XPRESSION FX

Expression pedal enhancer - TRS

User guide

Contents

Version 1.14

Declaration of compliance

Manufacturers Name: Oz Inventions

Manufacturer's address: PO Box 86, Warrnambool, Victoria. 3280

Declares that the product

Product name: Xpression fX expression pedal enhancer

is compliant with the following standards regarding radiated and conductive emissions relevant to this product and Electro Magnetic compatibility.

- AS/NZS 4268
- AS/NZS CISPR 32

Should the equipment cause radio frequency interference (disturber) or be the victim of radio frequency interference, the following measures can be taken:

- Relocate the disturber and/or the victim by increasing separation and/or reorientating the device/s.
- Connect the disturber and victim on different power circuits
- Contact the manufacturer or other expert party

Please read these two very important messages

1. **The position of the sensitivity, minimum depth and maximum depth controls is important in obtaining the correct amount of modulation. Having these controls in the incorrect position may mean no modulation, little modulation or erratic modulation.**

The sensitivity control is used to set the number of steps from the heel to toe position. Fully left gives 128 steps from 0 – 127. Fully right gives the custom step sizes set in the 'step size' menu. Other positions increase the step size. It needs to be positioned correctly, for the desired effect.

The minimum and maximum depth controls have multiple functions, operating on modulation and also changing items and parameters within the menus, and so these controls are often moved and need to be re-positioned for the desired effect whenever the menus are exited or the modulation mode is changed.

Failsafe starting positions outside of the menus are

- Sensitivity – Fully left (0)
- Minimum depth – fully left (0)
- Maximum depth – fully right (127)

If at any time things are not working as expected, check those controls.

2. **The polarity and resistance settings will also have a significant effect. Refer to the user manual for your effects unit / keyboard/ MIDI controller to determine the correct polarity and resistance.**
TRS polarity & 12Kohm resistance are common but not universal. The following settings have been found to work with the following products, though operation is not limited to these products.

Manufacturer	Polarity	Resistance (Kohm)
Arturia®	CV	50
Boss®	TRS	12
Digitech®	RTS	12
EHX®	TRS	12
Eleven rack®	TRS	12
Line 6®	TS	12
M-Audio®	TRS	12
Mooger Fooger®	TRS	50
Pigtronix®	TRS	12
Strymon®	TRS	25
TC Electronic®	TRS	25
TC Helicon®	TRS	50
Yamaha®	RTS	50
Zoom®	RTS	50

Figure 1 – Common polarity and resistance settings

Provided items

- Expression pedal enhancer - TRS
- DC 12 volt 150mA power supply (optional)
- one meter TRS cable (optional)
- Quick start manual (optional)

Safety and care

- Remove power from all devices to be connected before connecting or disconnecting
- Dismantling the device may damage the device. There are no user serviceable parts inside the device.
- Only use the provided AC to DC power adapter or other certified adapter. Only use the correct polarity of the provided reversible DC power adapter. Negative centre (tip) is the correct polarity. The power adapter is supplied in the correct configuration. Do not reverse the connection.
- Electromagnetic radiation is minimised by the aluminium enclosure and relevant internal components. However, should interference be experienced, position the device further away from the device that is interfering or being interfered with.
- Due to the nature of modulation, some modulated parameters, particularly at the ends of modulation, can cause a loud and/or irritating audio signal. Permanent high volume audio signals can damage hearing and equipment.
- Should the device malfunction, a reboot or restore to default settings, may resolve the problem. Otherwise the manufacturer should be contacted. There are no user serviceable parts inside the device.
- Avoid contact with, and environments, known to cause adverse effects with electronics and small moving parts, such as liquids, dust, sand, high humidity, high temperature and vibrations.
- Avoid excessive force when operating controls and connecting cables
- Disconnect the device during lightning storms and /or times of power outages
- **This device can output 0 – 5 volts on its output expression socket, and does output 0 -5 volts at all times on its input socket. Damage can be caused to this modulating device if greater than 5 volts is applied to the output expression socket. Damage can be caused to other devices it they are not able to accept 0 -5 volts from either socket. Consideration must be taken when connecting and using it.**

    If in doubt contact Oz inventions at contact@ozinventions.com

Warranty

The device is warranted for use in Australia.

If the product is defective as a result of faulty workmanship or materials, Oz Inventions will at their discretion repair or replace the product for a period of 12 months from purchase.

Proof of purchase is required and Oz Inventions at their discretion are required to inspect the product and reserve the right to update or improve the product including hardware and software during the period of inspection and /or repair.

The warranty is void if the product is opened or dismantled in any way

Warranty claims should be directed to contact@ozinventions.com

Power

The device requires a 9 – 12 volt DC power supply with a current capability of 150mA. The DC polarity is negative in the centre (tip). The supplied DC adapter is a reversible model. It is supplied with the correct polarity configuration. Do not reverse the connection.

See Connecting the DC power adapter

Introduction

Xpression fX expression pedal enhancer – TRS, from Oz Inventions, adds features to, and provides universal connectivity, to a simple TRS expression pedal. It is designed for use with effects units, keyboards and MIDI controllers that have an expression pedal socket, sometimes called a control socket, or foot controller socket.

The device provides unique expression capability.

The device can function as a -

- Expression pedal enhancer
- Triggered ADSR envelope shaper
- Triggered foot switch
- Recordable ADSR envelope shaper
- Standalone manual ADSR envelope shaper
- Foot switch / sustain switch
- Automatic or triggered arpeggiator *(using pitch parameter on effect unit)*

The device is compatible with most effect units, keyboards and MIDI controllers with expression sockets or with CV sockets. The enhancer provides the following features-

- TRS, RTS, TS and RS polarity and CV output (0 – 5 volt, 2mA Control Voltage).
- 12Kohm, 25Kohm and 50Kohm electrical resistance
- Controlled expression via TRS pedal, automatic and recordable waveforms
- Scalable modulation output in step sizes from 1 – 127
- Linear, logarithmic and anti-logarithmic sweep
- Reverse, continous and forward unidirectional sweep
- Continuous sweep
- Adjustable minimum and maximum depth positions
- Adjustable start and stop sweep positions
- Sensitivity control
- 50 millisecond to 99 second per stage, ADSR envelope shaper
- Triggered ADSR envelope shaper
- Automatic ADSR envelope shaper
- 15 minute external device sensing recording ADSR envelope shaper

Controls and sockets overview

Figure 2 Top panel controls

- Expression jack – Tip, Ring, Sleeve type 6.35mm (¼")socket
- Display – modulation mode; Sweep position; Menu text; mode indicators
- Bidirectional switch – continuous output; high to low or low to high
- Mode switch – External, Automatic, Playback
- Minimum Depth – sets the minimum modulation position (heel down)
- Maximum Depth - sets the maximum modulation position (toe down)
- External input – connects an external device such as a TRS expression pedal
- ON/OFF/calibration/record footswitch- Turns modulation on & off; Calibrates the beginning and ending sweep points; Arms recording and stops recording.
- External indicator – indicates when the 'external' channel is selected
- ON/OFF/calibration/record indicator – Yellow
  Illuminated = Modulation ON; Extinguished = Modulation OFF; Fast flashing = calibrating; Brief slow flashing = Record armed; Continuous slow flashing = Recording in progress.
- Sensitivity – sets step sizes within the sweep
- DC power jack –2.1mm; 9 – 12V; 150mA; Negative centre

