

# Guitar amplifier AMT SH-100R

## Quick start

### A little bit of history

For AMT the quest to reproduce tube amp characteristics in a foot pedal began about 10 years ago. Our engineers discovered a way to create a "tube" like sound using cascade modeling semiconductor devices and the design of the first "Legend Amps" series began.

**LA-1.** With the release in 2008 of the first Legend Amps pedals, guitarists got the opportunity to have at their disposal compact pedals simulating preamplifier overloads which became legendary for guitar players. Cascades with JFET transistors and Schottky diodes were the base for overloading and grid limiting.

**LA-2.** During the next several years, the AMT engineers were working on improvements of the first series, taking in mind "non ideality" of the first series modeling, and a new series appeared in 2012.

The list of modeled amps was significantly expanded, a new and effective way of "triode" limiting was applied, and the schematic of a cabinet simulation became more complicated. The additional drive output was implemented, that gave the opportunity to plug the device directly to the input of an amplifier's Clean channel and use the LA-2 series device as a drive pedal.

However, despite the obvious successes, the quality of emulation in terms of full compliance with the originals left much to be desired, primarily due to restrictions on the supply voltage (recall pedals are powered by a voltage source + 9..12V). Increasing the voltage in the preamp SS-30 "Bulava" and the amplifier StoneHead-50 helped in many ways to get rid of these limitations and improved the brightness and dynamics of the sound.

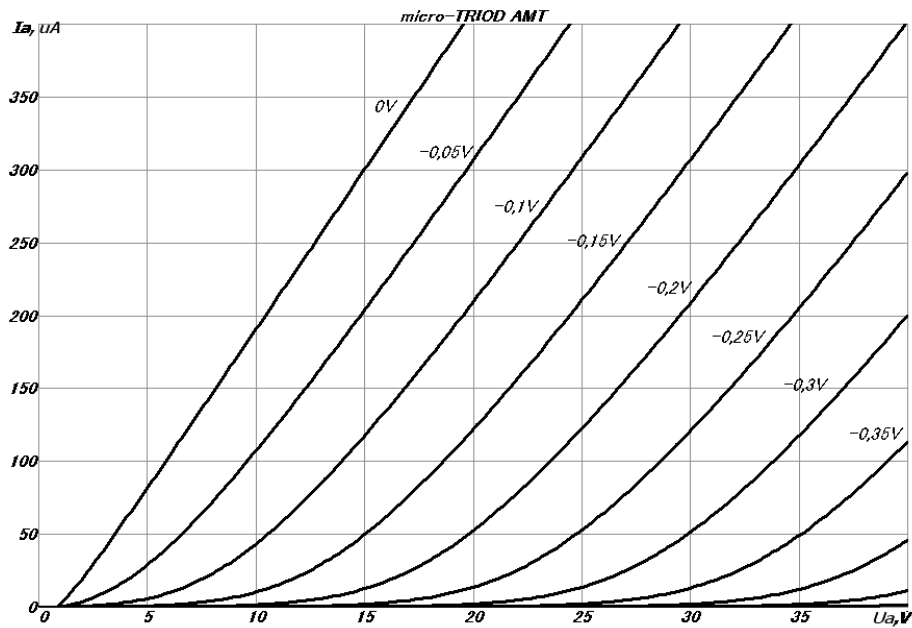
The power amplifier "StoneHead" SH50-4 can be called the "crowning" of the emulation technology applied in the LA-2 series. It is no coincidence it was warmly accepted by the guitar community and many guitarists are happy to use this compact, lightweight, and functional power amplifier in rehearsals and on tour..

