

Solid State Logic
S O U N D | | V I S I O N



Super-Analogue™ Outboard

X-Rack E Series Dynamics User's Guide

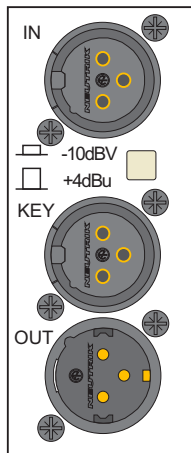
This documentation package contains the User's Guide for your new X-Rack Dynamics module. Depending on the age of your X-Rack, these pages may already be present in your X-Rack Owner's Manual – please check to see if these pages match your Manual. If they do not, these pages should be filed alongside it.

Please Note. For correct operation of this module, your X-Rack unit must be running V1.4/2 or later software. Please refer to your X-Rack Owners Manual for instructions on how to check the current software version and how to obtain and install a newer version if required.

There may be a newer version of the X-Rack Owner's Manual available for download from our website (www.solid-state-logic.com)

L. E Series Dynamics Module

L.1 Connection



The module input and output gains can be set to operate at a nominal level of either +4dBu or -10dBV, using a switch on the connector panel. Select the appropriate level for the equipment you are connecting to. If in doubt experiment!


To check the input and output gains, set the compressor Ratio and Threshold controls fully clockwise and send a signal close to the nominal operating level of your mixer or DAW to the dynamics module. The lower three LEDs of the compression meter should light if the input level matches the selected operating level. Release the switch for +4dBu operation: push it in for -10dBV operation.

L.2 Operation

The X-Rack E Series Dynamics module comprises a compressor/limiter and an expander/gate, the design of which returns faithfully to the circuit and key components which defined the sound of the original E Series channel strip. A true RMS converter is used in the side chain whilst the gain element is an all discrete design identical to the Class A VCA chip used in the original unit. The compressor contains additional switching options to defeat the over-easy curve and to use a linear release instead of the more usual logarithmic curve. The result is a compressor with three distinct voicings, all of which contributed to the many classic records tracked and mixed on early E Series consoles.

The IN button **1** switches the entire section in and out of circuit.

L.2.1 Compressor/Limiter Section **2**

RATIO – When turned to 1:1, the compressor/limiter section is inactive. Turning the control clockwise increases the compression ratio, giving a true limiter at the fully clockwise position. The compressor normally has an ‘over-easy’ characteristic. Pressing the  button switches this to peak sensing, and replaces the ‘over-easy’ characteristic with a hard knee’, providing an alternative for some instruments.

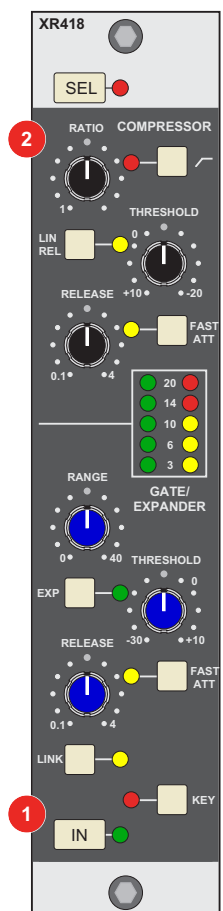
THRESHOLD – Whenever a signal exceeds the level set by this control, the compressor will start to act at the ratio set by the **RATIO** control. The **THRESHOLD** and **RATIO** controls also provide automatic make-up gain, so as you lower the threshold and introduce more compression, the output level is increased, maintaining a steady output level regardless of the amount of compression.

LIN REL – Changes the release curve from logarithmic to linear. This also raises the threshold by 6dB.

FST ATT – Provides a faster attack time (3mS for 20dB gain reduction). When off the attack time is slower and less aggressive (30mS for 20dB gain reduction).

RELEASE – Sets the time constant (speed) with which the compressor returns to normal gain settings once the signal has passed its maximum.

The vertical row of yellow and red LEDs, located centre right, indicate the amount of gain reduction (compression).



L.2.2 Gate/Expander Section **3**

This section can act as a ∞:1 Gate or as a 2:1 Expander when the **EXP** button is pressed.

RANGE – Determines the depth of gating or expansion. When turned fully anti-clockwise, this section is inactive. When turned fully clockwise, a gate depth or range of 40dB can be obtained.

THRESHOLD – Determines the level at which the gate opens or the level below which gain reduction begins (**EXP** selected), adjustable from +10dBu to -20dBu. Variable hysteresis is incorporated in the threshold circuitry which increases as the threshold is lowered. This is very useful in music recording as it allows instruments to decay below the open threshold before gating or expansion takes place.

FST ATK – Normally, a controlled linear attack time of 1.5ms per 40dB is provided. Press this button to select a fast attack time (100µs per 40dB). The attack time is the time taken for the Gate/Expander to 'recover' once the signal level is above the threshold. When gating signals with a steep rising edge, such as drums, a slow attack may effectively mask the initial 'THWACK', so you should be aware of this when selecting the appropriate attack time.

