objects:			
obj			All of the parameters arranged in a menupage.

Order

PEAK modulename in attackcntl decaycntl

PICODELAY **GROUP: DELAY**

Fine grain delay **pdl** **v2.3**

This delay module allows sample accurate small delay adjustment. The main purpose is to resynchronize two audio streams that have different group delays due to different path lengths or filtering.

signal	min	max	description
Specifiers			
maxdelay	0	2048	Maximum delay in samples.
Audio inputs			
in			Input audio stream to be delayed.
Audio outputs			
out			Delayed audio stream.
Control inputs			
delayamt	0	maxdelay	Controls the amount the audio should be delayed. Units are in samples.
Userobjects			
obj			All of the parameters arranged in a menupage.

Order

PICODELAY modulename in delayamt

Resource Usage

low

SCALES **GROUP: MISCELLANEOUS**

scl

This module implements an advanced version of diatonic pitch shifting and pitch correction. It will determine the pitch shift required to stay in key given a desired interval and will also determine the shift needed to correct an out of tune note. It does this by using the given pitch to determine what note of the current scale is being played. It will then use this information along with the selected scale, interval tuning, etc., to figure out how much pitch shift to apply.

This module is part of the diatonic processing for the UltraShifter(tm). It performs processing which is used by the *ultrashifter* module and as such is unlikely to be useful by itself.

signal	min	max	description
Specifiers:			
steps	12	12	The number of notes in the scale. It should be 12.
Control Inputs:			
scale	0	18	This control selects the scale, or mode, the user will be in. The scales are as follows:

0 - User	6 - Whole-tone	12 - Lydian
1 - Major	7 - Pentatonic Major	13 - Mixolydian
2 - Minor	8 - Pentatonic Minor	14 - Aeolian
3 - Harmonic Minor	9 - Ionian	16 - Enigmatic
4 - Melodic Minor	10 - Dorian	17 - Neapolitan
5 - Chromatic	11 - Phrygian	18 - Hungarian

key 0 16 This specifies the key the user will be playing in. The values are as follows:

0 - C	6 - E	12 - A_b
1 - $C^{\#}$	7 - F	13 - A
2 - D_b	8 - $F^{\#}$	14 - $A^{\#}$
3 - D	9 - G_b	15 - B_b
4 - $D^{\#}$	10 - G	16 - B
5 - E_b	11 - $G^{\#}$	

interval -14 14 Controls the interval of the desired pitch shift. If the interval specified does not exist in the current scale then the largest existing interval in the scale will be used in its place The values are as follows:

14 - 2 octaves up	2 - 3rd	-4 - 5th down
7 - octave up	1 - 2nd up	-5 - 6th down
6 - 7th	0 - unison	-6 - 7th down
5 - 6th	-1 - 2nd down	-7 - octave down .....
4 - 5th	-2 - 3rd down	-14 - 2 octaves down
3 - 4th	-3 - 4th down	

hystersis 0 50 cents Controls how much the pitch may move outside the range of the current note before the current note is changed to reflect that pitch. *Hystersis* can prevent the oscillating between adjacent notes that can occur when the pitch is in between two notes. Notes are typically 100 to 200 cents apart so 50 cents of *hystersis* would allow the pitch to wander a lot before a higher or lower note was recognized.

correctrate 0 2000 mS Controls how rapidly the pitch is corrected to bring it into tune. The numeric value gives the time for the pitch to change 100 cents. Actual pitch correction values will be much less than 100 cents and hence will be performed more rapidly.

mincorrect 0 50 cents Controls the smallest error in pitch that will be corrected - if the pitch deviates from a true note by less than this amount, no correction will be made. This value may be used to let vibrato through or to enable correction only on notes that are badly out of tune.

intervalglide	1	2000 mS	Controls how rapidly the pitch is changed to bring it into key. The numeric value is the time taken for the pitch to change 100 cents.
tuning	0	4.	Selects the tuning system used. The values are as follows: 0 - Equal Temperament 1 - Just Major 2 - Just Minor 3 - Pythagorean 4 - Meantone
tune	392	494 Hz	Allows the pitch reference to be set to a value other than the usual 440 Hz.
quantize$_{1..n}$	On	Off	Controls whether or not an individual note is quantized (corrected.) Each note of the scale may be set to on or off, allowing pitch correction to operate only on desired notes.
userscale $_{1..n}$			This control selects the notes of a custom scale. The notes must be in ascending order and can only cover an octave in range from the lowest note to the highest note with no gaps. The scale must have a least five notes. If the scale does not follow these rules it will be ignored and a major scale used instead. If the scale has seven or less notes then the intervals will be derived from the scale. If it has more than seven notes a default major scale interval pattern will be used.

Control Outputs:

freq	The current frequency in Hertz.
period	The current period in milliseconds.
pitch	The current pitch given in cents relative to middle C.
pitcherror	The instantaneous pitch error in cents. This is the amount the input pitch is currently out of tune.
correction	The amount of pitch correction. This value will generally not be the same as the negative of *pitcherror*. This is because the correction is never made instantaneously, as that would crush all the inflection, resulting in a robotic sound.
intervalshift	The amount in cents of the current interval shift.
totalshift	The total pitch shift i.e. correction and interval.
spentry	A special output used in by the *ultrashifter* module to support diatonic pitch shifting.

