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Data sheet
102/34, /D9 Dynamics Processor with Remote Control
Description, Features

The /34 Dynamics Processor is a two channel dynamics processor with limiter, two compressors, expander and noise gate. Other features are: Attack time, Manual Release time, two Auto Release times, Release Delay time, Predelay to avoid overshoots etc., Auto or Manual Gain-makeup, Sidechain EQ, Sidechain Link, Averaging Time etc.

The module is controlled by the /D9 Remote Control. An alternative to the /D9 panel is the PENGUIN system which is described elsewhere.

There are two different /34 Dynamics Processor hardwares. The old hardware is DSPV3 based ("DSPV3" written on the frontpanel) and supports an external sidechain input and a metering connector to hook up a level meter.

The new hardware ("Dynamics Processor" written on the frontpanel) uses a later version of the DSP32 signal processor chip. (The main reason for making a new hardware was that the older versions of the DSP32 are no longer available). The new hardware does not support the external sidechain input and the metering connector anymore. Beside of this the old and the new hardware are equivalent, e.g. the audio quality is exactly the same on both versions.

Operation

Before plugging in the **/34 Dynamics Processor module**, the rotary switches and jumpers on the last PCB have to be set to the proper positions. There are different switches depending on the hardware used:

"DSPV3" based hardware:

There are two rotary switches on the rightmost board. One sets the meter address for the input signal monitoring, the other oene sets the meter address for the output signal monitoring. Refer to the Meter Remote Control description for their operation.

The jumper selects the device address of the /34, i.e. jumper installed: /34 is DYN#1, jumper not installed: /34 is DYN#2.

New "Dynamics Processor" hardware:

There is a rotary switch on the rightmost board. It controls the device address which allows the Remote Control to communicate with this module. Usually only one Dynamics Processor module is used within a system. Then this switch must be on position 0 (zero). If more than one /34 is going to be used in a system then each of them has to be set to a different device address, starting with 0, 1, 2 etc.

The **/D9 Master Remote Control** has two DIP switches on the bottom right corner of the base board which set the mode of operation of the /D9. One /D9 can control one or two /34. If more than two /34 are used in a system then more than one /D9 is required.

The two DIP switches on the /D9 are set as follows:

Single /D9, single /34: DIP1=on, DIP2=off

Single /D9, two /34: DIP1=off, DIP2=don't care
allows to switch the /D9 between DYN#1 and DYN#2

Two /D9, two /34: 1st /D9: DIP1=on, DIP2=off
2nd /D9: DIP1=on, DIP2=on
gives the convenience of two /D9 panels for two DYNs

Two /D9, four /34: Both /D9: DIP1=off, DIP2=don't care

The operation of the Remote Control is straightforward. Select the parameters to be changed with the appropriate switch so that the parameters show up in the LCD display and then turn the appropriate knob to change the parameter.

The **"2nd"** switch allows to call for a second bank of parameters if there are more than four parameters in a menu, e.g. the "sidechain" menu has a second set of parameters.

A description of all switches and parameters follows:

The **"DYN on"** switch is an on/bypass switch for the whole Dynamics Processor. In bypass the output is 23 bit clone of the input.

The **"DYN # 1/2"** switch selects which Dynamics Processor (/34) in the Main Frame is controlled, i.e. up to two /34 can be controlled from one /D9.

The **"CH# 1/2"** switch selects which of the two channels is going to be controlled and displayed. This control is locked to channel # 1 when the /D9 is switched to "ganged" (see below).

The **"reset"** switch resets the Dynamics Processor to the default values.

The **"ganged"** switch, when active, both channels 1 and 2 have the same settings and are controlled at once in parallel. when not active the two channels can be independently controlled.

The **"safe"** switch, when active locks all controls.

The **"help"** switch gives context sensitive help information. Press again to return back to normal operation.

The **"display"** switch toggles between the graphic display with the input/output transfer curve and a text form display with a listing of all parameters.

The remaining nine switches assign the four rotary encoders to the appropriate parameters. The parameters are explained below.

The two **LED bargraphs** on the left side indicate in which mode the Dynamics Processor is working. This, together with the gain reduction meter on the LCD display, gives a good indication of the process-ing applied to the music signal. The gain reduction meter shows the gain reduction applied to the audio signal. Moving upwards it is in limiting / compression, moving downwards it is in expansion / gate mode.