But despite the restrictions due to low voltage, which makes the emulation of LA-2 not ideal, there is a fact that LA-2 emulates only tube limitations without taking in mind the "triodeness" of voltage-current characteristics inherent to real tubes, which significantly impacts the overall sound

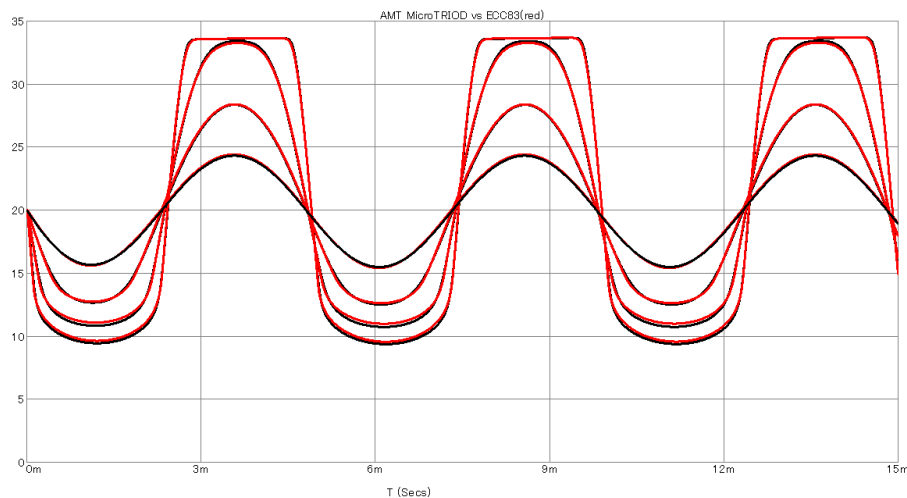
**LA-3.** The development in 2013 of solid-state analogues of 12AX7 tubes has created the basis for the emergence of solid-state preamps, virtually copying the behavior of tube prototypes and giving impetus to the development in 2014 of micro-triodes (basic of LA-3 series), i.e., the devices with the voltage-current characteristics which are miniature replicas of the characteristics of the vacuum triode. A lot of work had been done during 2014 to make the micro-triodes have characteristics which have a complete vacuum prototypes' identity (including scale). In 2015 the company began to develop a new LA-3 line.

### Some words about micro-triodes.

The new AMT analog modeling technology is based on the use of micro-triodes, which have reduced copies of the electrical characteristics of real vacuum tubes. You can take an image of the anode characteristics of a conventional "guitar" ESS83 (12AX7) and compare them with the following picture, which shows the AMT micro-triode "anode" curves and make sure that the forms are almost identical and differ only in scale.



They behave themselves identically during the guitar signal processing and provide practically the full spectrum of vacuum tube characteristics.



With the use of micro-triodes, the schematics of tube amplifiers' prototypes remain practically unchanged, only power voltages are reduced in K times and the signals in the device are simply K-times reduced copies of the ones of the real tube amplifier. With this approach, all the subtleties within the cascade signal changes and all nuances of inter-cascades interactions are reproduced.

## 1. Something about the AMT StoneHead SH-100R amplifier



The first-born of the third generation of emulation technology is a “StoneHead” heir SH-100R – a rack mounted full 4-channel amplifier. This amplifier concentrates the latest developments in the field of AMT solid state tube emulation technology. Playing through this amp, you can feel that same "tube-like" response and feedback, which was still a bit lacking in previous versions. You can experience the musical processing of sharp attacks when you catch yourself thinking that you want to overload these stages to enjoy the richness and rightness of the resulting sound.

SH-100R is a four channel, 1U rack mounted 100 Watt guitar power amplifier intended for use in the studio and live performances.

### Architecture and features of the SH-100R guitar amp:

Preamp section consists of four fully separate channels.

Each channel has a separate tone-stack, sensitivity and level controls.

The amplifier has a serial Effect Loop which can be switched off.

The SH-100R can work with Guitar cabinets (sockets for 8 Ohm and 16 Ohm) or directly to a mixer, a sound card, the line input of a broadband amplifier. It has a balanced XLR output and a special output for headphones.

The output power is the same (100 watts) regardless of whether you choose an 8 ohm or 16 ohm speaker load.

The SH-100R amplifier can be used without a load, with no risk of breakdown (unlike a tube amplifier).