User Objects:

obj	The main menupage.
quantize	The quantize menupage.
userscales	The userscales menupage.

Order:

SCALES modulename steps scale key interval hystersis correctrate mincorrect intervalglide tuning tune quantize$_1$..quantize$_n$ userscale$_1$..userscale$_n$

Modules

SOURCEANALYZER **GROUP: MISCELLANEOUS**

Source Analyzer **src**

This module is the "front-end" for the Ultrashifter(tm). It performs processing which is used by the *ultrashifter* module and as such is unlikely to be useful by itself. A built-in pitch detector's results are made available through various control outputs.

This module is very complex and is intended for experts only. The less experienced user may be well advised to tweak the existing presets, rather than trying to build new ones. Note that the Orville and 4000 versions are NOT compatible - a 4000 Ultrashifter(tm) program will NOT run on an Orville.

signal	min	max	description
Audio Inputs:			
in			The audio input signal to be analyzed.
Audio Outputs: (4000 only)			
prtsA, prtsB, envA, envB, sout			Special signals for the ultra module.
Audio Outputs: (Orville only)			
prts			Special signals for the ultra module.
Control Inputs:			
minpitch	50	150 Hz	Controls the lowest pitch that the pitch detector will accept as valid. This control can be used to improve pitch detection on troublesome source material.
maxpitch	150	1000 Hz	Controls the highest pitch that the pitch detector will accept as valid. This control can be used to improve pitch detection on troublesome source material.
gatelevel	-100	0 dB	Controls the level below which no pitch detection will occur. If this is set too high the input pitch will not be tracked and problems will occur.
speed	0	300	Controls how rapidly changes in the source material are reacted to.
poles	10	36	Controls how closely the spectral properties of the signal are followed. Set to 20.
maxp,spentry,special,adjust1,adjust2			Set to 0
Control Inputs: (4000 only)			
uprc			Special signal from the ultra module
pdamode	0	10	Selects the pitch detection mode. 0 - Normal. 10 - Unused.
Control Outputs:			
pitch			The output of the pitch detector given in cents relative to middle C.
period			The output of the pitch detector given as a period. The value is in milliseconds.
freq			The output of the pitch detector given as a frequency in Hertz.
User Objects:			
obj			This module may be treated as a menupage. If this module pointed to by head or by a menupage then if any of this module's control inputs are unconnected (left as *autoknob) they will be shown as knobs on a menu under PARAMETER. That menu will be titled "modulename parms".

Order (4000 only)

SOURCEANALYZER modulename in pdamode minpitch maxpitch gatelevel speed uprc maxp poles spentry special adjust1 adjust2

Order (Orville only)

SOURCEANALYZER modulename in minpitch maxpitch gatelevel speed maxp poles spentry special adjust1 adjust2

Modules

TEXTTRIGGER — GROUP: INTERFACE

Control trigger with variable name **ttg** **v2.3**

This module is similar to trigger, putting a button on the screen or the soft keys, with the difference that its name may be selected by means of a control input.

signal	min	max	description
Specifier			
nstrings	1	10	the number of different names the trigger may have.
text1	8 chars/text		name when *textnum* = 0
text2	8 chars/text		name when *textnum* = 1
....			
textn	8 chars/text		name when *textnum* = *nstrings-1*
Control inputs			
textnum	0	*nstrings-1*	sets the name of the trigger, by selecting from the $text_n$ strings.
Userobjects			
obj			The *userobject* for the trigger to be placed on a menupage or the *head userobj* inputs.

Order

TEXTTRIGGER, modulename, nstrings, textnum, text1, text2,..textn

TMENUPAGE — GROUP: INTERFACE

Menupage with variable name **tmn** **v2.3**

This module is similar to menupage, creating an on-screen menu page, with the difference that the name on its soft key may be selected by means of a control input.

signal	min	max	description
Specifier			
nstrings	1	10	the number of different names the menupage may have.
text1	8 chars/text		name when *textnum* = 0
text2	8 chars/text		name when *textnum* = 1
....			
textn	8 chars/text		name when *textnum* = *nstrings* - 1
description	19 chars/text		This is the text that will show up in the upper right of the PARAMETER screen when this menupage is selected
8charname	8 chars/text		not currently used
entries	0	32	number of *userobject* inputs
Control inputs			
textnum	0	*nstrings-1*	sets the name of the menupage, by selecting from the $text_n$ strings.
Userobject Inputs			
object1..n			may be a knob, other menupage, trigger, etc.
Userobjects			
obj			The *userobject* for the menupage to be placed on another menupage or the *head* userobj inputs.