The **"gains"** switch assigns the following parameters to the rotary encoders (RE#1..RE#4):

Reference level: Assigned to RE#1. This is equivalent to a change in input level to the sidechain. With a higher reference level setting the device becomes more sensitive to the input signal. The graph on the LCD consequently moves left or right when the output gain is changed.

Output gain: Assigned to RE#3. The output level can be changed if the "auto gain make-up" feature is set to off (see below). The graph on the LCD consequently moves up or down when the output gain is changed.

Auto gain make-up on/off: Assigned to RE#4. One prime objective of dynamic signal processing is to obtain a higher output level. This requires an optimization of the output level setting after the program material is subjected to more and more limiting or compression. The output level usually shifts when thresholds are changed or compression ratios are increased. In the auto gain make-up ON position the /34 will always set the output to 0dBFS for a 0dBFS input. This is indicated on the display through the transfer curve which never drops below the upper right hand corner. The additional gain is indicated on the display in the "Output gain" field.

The **"limit"** switch assigns the following parameter to the rotary encoders (RE#1..RE#4):

Limiter Threshold: Assigned to RE#1. The limiting curve is indicated through a horizontal segment on the top of the transfer curve. The limiter curve will move down or up, depending on the threshold setting (if the auto gain make-up feature is off).

(Note: The threshold refers to the input signal level and is read along the bottom horizontal scale.)

A lower output level results when the curve moves downward. Use the automatic gain make-up feature or change the output gain manually (as described above) to achieve the maximum output level.

The **"compr. 1,2"** switch assigns the following parameters to the rotary encoders (RE#1..RE#4):

There are two compressors in the /34. either one can be used as a single compressor, or both can be adjusted to combine their parameters. This feature provides a very powerful tool. Since both compression curves combine smoothly the operator can build the best suited transfer characteristic for the program material to pass through the compressors.

Compressor #2 Threshold: Assigned to RE#1, similar to the limiter threshold.

Compressor #2 Ratio: Assigned to RE#2. Is the steepness of the compression curve.

Compressor #1 Threshold and **Compressor #1 Ratio:** Assigned to RE#3 and RE#4 respectively. Are the same as for compressor # 2.

The **"expand, gate"** switch assigns the following parameters to the rotary encoders (RE#1..RE#4):

Expander Threshold: Assigned to RE#1, similar to the limiter threshold.

Expander Ratio: Assigned to RE#2. Is the steepness of the expansion curve.

Gate on/off: Assigned to RE#3, allows to switch the noise gate on or off.

Gate Threshold: Assigned to RE#4, similar to the limiter threshold.

The **"times"** switch assigns the following parameters to the rotary encoders (RE#1..RE#4):

Attack Time: Assigned to RE#1. The longer the attack time, the more will the leading edge of fast transients pass by the gain reduction circuit unaltered. The user must select the optimum time according to the program material. Very fast settings such as 20µs, i.e. one sampling period, do catch every transient, but may distort low frequencies.

Release auto/manual: Assigned to RE#2. Switches between auto and manual release times.

In manual release the release action begins when the audio drops in amplitude. The time constant is adjustable with RE#3. The release is optimized when the minimum amount of pumping is heard between program passages.

In auto release a whole new set of features becomes available. The input signal is monitored with two different methods: peak amplitude and rms value. The peak amplitude is the program portion we don't perceive as very loud, however which can easily cause overloads. The rms value of the program material we perceive as loudness. Its variations contribute most to the dynamic range of the audio.

In the auto release mode the processor compares the two measurements it obtained from the peaks and the rms. The ratio between the two determines which time constant would be the appropriate release. After short duration peak the faster release will be applied, and if the rms value requires a longer release, it will be selected.

The time period over which the rms value of the program material is averaged is set by the "average time" parameter.

Concerning auto release also see the release delay parameter description below.

Release time manual: Assigned to RE#3, description see above

Release time auto fast: Assigned to RE#3, description see above

Release time auto slow: Assigned to RE#4, description see above

Average time: Assigned to RE#1 when "2nd" switch is selected, description see above.

The **"delays"** switch assigns the following parameters to the rotary encoders (RE#1..RE#4):

The Dynamics Processor provides two different sets of delays: 1. the Program delay and 2. the Release delay.

