

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



Super-Analogue™ Outboard  
X-Rack Dynamics User's Guide

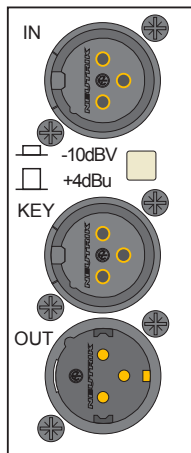
This documentation package contains the User's Guide for your new X-Rack Dynamics module. Depending on the age of your X-Rack, these pages may already be present in your X-Rack Owner's Manual – please check to see if these pages match your Manual. If they do not, these pages should be filed alongside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

*Note. There may be a newer version of the X-Rack Owner's Manual available for download from our website ([www.solidstatellogic.com](http://www.solidstatellogic.com))*



## D. Dynamics Module

### D.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 (yellow) 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.

### D.2 Operation

The X-Rack Dynamics module comprises a compressor/limiter and a gate/expander, both of which use the same gain element.

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

#### D.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 **PK** button switches this to peak sensing, and replaces the ‘over-easy’ characteristic with a hard knee.

**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 to maintain (approximately) the same perceived loudness regardless of the amount of compression.

**FST ATT** – Normally the attack time is program dependent (3mS – 30mS). Press this button to select a fixed fast attack time (3mS for 20dB gain reduction).

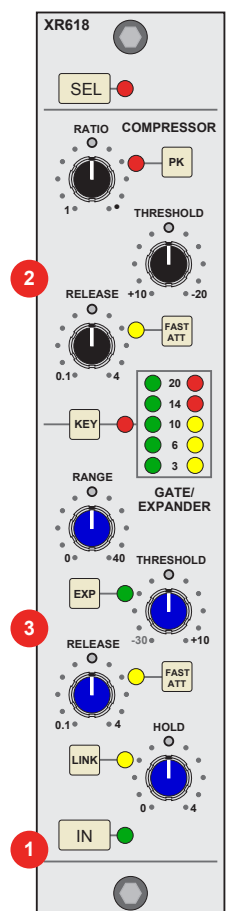
**RELEASE** – Sets the time constant (speed) with which the compressor returns to normal gain settings once the signal has passed its maximum.

#### D.2.2 Gate/Expander Section **3**

This section can act as a  $\infty$ :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 anticlockwise (Range = 0), this section is inactive. When turned fully clockwise, a gate depth of 40dB can be obtained.

**THRESHOLD** – Determines the level at which the gate opens or below which gain reduction begins (**EXP** selected), adjustable from +10dBu to -20dBu. Variable hysteresis is incorporated in the threshold circuitry to prevent spurious triggering of the gate when the signal is close to the threshold level. This means that the signal has to decay roughly 2dB below the threshold level before the gate will start to close.



**FST ATT** – 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.

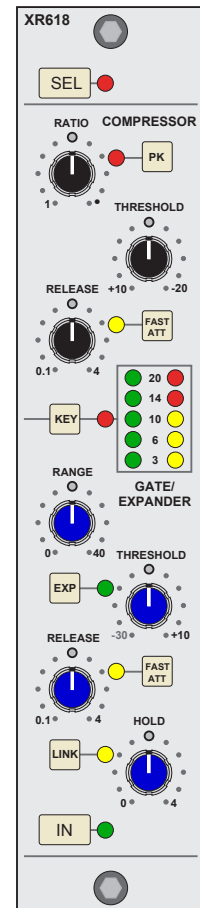
**RELEASE** – This determines the time constant (speed), variable from 0.1 to 4 seconds, at which the Gate/Expander reduces the signal level once it has passed below the threshold. Note that this control interacts with the **RANGE** control.

**HOLD** – Determines the time after the signal has decayed below the threshold before the gate starts to close. Variable from 0 to 4 seconds.

**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 module.



### D.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.

#### D.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.

#### D.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 $\Omega$
- Input impedance of Test Set: 100k $\Omega$
- 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  $\pm 0.5$ dB or 5%
- All measurements are made with the operating level switch set for +4dBu

#### D.3.3 Compressor/Limiter

##### Controls:

|               |  |
|---------------|--|
| Ratio (slope) | Variable from 1 to infinity (limit)      |
| Threshold     | Variable from +10dB to -30dB             |
| Attack Time   | Normally auto sensing, switchable to 1mS |
| Release       | Variable from 0.1 to 4 seconds           |

The Compressor/Limiter has two modes of signal detection, Peak and RMS. As their names suggest these modes of detection either act on peaks of the incoming signals or on their RMS levels. This gives two very different modes of compression and limiting with Peak Mode giving far more dramatic compression characteristics.