Channel 1 is focused on the classic clean sound with graceful light overloading at maximum sensitivity and crystal clarity and brightness at moderate sensitivity values. The channel has a standard tone stack (treble, middle, bass) and gain control. As an addition, channel 1 has a knob "Voicing" and a switch "T.Shift" that expand the range of tone regulation.

Channel 2, unlike channel 1, produces a much higher overall gain. The channel has classic regulators – sensitivity, level and three tone controls. It has a switch for two modes, which differ in the general level of sensitivity, and the final tone. LOW mode allows rounded sound perfectly suitable for many mild styles. HIGH mode has a bright "mod" sound.

The third channel is the most versatile. In view of the available HIGH/LOW gain switch and the additional VOICING control, that extends the overload range from classic British crunch to modern heavy "American" saturated gain

The fourth channel has the most aggressive sound. The channel features a spectral and timbre balance, which allows you to get Screaming Artificial Pinch Harmonics and produces brilliant readability with fast passages. Two modes of the channel allow you to choose a more “fat” or a more “dry” sound.

Power amp section has two switchable volume controls “MASTER VOLUME” and also two additional controls “PRESENCE” and “RESONANCE”.

## 2. Speaker protection and “POWER” LED

The SH100R amplifier’s “POWER” LED indicates not only the presence of the mains supply, but also some other conditions.

After pressing the “POWER” switch, “POWER” LED blinks several seconds by a green light. An on-board microcontroller assesses some conditions:

- Rightness of power supply voltages
- Absence of DC voltage on the amp’s output
- States of output jack connectors “8 Ohm” and “16 Ohm” (Plugged cables or not?)

If the supply voltages are normal, the output of the amplifier has no DC voltage and only one of the output connectors is busy, then:

- "POWER" LED constantly lights with a green light
- Amplifier's output is connected to output jack connectors "8 Ohm" and "16 Ohm"

If the supply voltages are normal, the output of the amplifier has no DC voltage but none of the cables is plugged in the output connectors, then:

- "POWER" LED constantly lights with a red light
- Amplifier's output isn't connected to output jack connectors "8 Ohm" and "16 Ohm"

If "POWER" LED blinks by a red light, it means that some failure has occurred:

- the supply voltages aren't normal
- DC voltage presents on the amp's output

In this case the amp's output is disconnected from the output jacks "8 Ohm" and "16 Ohm"

Speakers' protection is being fulfilled in such manner.

### 3. Amplifier's control with FootSwitches

There are two jack sockets on the amp's rear panel for connecting external Footswitches

A Foot switch connected to the socket "AB\Loop" has no special features and work in a clear way. By pressing one button you choose master section A or B, by pressing the other button you switch On or Off the amp's effect loop.

A Foot switch connected to the socket "#CH 1-4" has two different working modes of channels' switching. Let's name them RING and ZIGZAG.

The mode RING

short pressing on one FootSwitch button switches channels with increment - 1\_2\_3\_4\_1\_2\_... around the ring;

short pressing on another FootSwitch button switches channels with decrement - 4\_3\_2\_1\_4\_3\_... around the ring;

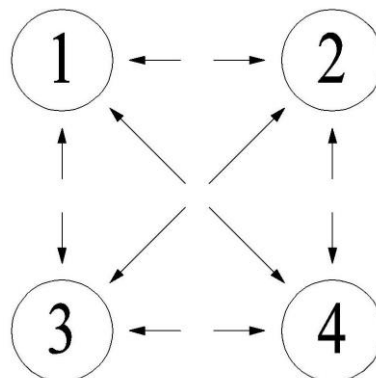
For choosing the mode RING, you have to press the button "CHANNEL 3" on the amp's front panel and to hold it pressed more than 2 seconds, until the LED "CHANNEL 3" would make a blink.

The mode ZIGZAG:

short pressing on one FootSwitch button switches channels 1 and 2 sequentially - 1\_2\_1\_2\_1\_2\_...;

short pressing on one FootSwitch button switches channels 3 and 4 sequentially - 3\_4\_3\_4\_3\_4\_...;

with transition from button to button, the chosen (in a pair) button's channel number is stored for being switched on after returning on the button.