The Program delay: A typical compressor/limiter circuit measures the audio signal and then generates the gain reduction control signal. At the time the control signal changes the gain, the program material is already there, so the gain change occurs too late. This causes in most instances a portion of the program material to pass through the circuit uncorrected. The result is overshoot and possible subsequent distortion. The /34 uses a different method to generate the gain control signal. The audio is taken at the input and fed to the sidechain which generates the gain control signal. On the other hand, the audio passing through the mainchain is delayed. This assures that upon reaching the gain reduction circuit the gain control signal has the proper value. The resulting corrected output signal has no overshoots, no leading edge distortion or other side effects due to timing lags in the sidechain.

Manual/auto delay: Assigned to RE#1, when set to manual, the delay time can be set with RE#2. When set to auto the delay time is tied to the attack time. Explanation of the program delay time see above.

Delay Time: Assigned to RE#2, description see above.

Release Delay Time: Assigned to RE#3. Normally the release begins immediately after the program material has fallen in level. The release delay determines how long the /34 hesitates before it actually returns to linear gain setting, i.e. starts the release portion. This feature is very useful when the program material has occasional peaks which should not modulate the audio. Also when brief pauses occur in the audio during which the settings should not change. The resulting dynamic characteristic is very smooth and avoids otherwise typical 'pumping' effects. The ideal setting is greatly program dependent and experimentation may be necessary to achieve the best combination of all dynamic parameters. The release delay is active only when auto release mode is selected.

The **"sidechain"** switch assigns the following parameters to the rotary encoders (RE#1..RE#4):

Sidechain EQ on/off: Assigned to RE#1. The sidechain contains complete equalizer circuits, one for each channel. It superimposes its response to the audio program in the sidechain only. (The main audio is not changed). The resulting control signal has become frequency dependent and the gain control circuit will affect the audio more or less at those frequency bands. This allows e.g. to reduce the effect of 'ducking' often caused by large amplitude low frequency components in the audio.

Sidechain EQ boost/cut: Assigned to RE#2, description see above.

Sidechain EQ center frequency: Assigned to RE#3, description see above.

Sidechain EQ Q factor: Assigned to RE#4, description see above.

External / Internal sidechain: Assigned to RE#1 when "2nd" switch is selected. Choose "internal" for normal operation. "External" selects the input on the frontpanel of the /34, which can be fed by a 102/42 Split-up V2 module to have the sidechain controlled from a different audio source. This feature is only available on the "DSPV3"

type /34 Dynamics Processors. The "DSPV3" is shown on the frontpanel. Later /34 models (designated "Dynamics Processor" on the frontpanel) do not support the external sidechain input anymore.

Sidechain split/link: Assigned to RE#2 when "2nd" switch is selected. In split mode both channels of the processor act independently. It does not matter whether the channels are ganged or not. Each channel performs its separate gain control action on the audio signal.

In link mode the two channels are controlled by the same gain control signal. A typical application is stereo program material where the center image would shift with uneven control signals. With link mode activated the channel with the largest amount of gain change will take priority in the gain reduction circuit.

The **"special function"** switch assigns the following parameters to the rotary encoders (RE#1..RE#4):

Make channel #2 parameters equal to channel #1 parameters: Assigned to RE#1. Sometimes it is necessary to copy all parameters from CH#1 to CH#2. For example after working in ganged mode, CH#2 may need slightly different settings. Turn RE#1 until the word 'done' appears in the window. Now, with ganged off, both channels can be modified independently from a given starting point. (Note: In ganged mode CH#2 parameters only temporarily take over CH#1 parameters.)

Zoom Graphic auto on/off: Assigned to RE#2. This feature adapts the scale of the display to fit the presently selected working range with maximum resolution. Normally the level scale has a range from -90 to 0 dB. If the Zoom Graphic auto mode is on the scale will change to a range from -45 to 0 dB if all the thresholds of the various segments are higher than -45dB.

Technical Data of the /34 Dynamics Processor

Input Format: up to 24 bits internal format
Input Wordlength: up to 24 bits

Output Format: up to 24 bits internal format
Output Wordlength: up to 24 bits

Sampling Frequency: 44.1 kHz or 48.0 kHz
The Dynamics coefficients are switched depending on the sampling frequency to conserve the proper dynamic response.