Order

TMENUPAGE, modulename, nstrings, textnum, description,8charname entries, object1, object2,….objectn, text1, text2,..textn

Example sigfile (also covers TEXTTRIGGER)

```
HEAD "adc" adc-null adc-null "TEXTTRIG example" "" 3 tmenupage-obj texttrigger-obj info-obj
TEXTTRIGGER "texttrigger" 3 knob-out "trig1" "trig2" "trig3"
TMENUPAGE "tmenupage" 3 knob1-out "" "" 3 knob-obj knob1-obj texttrigger-obj "menu1" "menu2" "menu3"
TEXTBLOCK "info" 3 "A simple program to demonstrate the use" " of the TEXTTRIG and TMENUPAGE modules" "Nothing in, nothing out."
KNOB "knob" "trig: %2.0f" "trig" 1 10 1 2
KNOB "knob1" "menu: %2.0f" "menu" 1 10 1 2
TAIL "njr"
```

Modules

ULTRASHIFTER **GROUP: PITCHSHIFT**

Formant Correct Pitch Shifter **ush**

This module can pitch shift a vocal two octaves up or one octave down while maintaining a natural vocal quality. It can also alter the overall formant structure of a vocal signal independently of any pitch shift. Ultrashifter is optimized for vocal signals although it may be suitable for other monophonic source material.

Due to the extensive processing performed by this module, the input signal will be delayed a total of 50 milliseconds (a delayed dry signal is available for mixing in the 4000). By comparison, Eventide's other pitch shifters typically delay the signal 20-25mS.

This module must be connected to the *sourceanalyzer* module in order to function. The combination of these two modules will use ALL the available DSP power on a 4000 - no other signal handling modules can be added. However, a simple mixer is included for wet/dry mixing and panning.

The Orville version omits the mixer but has a number of other enhancements and thus the combination uses about 50% of an Orville DSP.

This module is very complex and is intended for experts only. The less experienced user may be well advised to tweak the existing presets, rather than trying to build new ones. Note that the Orville and 4000 versions are NOT compatible - a 4000 Ultrashifter(tm) program will NOT run on an Orville.

signal	min	max	description
Audio Inputs: (4000 only)			
prtsA,prtsB,envA,envB,sin			Special signals from the *sourceanalyzer* module.
dryin			The dry audio signal, used by built in mixer only.
Audio Inputs: (Orville only)			
prts			Special signals from the *sourceanalyzer* module.
Audio Outputs:(4000 only)			
left			The left output of the built in mixer.
right			The right output of the built in mixer.
Audio Outputs:(Orville only)			
out			The output signal.
Control Inputs:			
pitchshift	-2400	2400 cents	Controls the amount of pitch shift. This adjustment is in "cents"; a cent is a hundredth of a semitone. Positive values shift the pitch up, negative values shift it down.
formantshift	-2400	2400 cents	Controls the amount the overall formant structure is shifted (in *formantmode* 3 only, see below). This adjustment is in "cents"; a cent is a hundredth of a semitone. Positive values shift the formant up, negative values shift it down.
formantscale	-90	200 percent.	Controls the scaling of the overall formant structure (in *formantmode* 1 & 2 only, see below).
shiftmode	0	1	Selects how pitch shifting is to be performed. 0 - Regular. Less likely to glitch badly but average quality is lower. 1- High. Glitches are more noticeable, not good for polyphonic input.
formantmode	0	3	Selects how the formant structure is to be modified. 0 - Unmodified. No modifications made, operates more like a regular pitch shifter. Less artifacts generated. 1 - Linked. Modified according to the current pitch shift value to preserve naturalness, may be modified by *formantscale* control only. 2 - Unlinked1. Modified according to the *formantscale* control only. 3 - Unlinked2. Modified according to the *formantshift* control only, which is in cents.
spentry			This control is a special input used in conjunction with the scales module to support diatonic pitch shifting.
Control Inputs: (Orville only)			
delayamt	50	70 mS	Controls the amount of delay. Note that this value includes the processing delay and thus can't be less than 50.
Control Inputs: (4000 only)			
wetgain	-100	6 dB.	This controls the gain applied to the wet signal.

wetamp	0	1	Controls the attenuation applied to the wet signal.
wetpan	-1	1	Controls the left/right output balance of the wet signal.
wetdelayamt	50	70 mS	Controls the amount of wet delay. Note that this value includes the processing delay and thus can't be less than 50.
dryamp	0	1	Controls the attenuation applied to the dry signal.
drypan	-1	1	Controls the left/right output balance of the dry signal.
drydelayamt	50	100 mS	Controls the amount of dry delay.
gatelevel	-100	0	Not currently used.
special			Used to control special features.

User Objects:

obj — This module may be treated as a menupage. If this module pointed to by head or by a menupage then if any of this module's control inputs are unconnected (left as *autoknob) they will be shown as knobs on a menu under PARAMETER. That menu will be titled "<modulename> parms".

Order (4000 only)

ULTRASHIFTER prtsA prtsB envA envB sin dryin pitchshift formantshift formantscale shiftmode formantmode wetgain wetamp wetpan wetdelayamt dryamp drypan drydelayamt gatelevel spentry special adjust1 adjust2

Order (Orville only)

ULTRASHIFTER prts pitchshift formantshift formantscale shiftmode formantmode delayamt spentry special adjust1 adjust2