Connecting

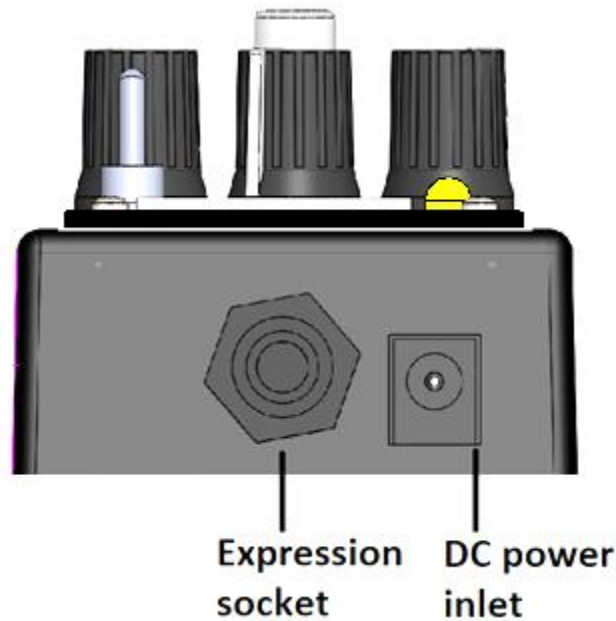The rear of the device provides access to the expression and DC power sockets.

Expression socket   DC power inlet

Figure 3 Rear panel connections

Connecting the expression jack

Connect the expression socket of the receiver to the expression socket of an effects unit, keyboard or MIDI controller, using a TRS cable. Regardless of whether TRS, RTS, TS, RS or CV polarity is chosen, a TRS cable is required. The wiring configuration of the TRS cable is tip to tip; ring to ring; and shield to shield.

A TS (mono) cable can be used for switching only, if the effects unit/keyboard/MIDI controller provides that functionality and is compatible See Using the modulator as a footswitch pg 37
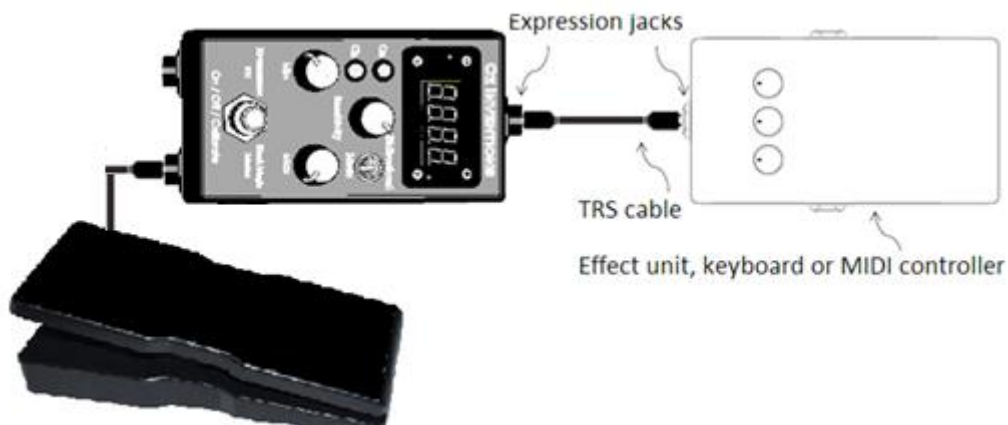

Figure 4 – Connecting the input and output jacks

The input jack is designed to take a TRS expression pedal.

The plug/socket connections are firm and should click when inserted. The plug should be pushed in gently until it can go no further.

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Connecting the DC power adapter

Push the DC power supply plug into the DC power inlet.

Figure 5 – Push the DC power plug into the DC power inlet

The DC power plug is reversible. It is provided with the correct configuration. Should the polarity need to be changed the arrow should point toward the negative (-) symbol. This provides the correct polarity (negative tip) for the receiver-modulator.

Figure 6 – Correct polarity – Negative tip

Using multiple enhancers

Multiple enhancers can be used in series so that a single expression pedal can control multiple effect units. Specific calibration can be carried out on each unit, so that parts of the pedals sweep affects the units differently. For example, the first half of the sweep can be assigned to one effect unit, whilst the second half of the sweep can be assigned to another effect unit. Or one can be calibrated for forward sweep and another calibrated for reverse sweep.
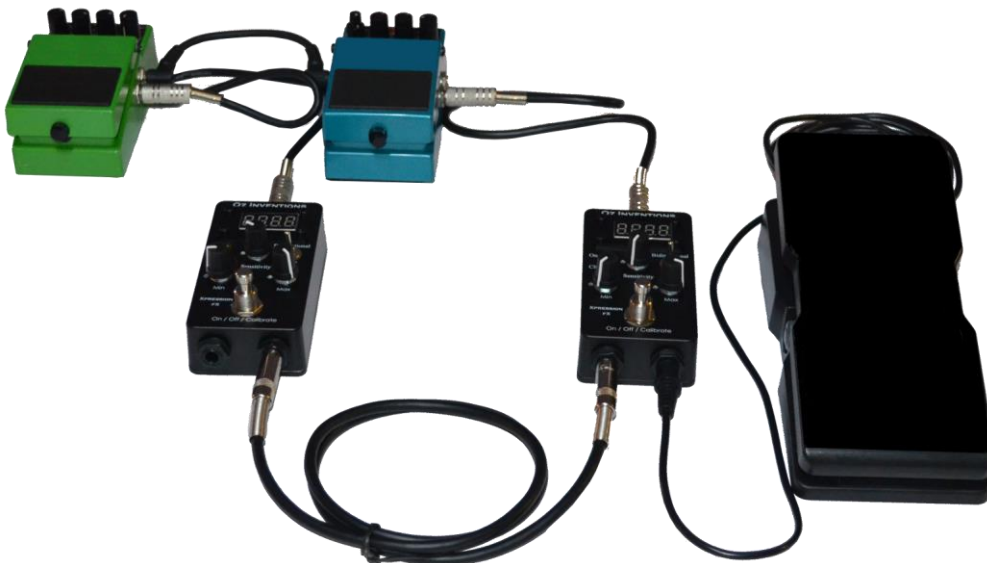

Figure 7 – Example setup for two enhancers

Note that not all models have a pedal output socket

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Main indicator lights

There are two main indicators.

ON

The ON indicator shows when modulation is on or off. When illuminated, modulation is on.

The ON indicator also indicates when calibration is occurring in 'Free' mode, via flashing.

The ON indicator also indicates states of recording when in 'Rec' mode. The indicator flashes and then goes steady when recording is armed. The indicator starts flashing again when recording has started and stops flashing when recording is completed.

Ch

The Ch indicator illuminates when 'external' is chosen as the channel of operation.

On — Yellow

Ch — Red
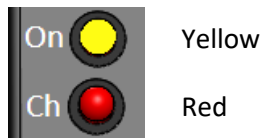
Figure 8 – Channel indicator

Minor indicator lights

There are two minor indicator lights and each provides unique indications in normal use mode and also within the menus.

Indicator lights in normal use mode

In normal use mode the indicator lights signify 'Record mode' or 'ADSR trigger mode'. The absence of lights signifies 'Free' mode.

ADSR trigger mode
(flashing)

Record mode
(flashing)

Indicator lights in menu mode

An illuminated dot under the last character, signifies that the menu is currently being accessed. An illuminated dot under the first character signifies that the current menu item is an ADSR item.

Menu item is
an ADSR item

Menu is being
accessed

Controls

Modulation mode switch

The mode switch is a momentary toggle switch. It is toggled forward and then released. The mode switch selects between modulation modes.

The modes are external, automatic and playback.