Processing precision: 32 bit floating point

Frontpanel elements: - 3 LEDs for sampling frequency display (invalid / 44.1k / 48.0k)

In addition on the "DSPV3" based modules:
- 1 external sidechain input connector
- 1 meter connector

On board controls on the "DSPV3" based modules:
- 1 rotary switch to set the meter address for input level metering
- 1 rotary switch to set the meter address for output level metering
- 1 jumper for DYN#1 / DYN#2 selection: not installed: is DYN#1

Onboard controls on the new "DynamicProcessor" modules:
- 1 rotary switch to set the device address of this particular module

Power-up default: depends on remote control setting
Width of module: 60 mm (2 2/5 inch)

Technical Data of the /D9 Dynamics Processor Remote Control

For detailed information on the operation of the switches below refer to the "Operation" chapter.

Frontpanel elements:
Four rotary encoders (digital potentiometers) which control various parameters depending on their assignment.

A block of six blue switches for the following functions:

DYN on bypass switch for the whole DYN. Output is 24 bit clone of the input

DYN # 1/2 selects which DYN processor (/34) in the Main Frame is controlled, i.e. up to two /34 processors can be controlled from one remote control

CH# 1/2 selects which of the channels is going to be controlled and displayed, this control is locked to channel # 1 when the Remote Control is switched to "ganged" (see below)

reset resets the DYN to the default values

ganged if active, both channels 1 and 2 have the same settings and are controlled at once in parallel

safe when active all controls are locked

Other switches:

help to activate a context sensitive help screen

display to toggle between graphic and numeric display

sidechain to assign the rotary encoders to the sidechain parameters

2nd to select a second set of parameters of applicable

spec. funct. to assign the rotary encoders to the special functions parameters

expand/gate to assign the rotary encoders to the expand/gate parameters

compr. 1/2 to assign the rotary encoders to the compressor 1/2 parameters

limit to assign the rotary encoders to the limiter parameters

times to assign the rotary encoders to the times parameters

delays to assign the rotary encoders to the delays parameters

gains to assign the rotary encoders to the gains parameters

Parameter ranges:

gate: Threshold variable from -90 to -30 dB in 1 dB steps

Ratio 1:20 constant

The gate section can be switched off

expander Threshold variable from -90 to 0 dB in 1 dB steps
Ratios: 1:1, 1:1.25, 1:1.50, 1:1.75, 1:2.00, 1:2.50, 1:3.00, 1:5.00, 1:8.00, 1:12.0, 1:16.0

compressor 1 Threshold variable from -60 to 0 dB in 1 dB steps
Ratios: 1:1, 1.25:1, 1.50:1, 1.75:1, 2.00:1, 2.5:1, 3.00:1, 5.00:1, 8.00:1, 12.0:1, 16.0:1, 20.0:1

compressor 2 same characteristics as compressor 1

limiter Threshold variable from -30 to 0 dB in 1 dB steps

Ratio 1000:1 constant

attack time 20us, 40us, 60us, 80us, 100us, 300us, 500us, 800us, 1ms, 3ms, 5ms, 8ms, 10ms, 30ms, 50ms, 80ms, 100ms, 200ms, 300ms

release time 1ms, 3ms, 5ms, 8ms, 10ms, 30ms, 50ms, 80ms, 100ms, 300ms, 500ms, 800ms, 1s, 3s, 5s

Release time can be set manually or automatically depending on program peaks and mean level. Two different release times can be set for fast peaks and slow mean. The ranges of the fast/slow release times are the same as in the manual release.

averaging time same values as for release times

This value sets the averaging time constant in the RMS measurement, active only in release auto mode.

reference level variable from -30dB up to 0dB in 1dB steps

output gain variable from 0dB up to +60dB in 1dB steps
The output gain can be set manually or left to the automatic gain makeup feature.

signal delay 20us, 40us, 60us, 80us, 100us, 300us, 500us, 800us, 1ms, 3ms, 5ms
The signal delay can be set manually or automatically tied to the attack time.

release delay 3ms, 5ms, 8ms, 10ms, 30ms, 50ms, 80ms, 100ms, 300ms, 500ms
The release delay allows to delay the begin of the release, active only in release auto mode.

sidechain input can be switched external / internal.

The external position allows for inserting any signal processing in the sidechain input. This makes possible a number of special effects. (Available only on the "DSPV3" based hardware.)