Pic. 1. Possible channels' pairs for switching in ZIGZAG mode.

This feature lets you to make sequential switching of any pair of channels by alternate pressing of two buttons, as it is shown on the Pic. 1.

For choosing the mode ZIGZAG, you have to press the button "CHANNEL 4" on the amp's front panel and to hold it pressed more than 2 seconds, until the LED "CHANNEL 4" would make a blink.

As a common case you can to use FootSwitches both as with latching or non-latching buttons. They have different logic of work. Compatibility problem was solved via program means.

However, this approach requires some restriction on work with buttons.

The common rule looks like:

- quickly release a pressed button and press it no more than 4 times per second.

When following this rule, the type of buttons does not matter.

### **Relay channel switching (this function is realized in the versions since 2019)**

In addition to channel switching with footswitches, you can use the # CH 1-4 TRS socket for relay amp's channel control with an external relay controller.

<b>Relays</b>	<b>States</b>	<b>Channel</b>
<b>Relay 1 (tip) Relay 2 (ring)</b>	<b>Open Open</b>	<b>CLEAN</b>
<b>Relay 1 (tip) Relay 2 (ring)</b>	<b>Closed Open</b>	<b>CRUNCH</b>
<b>Relay 1 (tip) Relay 2 (ring)</b>	<b>Open Closed</b>	<b>LEAD 1</b>
<b>Relay 1 (tip) Relay 2 (ring)</b>	<b>Closed Closed</b>	<b>LEAD 2</b>

Pic. 2 Relay control over channel switching.

Figure 2 shows the table of correspondence between the number of the turned on channel and the states of Relay 1 (TIP) and Relay 2 (RING) TRS socket contacts.

For choosing the mode RELAY, you have to press the button "CHANNEL 2" on the amp's front panel and to hold it pressed more than 2 seconds, until the LED "CHANNEL 2" would make a blink.

In this mode, if a connector is plugged into the # CH 1-4 socket, the front panel button control over channels is cancelled.

MIDI in the RELAY mode:

- Incoming channel switching MIDI commands are not executed, but are retransmitted to the MIDI OUT.  
- when some channel is chosen via # CH 1-4 socket, a corresponded midi command is sent via MIDI OUT.

## 4. Storage of working state and default settings

After switching Off and after switching On the “POWER” switch, the amp’s working parameters are stored or restored respectively:

- chosen channel’s number (channel 1 is default)
- Master section A or B (A is default)
- LOOP\_ON or LOOP\_OFF (LOOP\_OFF is default)
- chosen MIDI commands set (see midi\_SH100R for default settings)

***As default, you ought to understand the after production settings***

## 5. DIP-switches of MIDI settings

Four first DIP-switches (MIDI) define the midi channel number in binary code.

MSB (Most Significant Bit) – the first switch S1

LSB (Least Significant Bit) – the fourth switch S4

Channel №1 corresponds to a binary code 0, Channel 16 corresponds to a binary code 15.

A switch is On when its lever is in Down position.

The switch S5 enables the mode OMNI for received executable commands.

The channel number for transmitted MIDI commands is defined by the S1...S4 settings.

The switch S6 lets the execution of the command MUTE, CC#7.

The executed command MUTE isn’t stored when turning the power off.

All DIP-switches ought to be set in needed positions when the amp’s power is Off.

The on-board microcontroller reads their states only once, when turning power On.

## 6. MIDI command programming

### 6.1 entering programming mode

- press the "CHANNEL 1" button for more than 2 seconds until the LED "CHANNEL 1" begins blinking.

The LED "POWER" will begin blinking with Red and Green lights. This means that we are in the programming mode.

All the other LEDs are dark.

The amp's input is in Off state,

the amp's out is disconnected from output jacks "8 Ohm" and "16 Ohm".

### 6.2 Choosing a button for programming

- after a short pressing a button, a corresponding LED begins to blink.