External (E)

This mode is designed for connecting external devices, such as a TRS expression pedal, to the TRS input socket. Calibration may be required before use*.*

Automatic ADSR (A)

Plays the ADSR envelope as set within the ADSR menu
See Understanding ADSR, Automatic ADSR mode and ADSR trigger mode

Playback recorded ADSR (P)

Plays the recorded ADSR envelope as recorded in record mode. *See Understanding recording pg 31*

Bidirectional switch

The bidirectional switch is a permanent toggle switch. It is actuated by pushing it backward. It enables a bidirectional sweep where the output reverses when the pedal reverses The output will normally increase from minimum to maximum as an external pedal is depressed and then maximum to minimum, on the way back up again. However, with bidirectional selected, the output will reverse so that the output is minimum to maximum in both pedal directions. *(note – this is not what is called reverse sweep pg 22)*

Sensitivity control (0 – 127)

External mode

The sensitivity control adjusts the step size within the sweep. Fully left (1) gives individual steps of 1, from 0 – 127. Next right (2) gives individual steps in 2's (e.g 0, 2, 4, 6…. Etc). Turning right continues the step size increase. Fully right (128) forces the device to use the custom step sizes set in the step size menu.

Playback mode

The sensitivity control is used as a trim control in playback mode to remove possible uneven timing toward the end of the recording. See 'Understanding recording' pg 31

It is important to have the sensitivity control in the correct position for each mode. If it is in the wrong position, the result can be no or erratic output. If at any time the output is not working as expected, check the sensitivity control, and also the min and max depth controls.

Min depth (0 – 127)

The minimum depth control limits the output by preventing it falling below a preset level. For example, when minimum depth is set to 25, output cannot go lower than 25. For example, if the chosen effect parameter to be modulated is 'volume' with a range from no volume at 0, to maximum volume at 127, setting the minimum depth control to 25 will prevent the volume from reaching zero. In relation to a traditional expression pedal, the minimum depth control can be likened to the heel down position.

Knowing the exact position of the minimum depth control is not always needed, however its level is briefly flashed on the screen whenever it is moved. Fully anti-clockwise = 0. Fully clockwise = 127.

The minimum depth control also functions as the menu item indexer. The control does not function as a depth control when a menu is accessed. However, its value is retained by the system when inside a menu. When a menu is exited the control should be returned to the position it was in before menu entry.

It is important to have the minimum depth control in the correct position for the result you are trying to obtain. If it is in the wrong position, the result can be no modulating output. Whenever the menu is exited, be sure to correctly place the minimum depth control. If at any time modulation is not working as expected, check the minimum depth control, and also the maximum depth control and the sensitivity control.

Max depth

The maximum depth control limits the output by preventing it from rising above a preset level. For example, when maximum depth is set to 90, modulation cannot go higher than 90. For example, if the chosen effect parameter to be modulated is 'volume' with a range from no volume at 0, to maximum volume at 127, setting the maximum depth control to 90 will prevent 'maximum volume' being reached. In relation to a traditional expression pedal, the maximum depth control can be likened to the toe down position.

Knowing the exact position of the maximum depth control is not always needed, however its level is briefly flashed on the screen whenever it is moved. Fully anti-clockwise is 0, fully clockwise is 127.

The maximum depth control also functions as the menu item parameter indexer. The control does not function as a depth control when a menu is accessed. However, its depth value is retained by the system whilst in the menu. When the menu is exited the control should be returned to the position it was in before menu entry.

**It is important to have the maximum depth control in the correct position for the result you are trying to obtain. If it is in the wrong position, the result can be no modulating output. Whenever a menu is exited, be sure to correctly place the maximum depth control. If at any time modulation is not working as expected, check the maximum depth control, and also the minimum depth control and the sensitivity control.**

Display

In normal use mode, the display shows the modulation output and the modulation mode. The display also shows menu information and has indicator lights to signify a menu is currently being accessed, and also indicator lights outside of a menu to show when ADSR trigger, and Record mode are selected.

Display in normal use mode

In normal use mode, the display shows the currently chosen modulation mode and the modulation level of that mode.
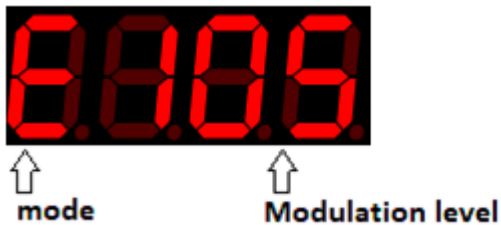
Indicator lights in normal use mode

In normal use mode the indicator lights signify record mode or ADSR trigger mode. The absence of lights signifies 'Free' mode.
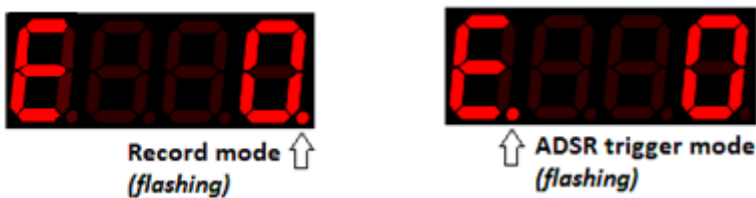
Display in menu mode

In Menu mode, the display shows the currently selected menu item and its current parameter level. An illuminated dot under the last character distinguishes between menu access and normal use mode.

Indicator lights in menu mode

An illuminated dot under the last character, signifies that the menu is currently being accessed. An additional illuminated dot under the first character signifies that the current menu item is an ADSR item.

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Menu

There are two menus and a preset select option.

1. The system menu holds system items and ADSR items–
   - System items –Resistance, polarity, record trigger level, reverse sweep direction, record time, linear/log sweep, and selects Free mode, ADSR1 trigger mode, ADSR2 mode & Record mode.
   - ADSR items – Changes ADSR settings - attack rate, decay rate, sustain level, sustain time, release rate and trigger modes.
2. The step size menu holds step size items. Variable step sizes from 1 – 127.
3. There are 10 available presets. Unless changed, each preset holds the same default information.

There is also a reset option accessed during power on that returns the unit to default settings See pg 24

Menu access and control
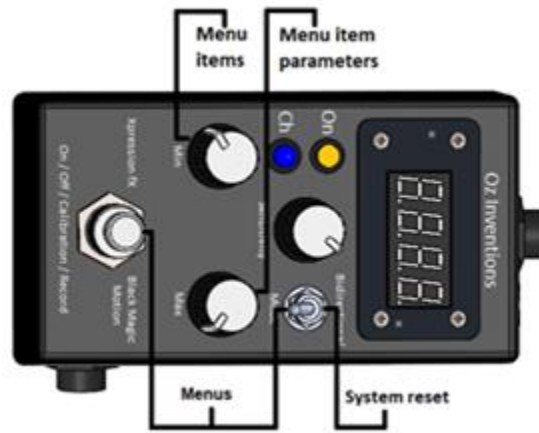
Figure 9 – Menu Access and control

- The system menu is accessed by first pressing and holding the on / off / calibration / record switch and then pulling forward the modulation mode toggle switch. Both switches must be held together, with the on/off/calibration/recording switch being held first.

- The 'Step size' menu is accessed by first pulling forward and holding the modulation mode toggle switch and then pressing the on/off/calibration/recording switch. Both switches must be held together, with the toggle switch being held first.

  Once inside a menu the minimum depth control moves through the menu items and the maximum depth control changes the parameters of the currently selected menu item. Exiting the menu is done in the same way as entry
  .