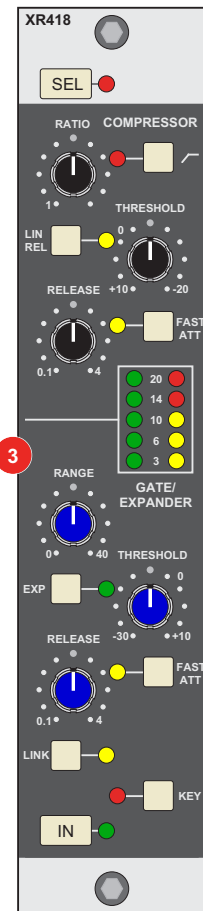
RELEASE – This determines the time constant (speed), variable from 0.1 to 4 seconds, at which the Gate/Expander reduces the signal level once it has passed below the threshold. Note that this control interacts with the **RANGE** control.

KEY – Switches the Dynamics side chain to the 'KEY' input on the rear panel of the unit.

LINK – The side chain control signals of multiple modules can be linked by pressing the **LINK** switch on those modules you wish to gang. When two (or more) Dynamics sections are linked, the control voltages of each section sum together, so that whichever section has the most gain reduction will control the other section.

Don't try to link two gates using the **LINK** button when you want the signal on one to open the other. If you need to achieve this effect, take a keying signal from one section to trigger the other. The easiest way to do this is by patching from the 'source' signal to the Key input of the 'destination' channel, and selecting **KEY** (see above) on this channel.

The vertical row of green LEDs, located towards the centre of the module, indicate Gate/Expander activity (the amount of gain reduction/increase).



L.3 Performance Specification

The following pages contain audio performance specification figures for the X-Rack Dynamics Module. No other Solid State Logic products are covered by this document and the performance of other Solid State Logic products can not be inferred from the data contained herein.

L.3.1 Measurement Conditions

For each set of figures on the following pages, the specific unit and test setup will be stated at the beginning of that section. Any changes to the specified setup for any particular figure(s) will be detailed beside the figures to which that difference applies.

L.3.2 Measurement References

Unless otherwise specified the references used in this specification are as follows:

- Reference frequency: 1kHz
- Reference level: 0dBu, where 0dBu \approx 0.775V into any load
- Source impedance of Test Set: 50 Ω
- Input impedance of Test Set: 100k Ω
- All unweighted measurements are specified as 22Hz to 22kHz band limited RMS and are expressed in units of dBu
- All distortion measurements are specified with a 36dB/Octave low pass filter at 80kHz and are expressed as a percentage
- The onset of clipping (for headroom measurements) should be taken as 1% THD
- Unless otherwise quoted all figures have a tolerance of \pm 0.5dB or 5%
- All measurements are made with the operating level switch set for +4dBu

L.3.3 Compressor/Limiter

Controls:

Ratio (slope)	Variable from 1 to infinity (limit)
Threshold	Variable from +10dB to -30dB
Attack Slope	Normally 'Over Easy', switchable to 'Hard Knee'
Attack Time	Normally 30mS per 20dB, switchable to 3mS ('Fast Att')
Release	Variable from 0.1 to 4 seconds
Release Slope	Normally 'Logarithmic', switchable to 'Linear'

The Compressor/Limiter has two different attack slope modes and two different release slope modes; 'Hard Knee' & 'Over Easy' and 'Logarithmic' & 'Linear' respectively. As their names suggest these modes affect of manner of response to incoming signals. Combining the two modes provides four very different modes of compression and limiting with the 'Hard Knee' and 'Linear' modes giving far more dramatic compression characteristics.

LED meters independently indicate amount of compression.

L.3.4 Expander/Gate

Controls:

Range	Variable from 0 to 40dB
Threshold	Variable from -30dB to +10dB
Attack Time	Normally 1.5mS per 40dB, switchable to 100 μ s
Release Time	Variable from 0.1 to 4 seconds

The side chain signal can be sourced either from the signal feeding the dynamic or the external Key input.

LED meters independently indicate amount of gating or expansion.

L.3.5 Performance

Signal applied to Input, output measured at Output. All pots anti-clockwise and switches 'out' except for Dynamics 'IN'.

THD + N (+20dBu applied)	< 0.05% at 1kHz
Output Headroom	> +26dBu at onset of clipping
Frequency Response	±0.25dB from 20Hz to 20kHz -3dB at 130kHz
Noise	< -75dBu

L.4 Calibration Information

The X-Rack E Series Dynamics module is factory calibrated and should only need calibration if a potentiometer or other component has been replaced or if it is suspected that there is a problem with calibration.

In each of the following instructions it is assumed that the lid has been removed and that power has been applied. It is also assumed that unless otherwise specified, all switches are released and all front panel potentiometers are at unity or minimum position as appropriate. The required accuracy for each adjustment will be specified along with the target value. All level and distortion measurements should be made with audio-band 20Hz to 20kHz filters unless otherwise specified.