LED "MASTER A" corresponds to the button "MASTER A/B"

LED "LOOP" corresponds to the button "LOOP"

### 6.3 Send to the MIDI IN the command for programming of the button, which LED is blinking.

The sent command is not being executed in the programming mode.

The sent command is not being retransmitted in the programming mode.

You ought to send PC commands for CHANNEL 1...CHANNEL 4 buttons.

You ought to send CC commands for A/B and LOOP buttons.

There can be any channel number in the programming command's status byte.

In working mode, the channel number in the command has to correspond to the DIP-switches settings (see p.5).

When programming, the first data byte, which follows directly after the status byte, can have an arbitrary value.

For CC toggle commands (buttons LOOP and A/B), the second data byte (CC2) has to be set as it is in default commands (see p.6.6 below)

### 6.4 The sent command is stored, the button's LED stops blinking and constantly lights. This means that the command is written.

The next sent commands will not be written for this buttons. Short pressing on the button will return it in the programming mode and the LED will be blinking again.

The LED of the programmed button will be lighting constantly. When you press the other button, its LED will be blinking.

If the type of the sent MIDI command does not correspond to the press button (see p.2.3),

The button LED will burn constantly for one second. LED "POWER" will burn red. Then, the both LEDs will be blinking again.

This shows that that the received Midi command has a wrong type and the programming hasn't been fulfilled.

If during programming, the same command would be written for two buttons, for example, buttons A/B and LOOP, then in the working mode this command would be fulfilled according to priority (buttons Channel 1,2,3,4, LOOP, A/B) only for one button, in this case for the button LOOP.

Similarly, if a command would be written for the "CHANNEL 1...Channel 4" buttons, then it will only be performed for the "CHANNEL 1" button.

### 6.5 To exit programming mode with a programmed MIDI-commands' set – press the button "Channel 1" for more than 2 seconds, until the LED "Channel 1" would be lighting constantly.

To exit programming mode with a Default MIDI-commands' set – press the button “A/B” for more than 2 seconds, until the LED “A” would be lighting constantly.

So, you can use two sets of MIDI-commands for you to choose. To select the desired one, you have to enter programming mode and to exit in a proper way.

The selected set is being stored in the microcontroller's memory and there is no need to set it after turning on the power.

Initially, MIDI-command programmed set is the same as the Default set.

## 6.6 MIDI Commands' default set

Button “Channel 1” -- PC#0

Button “Channel 2” -- PC#1

Button “Channel 3” -- PC#2

Button “Channel 4” -- PC#3

Button “LOOP” CC#15 (CC2 = 64...127 -- LOOP\_ON; CC2 = 0...63 -- LOOP\_OFF)

Button “A/B” -- CC#14 (CC2 = 0...63 -- A\_ON; CC2 = 64...127 -- B\_ON)

Preprogrammed MUTE command is being enabled with the 6th DIP-switch.

MUTE -- CC#7 (CC2 = 64...127 -- MUTE\_ON; CC2 = 0...63 -- MUTE\_OFF)

Note:

- in the received CC (switching) command, the second data byte (CC2) with a value 0...63 is treated as 0, with a value 64...127 is treated as 127.

- When sending CC command, the second data byte (CC2) has a value 0 or 127, according to a button's state.

## Specification

- |                                    |              |
|------------------------------------|--------------|
| 1. Load impedance                  | 8/16 Ohm*    |
| 2. Main AC Power (universal input) | 85~265VAC    |
| 3. Weight (without package)        | 2.85 кг      |
| 4. Weight (with package)           | 3.26 кг      |
| 5. Output Power                    | 100 Watt     |
| 6. Dimensions:                     |              |
| Width:                             | 480 mm / 19" |
| Depth:                             | 170 mm       |
| Height:                            | 45 mm/1U     |

**Note:** The amp can be used without a load.

## 7. Complete set

- 1. Amplifier SH-100R 1pc.
- 2. AC main power cable 1pc.
- 3. User manual 1pc.
- 4. Warranty card 1pc.
- 5. Package 1pc.