- The presets are access by rotating the maximum depth control fully counter clockwise (0) and rotating the minimum depth control fully clockwise (127). The presets can then be changed by pulling forward the mode toggle switch. To exit preset selection, change the minimum or maximum depth control to any position.

- 'SyS' appears on the display briefly when the system menu is entered. The display then shows the first menu item

- 'Stp' appears on the display briefly when the 'Step size' menu is entered. The display then shows the first menu item.

- 'PS appears on the display when 'Preset' selection is entered. '

- A small illuminated dot is permanently on under the last character on the display to signify that a menu has been entered.
- A small illuminated dot is also permanently on under the first character of the ADSR settings only, to distinguish between the ADSR settings and the other settings.
- Exit from a menu is done in the same way as entry.
- The individual items of a menu are indexed via the minimum depth control.
- The individual menu item parameters are modified by the maximum depth control.
- After meu exit, it is important to remember that these controls may need to be returned to the position they were in before entry, depending on what is required.
- Calibration is not possible when in ADSR or Record mode. Any calibration should be carried out before entering these modes.
- The hard ON/OFF switch and soft ON/OFF control, functions as normal when in the system menu
- The minimum and maximum depth controls do not function as depth controls when in the menu. However, their values at the time of menu entry are retained whilst in the menu.
- After menu exit the min and max depth controls will take on the values relevant to their current position and so,
- **After menu exit, It is important to return the depth controls to the position they were in before menu entry**

System reset

System reset is actuated by holding the mode switch forward, whilst applying power, and then releasing the switch.

System menu items

The system items in the menu enable adjustment of system settings. Some of these settings may only need

Free/ADSR1/ADSR2/Record (Free / Atg1 /Atg2/ rEC)

Default – Free; Range - Free, AtrG1. AtrG2 & Record

Free

Modulation output is based directly on mode data. The range is 0 – 127 and can be modified via the minimum and maximum depth controls. For example, with the minimum depth control set at minimum and the maximum depth control set at maximum, the modulation output will range from 0 – 127. Reducing the maximum control will reduce the modulating output from 127. Increasing the minimum control will increase the beginning modulation above 0.

Atr1 (ADSR trigger mode 1)

The ADSR envelope will be triggered on and off by the modulating output, as per the ADSR trigger settings in the menu. The external pedal will have no affect on the output as it passes through its sweep, other than at the trigger point of the maximum depth setting, where it will turn the ADSR on or off.

Atr2 (ADSR trigger mode 2)

The ADSR envelope will be triggered on and off by the modulating output, as per the ADSR trigger settings in the menu. The external pedal will continue to affect the output as it passes through its sweep, and also trigger the ADSR on and off at the trigger point. The trigger point is the maximum depth setting.

Rec (Record)

The device will record the external device for a duration between 0 to 1000 seconds dependent on the 'Recording Time' set in the menu. The recording can be heard by selecting playblack ('P') with the modulation mode switch. The recording will play back continuously and can be trimmed using the trim (sensitivity) control. The recorded waveform cannot be saved. *See* Understanding recording pg 31

Resistance (r)

Default 12; Range 12, 25 and 50.

The device has three electrical resistances – 12Kohms; 25Kohms; 50Kohms.
Most effect units/keyboards/MIDI controllers, will function with any of these resistances. However, some devices have specific requirements that must be adhered to for correct functioning. Refer to the effect unit/keyboard/MIDI controller manual for specific requirements.

Polarity (P) (and foot switch and control voltage)

Default – TRS; Range TRS, RTS, TS, RS, CV

Many effects units/ keyboards/MIDI controllers use the TRS setting. However, many do not. . If this setting is not set correctly the results can vary from no modulation to intermittent modulation. Refer to the effect unit/keyboard/MIDI controller manual for specific requirements.

TRS

Tip, Ring, Sleeve. A constant voltage is applied to the ring and sleeve from the effect unit/keyboard/MIDI controller. A varying voltage returns from the tip.

RTS

Ring, Tip, Sleeve. A constant voltage is applied to the tip and sleeve from the effect unit/keyboard/MIDI controller. A varying voltage returns from the ring.

TS

Tip, Sleeve. The ring is disconnected. A varying voltage comes through the tip. Depending on the effects unit/keyboard/MIDI controller, TS polarity may enable the modulator to function as a foot switch

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RS

Ring sleeve. The tip is disconnected. This polarity can be used to simulate some footswitches.

CV

Control Voltage. The ring is disconnected. A varying voltage is generated by this device and returns through the tip. The voltage is 0 – 5 volts DC. This is suitable for many CV devices. Some devices may require 10 volts, and so this modulator will have a limited range, though still a significant effect with 10 volt synthesizers.

*Warning – Supplying a voltage to an incompatible external device can damage the modulator and the incompatible device. CV mode is designed for connection to devices such as analog synthesizers that require a varying 0 – 5v input. Damage is unlikely as current is limited to 2 milliamperes. However, ensure the other devices instruction manual and/or the manufacturer is consulted before connecting the modulator to another device.

Linear / Logarithmic / Anti-Logarithmic scale
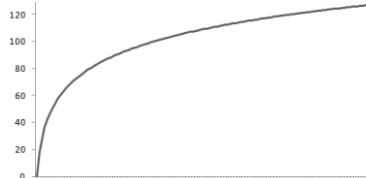Default Linear; Range – Linear (LoG-); Logarithmic (LoGL); Anti-logarithmic (LoGA)

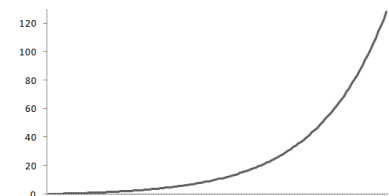This sets how evenly the output rises.

- Linear gives an even sweep
- Log gives an initial fast sweep that slows down as it approaches the end
- Anti-log gives an initial sweep rise that speeds up as it approaches the end
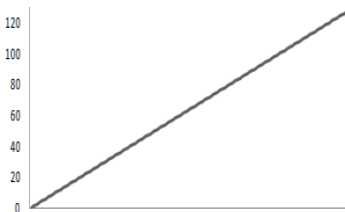
Linear   *Logarithmic*   *Anti-Logarithmic (Inverse)*

Record trigger level(tL)
Default 10; Range 0 – 127

Sets the level at which external data will activate recording. For example, if the record trigger level is set to 10, and recording is armed, recording will start when the current modulation output moves 10 above or 10 below the position recorded when the system was armed. The minimum depth control can also be used to trigger recording.

See Understanding recording pg 31

Reverse sweep (rs)
Default – No; Range Yes & No

Changes the direction of sweep. For example if the current sweep changes a volume effect from lowest volume to highest volume, reversing the sweep will change the sweep so the volume effect goes from highest volume to lowest volume.

Reverse sweep can also be done by calibrating in the reverse direction, but it is provided in the menu for easy access and so it can be applied to the ADSR envelope, and also to a recorded waveform.

Recording time (rt)
Default – 1; Range – 1 - 99

Changes the available recording time and changes the length of playback. There is a trade-off between recording time and resolution or sample time, with longer recording times have lower playback resolution.

Off Level (l)
Default – 0; Range –0 – 128

Sets the permanent output level when modulation is turned off. '0' sets the level at minimum. '127' sets the level at maximum. '128' sets the level at the current modulation level.

Quit / Save (quit / Save)

Default – quit; Range – quit & save

When the system menu is exited, the settings will be saved or not, dependant on this setting. The parameter is always set to 'quit' when a menu is accessed. The parameter must be purposely changed to 'Save' even after 'Save' has been selected previously.