A built in 2nd order equalizer with bell shaped characteristic can be inserted into the sidechain. Its characteristics are:
center frequencies: 0.1, 0.125, 0.16, 0.2, 0.25, 0.315, 0.4, 0.5, 0.63, 0.8, 1.0, 1.25, 1.6, 2.0, 2.5, 3.15, 4.0, 5.0, 6.3, 8.0, 10.0, 12.5, 16.0 kHz
boost/cut: -18 dB up to +18 dB in 1 dB steps
Q factor: 0.8, 2.5, 4.3

sidechain link switch for linking the two sidechains to treat both channels the same way.

Data sheet
102/68, 102/68DS, 102/D19 Bandpass Type De-Esser with Remote Control
Description, Features

The /68 De-Esser module is a two channel, two band De-Esser which is also switchable to Limiter mode. The module is controlled by the /D19 Remote Control. An alternative to the /D19 panel is the PENGUIN system which is described elsewhere.

Operation

No switches or jumpers have to be set on the /68 module. All functions are controlled from the /D19 Remote Control.

The /D19 Remote Control has two internal trimming potentiometers, one to set the display brigthness, the other to set the display contrast. There are also two internal DIP switches, which are not supported by the current software.

The controls on the frontpanel of the /D19 Remote Control are as follows:

- The switches to the right of the display are soft switches and select the parameter indicated on the display for changing
with the rotary encoder knob. Certain soft switches also allow to toggle through a set of parameters, thus avoiding the
need to turn the rotary encoder. E.g. the operating mode (Limiter or De-Esser) can be selected with the soft switch or
with the rotary encoder.

- The "reset" switch on top resets all parameters to a default setting.

- The "on" switch puts the De-Esser to bypass or to on.

- The "CH1/2" switch is not working with the current software, because the parameters can not be set independently in
each channel. The same applies to the "ganged" switch.

- The "safe" switch sets all frontpanel controls safe.

- Over LEDs are provided for the left and the right channel.

- The LCD serves as display for the "operating mode", "Threshold", "Attack Time", "Release Time", "Center Frequency" and
"Q-Factor" parameters. In addition the gain reduction is displayed as a bargraph.

Technical Data of the /68 Bandpass Type De-Esser

Input Format: up to 24 bits internal format

Input Wordlength: up to 24 bits

Output Format: up to 24 bits internal format

Output Wordlength: up to 24 bits

Sampling Frequency: 32 kHz....50 kHz **(64kHz....96kHz for the 102/68DS model)**

Processing precision: 32 bit floating point

Filter architecture: Phase linear FIR type, yielding an overall phase linear response

Frontpanel elements: none

On board controls: none

Power-up default: depends on remote control setting

Width of module: 30 mm (1 1/5 inch) **(60mm for the 102/68DS model)**

Technical Data of the /D19 De-Esser Remote Control

Frontpanel elements:

One rotary encoder (digital potentiometer) which controls the parameters selected by six soft switches adjacent to the LCD display.

LCD as display for the "operating mode", "Threshold", "Attack Time", "Release Time", "Center Frequency" and "Q-Factor" parameters. In addition the gain reduction is displayed as a bargraph.

Two LEDs for over indication.

Switches:

Six switches used as soft switches, i.e. function depends on software.

De-Esser on switch: as bypass switch for the whole De-Esser. Output is 24 bit clone of input.

reset: resets the De-Esser to the default values.

safe: when active all controls are locked.

CH# 1/2, ganged: not supported

Parameter ranges:

Threshold: 0 dBFS to -47dBFS in 1 dB steps

Attack Time: 20ms, 100ms, 300ms, 500ms, 1ms, 3ms, 5ms, 10ms, 30ms, 50ms, 100ms

Release Time: 5ms, 10ms, 30ms, 50ms, 100ms, 500ms, 1s, 2s, 5s

Center Frequency of De-Esser: 4kHz to 16kHz in 1kHz steps

Q-Factor: 0.25, 0.5, 0.75, 1.0, 1.25, 1.5

Gain reduction display: 0dB to 25dB in bargraph form

Data sheet
102/37 Limiter
Description, Features
<under construction>
The 102/37 limiter is a simple Limiter with Attack Time, ReleaseTime and Threshold controls on the frontpanel.