All presets are accessible from the top of the unit.

Note. The unit should be allowed to warm up with power applied for at least 15 minutes prior to any adjustments being made.

L.4.1 Dynamics Adjustments

If the dynamics circuitry requires adjustment the following procedure should be followed in the order shown.

Equipment Required:	Calibrated audio oscillator, audio distortion analyser, audio level meter, oscilloscope and a (digital) DC volt meter.
Test Signal:	1kHz sine wave unless specified otherwise, level as specified.
Input and Output:	Oscillator to Input, Output to either the distortion analyser or the level meter, as specified below. Use the oscilloscope to monitor the measured signal.
Unit Setup:	Set all of the controls anti-clockwise and release all switches. Switch the dynamics IN.

L.4.2 Unity Gain

- Adjustment:
1. Set the oscillator for 0dBu.
 2. Adjust VR10 (VCA GAIN) for 0dBu ±0.05dB.

L.4.3 RMS-to-DC Converter DC Offset

- Adjustment:
1. Connect the level meter to the Output and set the oscillator level for -40dBu.
 2. Measure the DC voltage at test point TP14 relative to 0VA and adjust VR8 (COMP THOLD) for 0V ±10mV.

L.4.4 RMS-to-DC Converter Gain

- Adjustment:
1. Set the oscillator level for +24dBu.
 2. Connect the level meter to the Output. Check for +24dBu ± 0.5 dB.
 3. Set the compressor RATIO control fully clockwise and press in the \swarrow switch.
 4. Adjust VR9 (COMP LAW) for a level of -4dBu ± 0.1 dB.
 5. Reset the compressor RATIO control fully anti-clockwise.

L.4.5 Gate Threshold

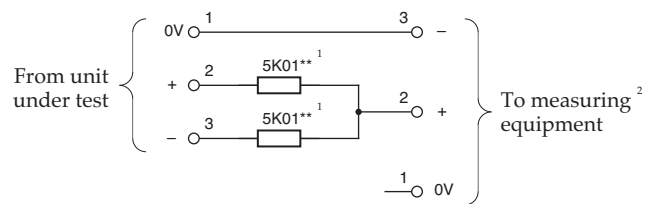
- Adjustment:
1. Set the oscillator level for +14dBu and connect the level meter to the Output.
 2. Set the gate/expander to 'gate' by releasing the EXP switch, set the gate range and gate threshold controls fully clockwise.
 3. Adjust VR7 (GATE THOLD) so that the gate just switches on.
 4. Check this adjustment by changing the oscillator level a little. Re-adjust VR7 if necessary so that the gate just opens when a +14dBu signal @ 1kHz is applied.

L.4.6 Output Balance

- Equipment Required: Calibrated audio oscillator, audio level meter and a 'balance' adaptor (see below).
- Test Signal: 1kHz sine wave at +24dBu.
- Input and Output: Oscillator to the Input of the channel being tested, Output to the level meter via the 'balance' adaptor.
- Unit Setup: Ensure that all front panel switches are off and all controls are set fully anti-clockwise.
- Adjustment: Connect the test equipment to the each channel in turn and adjust VR11 (BAL) for minimum level (< 55dBr).

L.4.7 'Balance' Adaptor

For the output balance adjustment, a 'balance' adaptor such as that illustrated here will be required. This adaptor consists of a pair of close tolerance resistors in an in-line cable and is used to sum together a balanced output in order to correctly adjust the level balance of the measured output; perfect balance should result in complete signal cancellation.



- Note
1. Resistor tolerance should ideally be 0.01%
 2. Absolute level measured will depend upon the input impedance of the measuring equipment.

L.5 Connector Details

Audio Input	
Location:	Rear Panel
Conn' Type:	XLR Female
<i>Pin</i>	<i>Description</i>
1	Chassis
2	Audio +ve
3	Audio -ve

Audio Output	
Location:	Rear Panel
Conn' Type:	XLR Male
<i>Pin</i>	<i>Description</i>
1	Chassis
2	Audio +ve
3	Audio -ve

Key Input	
Location:	Rear Panel
Conn' Type:	XLR Female
<i>Pin</i>	<i>Description</i>
1	Chassis
2	Audio +ve
3	Audio -ve

L.6 Physical Specification

Depth: 200mm / 7.9 inches
275mm / 10.9 inches

Height: 171mm / 6.75 inches

Width: 35mm / 1.4 inches
49mm / 1.9 inches

Weight: 260g / 9.5 ounces

Boxed size: 190mm x 290mm x 70mm / 7.5" x 11.5" x 2.5"

Boxed weight: 460g / 16.5 ounces

** All values are approximate*

*including front panel knobs, excluding connectors
including front panel knobs and connectors*

*front/rear panels
overall width (front and rear panels are offset)*

L.7 Environmental Specification

As per X-Rack – see page 19.