Quit

The menu is exited and all settings, including calibration and system settings, remain as set by the user until the device is powered off. When the device is powered on again, the settings revert to the previously saved, or default settings.

Save

The menu is exited and all settings for all presets, including calibration, system settings and the current modulation mode, are saved. When the device is powered off and on, the settings are retained.

ADSR items

Attack Rate (Ar)
Default – 5; Range 1 – 99 – 0.

With any modulated parameter, the attack rate sets how quickly the envelope rises from minimum to maximum. It is adjustable from 1 – 99 in 10 millisecond increments with a scale setting of 1, and up to 1 second increments with a scale setting of 99. This provides a total stage time of 99 seconds.

As an example of controlling a volume parameter, the attack rate sets how long it takes to get from minimum to maximum volume.

A setting of '0.' which is fully right, means the attack rate is assigned to the external controlling device.

Decay Rate (dr)
Default – 5; Range 1 – 99 – 0.

The decay rate sets how quickly the envelope decays to the sustain level. A setting of '0.' which is fully right, means the rate is assigned to the external controlling device.

Sustain Level (SL)
Default – 64; Range 1 – 127 – 0.

The sustain level is the level the envelope remains at after the decay rate has finished. The sustain level remains constant for a period set by the sustain time. A setting of '00' which is fully right, means the level is assigned to the external controlling device.

Sustain Time (St)
Default – 5; Range 1 – 99 – 0.

The sustain time is the period of time between the decay rate finishing and the release rate starting. A setting of '0.' which is fully right, means the rate is assigned to the external controlling device.

Release Rate (rr)

Default – 5; Range 1- 99 – 0.

The release rate starts when the sustain time finishes, and sets how long the envelope takes to fall from the sustain level to zero. A setting of '0.' which is fully right, means the rate is assigned to the external controlling device.

Trigger mode (tnn)

Default - Repeat; Range – Once (o), Hold (H), Repeat (r)

There are four trigger modes –

Once (t.nno.)

The ADSR envelope is triggered when modulating output reaching its maximum as set by the maximum depth control (1 – 127). The envelope plays once when the maximum depth is reached. The envelope is reset ready to be triggered again when the current modulation output reaches its minimum depth as set by the minimum depth control. The envelope cannot be interrupted, it will complete regardless of further actions.

Interrupt(tnni.)

The ADSR envelope is triggered when modulating output reaching its maximum as set by the maximum depth control (1 – 127). The envelope plays once when the maximum depth is reached. The envelope is reset ready to be triggered again when the current modulation output reaches its minimum depth as set by the minimum depth control, or the envelope is reset when the maximum depth is reached again, thus interrupting the envelope and restarting it.

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Hold (tnnH)

The ADSR envelope is triggered by any modulation output reaching its maximum as set by the maximum depth control (1 – 127). The envelope holds at the sustain stage until the current modulation output reaches its minimum depth, as set by the minimum depth control.

Repeat (tnnr)

The ADSR envelope is triggered when the modulating output reaching its maximum as set by the maximum depth control (1 – 127). The envelope plays continuously until the modulation output reaches the minimum depth as set by the minimum depth control.

Scale (Sc)
Default 1; Range 1 – 99 – 0.

Changes the overall envelope time by a factor of 1 - 99. A setting of '0.' which is fully right, means the scale is assigned to the external controlling device.

When scale is set to 1,
All rates are adjustable from 1 - 99 in 10 millisecond increments giving a total period of approximately 1 second for each stage. Settings below 5 can bring unwanted intermittent results.

When scale is set to 10
All rates are adjustable from 1 - 99 in 100 millisecond increments giving a total period of approximately 10 seconds for each stage.

When scale is set to 99
All rates are scalable from 1 - 99 in 1 second increments giving a total period of approximately 99 seconds for each stage depending on the sustain level setting.

Scale (value)	Increment size (milliseconds)	Total length of ADSR envelope (seconds)
1	10	1
2	20	2
3	30	3
4	40	4
5	50	5
.	.	.
10	100	10
20	200	20
30	300	30
.	.	.
90	900	90
100	1000 (1 second)	100

Table 1

System reset
System reset restores the unit to its default settings. See *Default settings pg 22*

To reset the device
- Reset the device by holding the modulation mode switch forward whilst powering on the device.
- The display will show 'rst-'
- Releasing the modulation mode switch will restore default settings and reboot the device
- Alternatively, removing power whilst the switch is still held will retain the stored settings.

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Step size menu items

The step size menu items enable how fine or coarse each step from 0 – 127 is and also enables individual customised steps which when used for example with a pitch parameter may equate to semitone, tone, 3rd, 5th and/or octave steps.

Step size (S)

Default – 1; Range 0 – 127

Modifies the size of each step as the modulating output progresses from 0 – 127. For example, when set to 10 the modulation output will follow this pattern – 0, 10, 20, 30 …. 110, 120, 127. This creates audible steps in the modulation rather than a smooth progression as found when the step size is set to the default of '1'.

- When the step size is set to '0, a step can be set to an exact amount rather than even multiples. In this mode there are sixteen possible steps. The steps could for example be set to semitone steps. The amount required for each step will vary depending on the effect unit, keyboard or MIDI controller used. For example, the settings for semitone steps for Zoom® G1 are[1] -

20	26	33	40	46	56	66	77	87	100	110	127
C#	D	D#	E	F	F#	G	G#	A	A#	B	C

[1] Accuracy +/- 20 cents

Any step size can be used and any number of steps, up to sixteen, can be used. For example an arpeggio -

46	87	127	*								
E	G	C octave									

If required the minimum and maximum depth controls can limit how many steps are used.
A good ear for pitch or a chromatic tuner are required to set the steps accurately.

Each step is signified in the menu by a starting number, which is incremented by the minimum depth control

e.g

It can be useful to set the same value for multiple steps as this spreads the amount of change required before a new step is selected. For example -

Calibrating over a larger angle also creates a wider spread.

- Using step sizes in combination with an automatic or triggered ADSR envelope, and a pitch parameter, creates an arpeggiator. In these modes the maximum and minimum depth control can limit the steps heard. In these modes the depth controls display 1 – 16 for the 16 available steps, rather than the usual 0 – 127.
- The maximum depth control also adjusts the timing between the last rising and first falling step.

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Preset selection

The preset selection enables changing between ten available presets numbered 0 - 9.

The presets are access by rotating the maximum depth control fully counter clockwise (0) and rotating the minimum depth control fully clockwise (127). The presets can then be changed by pulling forward the modulation mode toggle switch. To exit preset selection, change the minimum and maximum depth controls to any other position.

Presets (PS)
Default – 0; Range 0 – 9;

Any changes made to the current preset are lost when a new preset is selected. Therefore, preset changes should be saved when required by accessing the 'Save' menu item available in the 'System' or 'Step size' menus.

Selecting 'Save' in any menu will save all menu items from all menus, all calibration values and the current modulation mode, to the currently selected preset.