#### D.3.4 Expander/Gate

##### Controls:

|              |  |
|--------------|--|
| Range        | Variable from 0 to 40dB                          |
| Threshold    | Variable from -30dB to +10dB                     |
| Attack Time  | Normally auto-sensing, switchable to 150 $\mu$ s |
| Hold Time    | Variable from 0 to 4 seconds                     |
| 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 compression and expansion.

### D.3.5 Measurement Conditions

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

|                          |   |
|--------------------------|---|
| THD + N (+10dBu applied) | < 0.01% at 1kHz                             |
| Output Headroom          | > +26dBu at onset of clipping               |
| Frequency Response       | ±0.2dB from 20Hz to 20kHz<br>-3dB at 130kHz |
| Noise                    | < -88dBu                                    |

Signal at +20dBu applied to Input, Compressor Threshold set at -20, Compressor Ratio adjusted to give +4dBu at Output. RMS sensing mode selected.

|                      |                  |
|----------------------|------------------|
| THD + N              | < 0.3% at 1kHz   |
| (Fast Attack Mode) † | < 0.05% at 10kHz |
| THD + N              | < 0.03% at 1kHz  |
| (Slow Attack Mode)   | < 0.05% at 10kHz |

† LF distortion is consistent with attack and release time constants.

### D.4 Calibration Information

The X-Rack 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.

#### D.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.   |

#### D.4.2 Distortion

- Adjustment:
1. Connect the distortion analyser to the Output and set the oscillator level for +20dBu.
  2. Adjust VR12 for minimum distortion (< 0.02%).

### D.4.3 Compressor Threshold

- Adjustment:
1. Connect the level meter to the Output and set the oscillator level for  $-28.35\text{dBu}$ .
  2. Measure the DC voltage at test point TP14 relative to 0VA and adjust VR9 (COMP\_THOLD) for  $0\text{V} \pm 10\text{mV}$ .

### D.4.4 Compressor Law

- Adjustment:
1. Set the oscillator level for  $+20\text{dBu}$ .
  2. Connect the level meter to the Output. Check for  $+20\text{dBu} \pm 0.5\text{dB}$ .
  3. Set the compressor ratio control fully clockwise and press in the compressor FST ATT and PK switches.
  4. Adjust VR10 (COMP\_LAW) for a level of  $14\text{dBu} \pm 0.1\text{dB}$ .
  5. Reset the compressor ratio control fully anti-clockwise.

### D.4.5 Gate Threshold

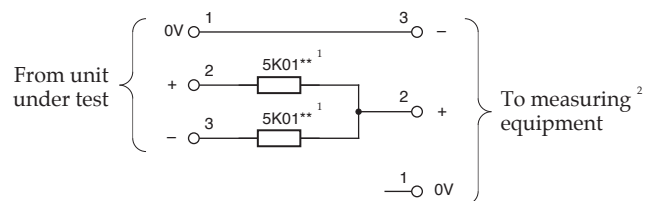
- Adjustment:
1. Set the oscillator level for  $+10\text{dBu}$  and connect the level meter to the Output.
  2. Set the gate/expander to 'gate' by releasing the EXP switch, set the gate range and gate threshold controls fully clockwise.
  3. Adjust VR8 (GATE\_THOLD) so that the gate just switches on.
  4. Check this adjustment by changing the oscillator level a little. Re-adjust VR8 if necessary so that the gate just opens when a  $+10\text{dBu}$  signal @  $1\text{kHz}$  is applied.

### D.4.6 Output Balance

- Equipment Required: Calibrated audio oscillator, audio level meter and a 'balance' adaptor (see below).
- Test Signal:  $1\text{kHz}$  sine wave at  $+24\text{dBu}$ .
- 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 VR13 (BAL) for minimum level ( $< 55\text{dBr}$ ).

### D.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.

**D.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          |

**D.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

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

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

\* All values are approximate

**D.7 Environmental Specification**

As per X-Rack – see page 19.