Having presets enables quick changes. For example -

- Presets enable quick changes between effect units/keyboards/MIDI controllers that have different polarity and resistance settings
- Presets enable quick changes between different customisable step sizes
- Presets enable quick changes between different calibration settings

Upon first powering up the unit after manufacture, all presets will have the same default values (pg 22)

Calibration

General calibration process

An external pedal may need to be calibrated for best operation. The calibration operation means to set the sweep angle over which the output changes. The angle can be narrow or wide, forwards or backwards. Modulation begins at zero at the start of calibration and finishes at 127 at the end of calibration.
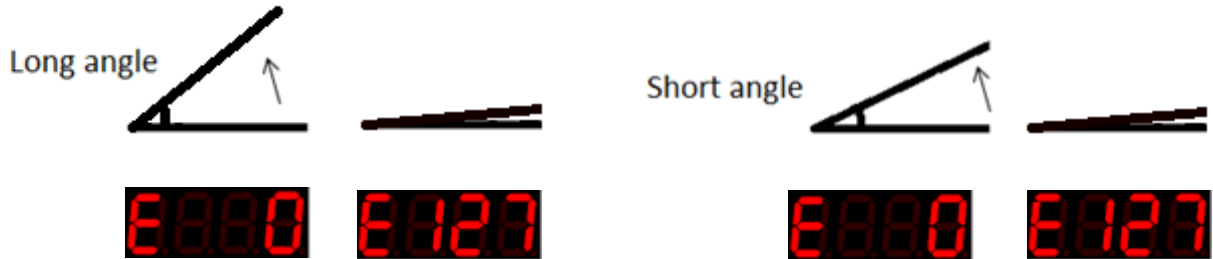
Figure 10 – Long and short angle Calibrations

Calibration steps

1. Hold the pedal at the required starting position, say heel down

2. Press and hold the on/off/calibration/record button. The ON indicator will start to flash, signalling the start of the angle has been set and that an output of zero will be at that point.

3. Continue to hold the button and move the pedal to the finishing position, say toe down.

4. Release the button. The angle end has now been set and modulation will be at maximum at that point.

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Understanding recording and playback modes

The modulator is able to the external pedals movement and play it back later to modulate the output.. This means that you can create your own ADSR envelops, more intricate than those created with the various ADSR settings available in the menu.

The length of a recording can vary from 0 – 1000 seconds (16 minutes). However, there is a trade-off between recording length and resolution. Regardless of the recording length there are only ever 1000 samples maximum, recorded.

With a setting of'1' the maximum recording time is 10 seconds with a sample time of 10milliseconds. That means that the external data is being recorded 100 times every second, so even very rapid movements are recorded and the 1000 samples are exhausted after 10 seconds.

With a setting of 100 the maximum recording time is 1000 seconds (16 minutes), with a sample time of 1 second. This means the external data is only recorded once per second. Settings this high can be used for foot switching or triggering some external event.

Recording time (menu value)	Recording time (seconds)	Sample time (millseconds)	Samples per sec
1	10	10	100
2	20	20	50
3	30	30	33
4	40	40	25
5	50	50	20
.	.	.	.
10	100	100	10
25	250	250	4
50	500	500	2
100	1000	1000	1

Table 2 – Recording time

Trimming the recording

When in playback mode, the sensitivity control is used as a trim control where the finishing sections of a recording can be removed. This has several benefits.

- If a recording does not finish quite on time, the recording can be trimmed to remove the odd timing.
- A particular section of the recording can be isolated and used, rather than the complete recording.

Fully anti-clockwise (0) is no trim. Fully clock-wise trims the entire recording, leaving nothing left to play and so no modulation. Initially in playback mode start with the trim control fully anti-clockwise so you can hear the entire recording, and then work toward clockwise to remove the trailing section/s.

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Recording process

- Calibrate the external device if required (pg **Error! Bookmark not defined.**)
- Enter the system menu and select 'Rec-'
- Scroll through the menu and select a maximum recording time (1 equates to 10 seconds)
- Exit the menu
- A flashing dot will appear under the last digit on the display to signify that record mode has been entered
- Hold the sensor at your chosen start position, this does not need to be the calibrated starting position
- Press and hold the On/Off/Calibration/Record button, until the indicator light starts to flash
- Release the On/Off/Calibration/Record button. The indicator light will cease flashing and the system is armed for recording*, but will not start recording yet.
- Move the sensor along the direction or angle as required for the current modulation mode
- When the modulation output moves past the trigger level as set in the system menu, and defaulting at '10', the system will begin to record external data and the indicator light will flash continuously.
- Move the sensor as you wish
- Recording will cease when the On/Off/Calibration/Record button is pressed, or when the recording time, as set in the menu, has elapsed, whichever is sooner.
- The movement pattern has now been recorded**.
- Select 'P' with the modulation mode switch and the recording will play back continuously, modulating the output
- Trim the recording in 'Playback' mode if required with the sensitivity control. Start from fully clockwise (99) and work towards zero.

*Once armed for recording, the device will wait indefinitely for external data. To exit from the armed state without external data, requires pressing the on/off/calibration/record button, or toggling the modulation mode switch.

**The minimum depth control can also be used to trigger recording and can be used to control the waveform to be recorded, rather than using the sensor module. The recorded pattern cannot be saved.

Understanding ADSR, Automatic ADSR mode and ADSR trigger mode

ADSR

The ADSR (Attack, Decay, Sustain & Release) items control the ADSR envelope shape. The envelope can be triggered based on the output level, or the envelope can be automatically triggered. The time periods for each section of the envelope, (Attack rate, Decay rate, Sustain level, sustain time & Release rate) are individually adjustable.

Long duration envelopes like the one shown below are used to make changes that slowly increase and/or decrease, such as arpeggios. The maximum period is 5 minutes.

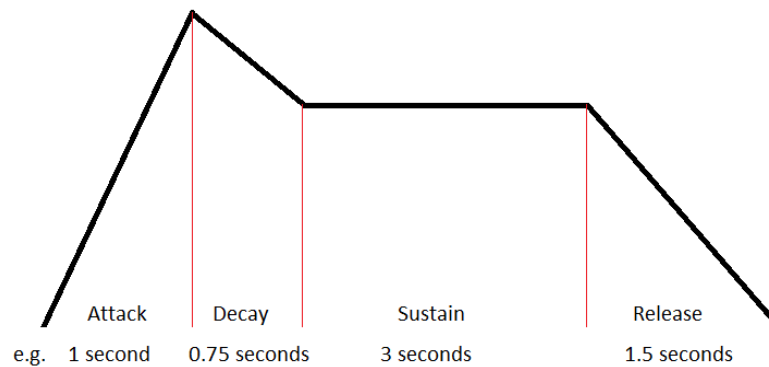**Figure 11 – Long duration envelope**

The picture below shows a short duration envelope in the range of milliseconds. Short envelopes make good tremolo and vibrato effects from pitch and volume parameters.
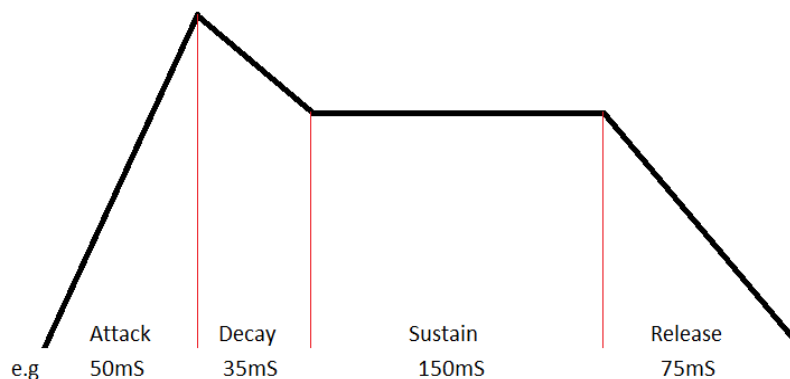

Figure 12 – Shot duration envelope

Not all sections of the ADSR envelope need to be used. The picture below shows only the attack and decay sections in use.
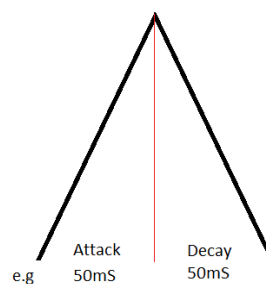

Figure 13 – Limited section envelope

ADSR menu

The ADSR menu consists of the stages of attack rate, decay rate, sustain level, sustain time and release rate. There is also an overall scale adjustment, and also ADSR trigger modes.

The rates can be set between 0 and 99, and 00 which assigns control to the external device. Each increment equates to 10 milliseconds for the attack rate and sustain time. The sustain level is adjustable between 0 and 100%. The decay rate and release rates combine in ratios dependent on the sustain level. Assuming the sustain level is 0, then the decay rate value corresponds to increments of 10 milliseconds. The figure below shows that it takes the same time to rise as it does to fall, for an attack rate of 10 and a decay rate of 10.
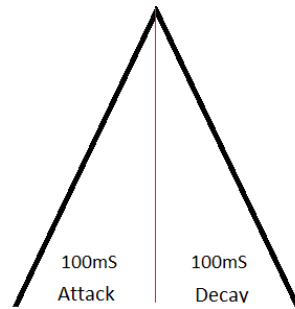
If, however the sustain level is at say 50%, then it will only take half as long to reach the sustain level, and so each increment of the decay rate is actually 5 milliseconds. In addition there now must be some time available to release from the sustain level and fall to zero. This is made up by the release rate whose increments will also be at 5 milliseconds.
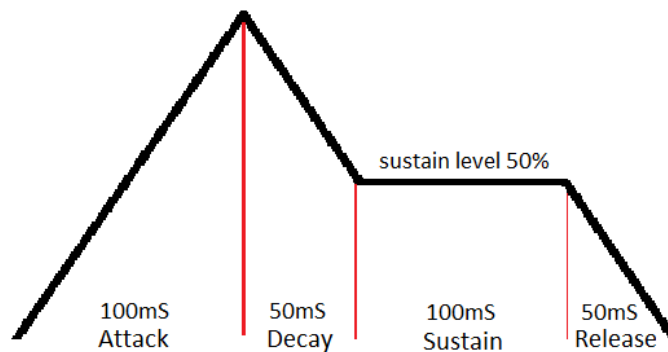

Figure 14 – Decay and release combine to form a single time section

As a final example, if the sustain level is set at 90% then the decay time will be 10 milliseconds and the release time 90 milliseconds.
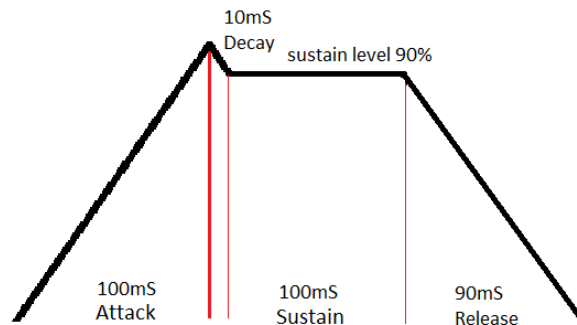

Figure 15 – Release rate increases and decay rate decreases

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Automatic ADSR mode

Automatic ADSR mode will play the ADSR envelope, as set within the menu, over and over again. Automatic ADSR mode is selected with the modulation mode switch choosing 'A'.

Testing automatic ADSR mode

1. Start the unit with the default settings *See system reset pg 27*
2. Choose a parameter to modulate on an effect unit, keyboard or MIDI controller
3. Select 'A' using the mode switch and the ADSR envelop will immediately start playing.
4. Press the on/off/calibration switch so that the ON LED lights
5. Play a note on an instrument, and the modulation will be heard.
   The modulation waveform will be using the default ADSR parameters in the system menu.
6. Access the menu (mode switch + on/off/calibration switch)
7. Rotate the minimum depth control to find "Ar" (Attack rate). This sets how quickly the envelop rises. Set this to 10 using the max depth control.
8. Rotate the min depth control further until "dr" (decay rate) is found. This sets how quickly the envelope will fall to the sustain level. Set this to 10 using the max depth control.
9. Continue to rotate the minimum depth control set SL (sustain level), St (sustain time) and rr (release rate) to zero.
10. Rotate the min depth control to find the Sc (scale setting). This adjusts the overall time for the envelope. Set this at 5.
11. Play a note on the instrument being modulated and the modulation will be heard.
12. Adjust the scale setting for the overall length required.
13. In this example the attack and decay have both been set for 10 x 10 milliseconds. That equates to a 5 Hz vibration (5 times a second backwards and forwards). Settings less than five milliseconds can have unpredictable but interesting results, depending on the other ADSR settings.

ADSR trigger mode

Trigger mode is used to trigger the ADSR envelope. 'Atg1 or Atg2' must be selected from the system menu for trigger mode to function. The maximum depth as set by the maximum depth control, will trigger the ADSR envelope. The shape of the envelop is set in the menu. The stages of the envelope can be set with a minimum time of 50 milliseconds and a maximum of 99 seconds which gives a wide range of possibilities.

When the overall envelope shape is set, the scale setting can be used to vary the time over which the entire envelop executes.

There are four trigger modes

1. One shot (tnno)
   When the modulating output reaches the maximum depth the envelope starts and completes. If the modulation output remains at the maximum depth, the envelope will repeat.
2. Interrupt (tnni)
   When the modulating output reaches the maximum depth the envelope starts and completes unless the maximum depth is reached again at which time the envelope will return to the beginning and start again. If the modulation output remains at the maximum depth, the envelope will repeat.

3. Hold (tnnH)
When the modulating output reaches the maximum depth the envelope starts and holds at the sustain section until the modulating output reaches maximum again, at which time the envelope finishes sustain, begins release, and completes.

4. Repeat (tnnr)
When the modulating output reaches maximum the envelope repeats continuously until the modulating output reaches maximum again, at which time the current repetition completes and stops.

The maximum depth sets the point at which the trigger occurs.

Testing ADSR trigger mode
1. Choose a parameter to modulate on an effect unit, keyboard or MIDI controller
2. *Start the device with the default settings See System reset*
3. Open the system menu (Mode switch + on/off/calibration switch)
4. Scroll through the menu and set ADSR trigger mode on (select 'Atg1' from 'Free / Rec / Atg1/ Atg2'
5. Scroll through the menu and set AR to 30 (Attack rate 30 x 10mS = 300 milliseconds). The default settings for the other envelope values will be OK.
6. Scroll through the menu and set the trigger mode to trigger the envelope just once ('tnno – Trigger One shot)
7. Exit the menu (Mode switch + on/off/calibration switch)
8. Change to 'External' mode
9. Activate the external device so that the maximum depth is read on the display
10. The envelope will play once using the ADSR settings. Attack rate is 30 so there will be a slow rise before the envelope completes
11.
    o Change the trigger mode to hold. ('tnnh' – Trigger Hold)
    o Activate the external device so that the maximum depth is read on the display
    o The ADSR envelop will start and stay in the sustain section indefinitely
    o Reach maximum depth again, and the envelop will complete

12.
    o Change the trigger mode to repeat. ('tnnr' – Trigger Repeat)
    o Activate the external device so that the maximum depth is read on the display
    o The ADSR envelop will repeat continuously
    o Reach maximum depth again, and the envelop will complete

The sensitivity control has no effect at all when in automatic ADSR mode. When in ADSR trigger mode the sensitivity control functions as it would for any mode, as a step size control.

Using the modulator as a foot switch

Some effects units/keyboards/MIDI controllers, have sustain sockets, footswitch sockets or expression sockets that have foot switch functionality. The function of the switch, as well as the type of footswitch required, is dependent on the brand and model. Footswitches may be momentary or latched, footswitch devices may contain a single footswitch or two or three switches. The function of a footswitch may be to change presets, change banks, start and stop loopers and select other built-in functions. The specific devices user manual will need to be referenced. There are many types and this modulator will not function as a footswitch will all of them. Some examples are shown here -

Zoom® effect products often have an expression socket that also accepts a footswitch. The footswitch required is a single switch connected to a TS (mono) cable. To use this enhancer as a footswitch with these products, set the polarity to TS and use a TS (mono) cable. The switching can be activated in three ways

1. Turn the minimum depth control to fully clockwise (127). The on/off/calibrate button or remote on/off function can now be used for switching.
2. Set the step size to 127; turn the output on; The external device will function as a switch wnever 127 is reached.
3. A pre-recorded pattern will activate switching, whenever maximum output (127) or zero is reached

TC Helicon ® effects often use a three switch unit with a TRS cable. Switch one is activated by joining tip to sleeve; Switch two is activated by joining ring to sleeve; Switch three is activated by having the tip joined to the ring, and then joining them to the sleeve.

All three switches can be simulated by the modulator, but only one at a time. The switching is enabled in the following ways –

- Switch 1 – Set the modulator to TRS
- Switch 2 – Set the modulator to RTS
- Switch 3 – Set the modulator to RS

The switching can be activated in three ways

1. Turn the minimum depth control to fully clockwise (127). The on/off/calibrate button or remote on/off function can now be used for switching.
2. Set the step size to 127; turn the output on; The external device will function as a switch wnever 127 is reached
3. A pre-recorded pattern will activate switching whenever the maximum output (127) or zero is reached

There are many devices available that have footswitches that interface in different ways and so the devices user manual needs to be referenced to setup the function of the footswitches and also the type (momentary / latched).

Default settings

The following parameters are found at first power on and after a factory reset.

System Menu item	Default parameter	Step size Menu item	Default parameter
		Step size	1
Use mode	Free	1	20
Resistance	12Kohms	2	26
		3	33
Polarity	TRS	4	40
Log / linear scale	Linear	5	48
		6	66
Record trigger level	10	7	76
Record time	1	8	88
Reverse sweep	No	9	98
Off Level	0	9	111
ADSR items		10	127
Attack rate	5	11	127
Decay rate	5	12	127
Sustain level	64	13	127
Sustain time	2	14	127
Release rate	5	15	127
		16	127
Scale	1 x the entire waveform	Preset*	0
Trigger mode	Repeat		

All ten available presets have the same default system, calibration, ADSR and step size, settings

The default settings can be restored by using the system reset function (pg 27).

Menu item order

System items		
Item	Identifier	Range
Use mode	Free / Atg1 / Atg2 / Rec	Free / Atg1 / Atg2 / Rec
Resistance	R	12, 25, 50
Polarity	P	trS, rtS, tS, rS, CV
Logarithmic / Linear scale	Log	-(linear), L(log), A(anti-log)
Trigger level	tL	0 – 99
Record time	Rt	1-99
Reverse sweep	rS	No / Yes
Off Level	l	0 – 128

ADSR items		
Item	Identifier	Range
Attack rate	Ar	0 – 99 – 0.
Decay rate	Dr	0 – 99 – 0.
Sustain level	l	0 – 127 – 0.
Sustain time	St	0 – 99 – 0.
Release rate	Rr	0 – 99 – 0.
Scale	SC	1 – 99 – 0.
Trigger mode	T	nno / nni / nnH / nnr
quit / save	quit /save	quit / save

Step size items		
Item	Identifier	Range
Step size	S	0 – 127
Step 1	1	0 – 127
Step 2	2	0 – 127
Step 3	3	0 – 127
Step 4	4	0 – 127
Step 5	5	0 – 127
Step 6	6	0 – 127
Step 7	7	0 – 127
Step 8	8	0 – 127
Step 9	9	0 – 127
Step 10	10	0 – 127
Step 11	11	0 – 127
Step 12	12	0 – 127
Step 13	12	0 – 127
Step 14	12	0 – 127
Step 15	12	0 – 127
Step 16	12	0 – 127
quit / save	quit /save	quit / save

Preset items		
Item	Identifier	Range
Preset	PS	0 – 9

Step size settings for various devices

Arturia® MiniBrute

2	4	6	9	11	14	16	19	21	24	26	29
C#	D	D#	E	F	F#	G	G#	A	A#	B	C

Yamaha® MOTIF XS6

6	9	11	14	16	19	22	24	27	31	32	35
C#	D	D#	E	F	F#	G	G#	A	A#	B	C

Zoom guitar effects G series®

20	26	33	40	48	58	66	76	88	98	111	127
C#	D	D#	E	F	F#	G	G#	A	A#	B	C

Behringer® Ultra Shifter / Hamoniser US600

6	12	16	23	30	42	50	63	77	93	107	127
C#	D	D#	E	F	F#	G	G#	A	A#	B	C

Digitech® RP360

30	36	44	52	60	68	76	85	94	103	113	127
C#	D	D#	E	F	F#	G	G#	A	A#	B	C

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Trouble shooting

Problem	Resolution
The display and modulation does not change	Check minimum depth control Check maximum depth control Check sensitivity control
The display and output change erratically	Check sensitivity control
Output is too sensitive	Reduce sensitivity control
Nothing is playing back after a recording	Reduce sensitivity control (trim)
The channel indicator is not lit	Indicator only lights in 'E' external mode
Modulation is not smooth or jumps large steps	Check polarity setting and/or resistance settings
Display is functioning smoothly but there is no modulation effect	• Turn modulation on • Check polarity and/or resistance settings • Check setup of device being modulated
Modulation jumps in steps	Normal operation. Check 'step size' setting and/or linear/logarithmic settings
Recording is armed but does not begin	Record trigger level set too high
The angle over which modulation occurs is too large or too small	Re-calibrate
No lights and no display	Check power adapter configuration
Calibration is not working	Check that 'free' or 'AtrG' mode is selected in menu
Modulation is not triggering the ADSR envelope on and/or not triggering it off	Ensure that maximum depth is being reached to trigger the envelope
Automatic ADSR modulation is not smooth	Check ADSR settings. Settings less than 5 for attack and decay rates simultaneously whilst the scale is less than 2, are not supported
Menu cannot be accessed or exited	Ensure the correct order of switch and controls is used (pg 17)
Not working properly after menu exited	• Check minimum depth control • Check maximum depth control • Check sensitivity control
Many menu item values have changed accidently	Be careful not to move the maximum depth control when moving through the menu items with the minimum depth control
The automatic arpeggiator timing is off	Adjust the maximum and/or minimum depth controls as required
The controls skip a number	Turn the control slowly or turn the control to maximum and try again
Everything has been tried, but it won't work, or it seems stuck	• Turn power off and on • Load default settings (system reset) • Contact Oz Inventions

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Modulator-Receiver specifications

- 9 – 12 volt; Negative centre (tip)
- Current draw 60 – 80mA
- Expression connection electrical resistance 12Kohm, 25Kohm and 50Kohm
- Expression jack type- ¼" (6.35mm) stereo (output)
- Expression jack type- ¼" (6.35mm) stereo (input)
- Polarity - TRS, RTS, TS, RS or CV (0 – 5v; 2mA maximum)
- Dimensions - L 112mm x W 60.5mm x H 31mm
- Weight - 0.175 Kg (175 grams)

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