HardWay
VINTAGE ELECTRONICS

RangeMaster – Gen. VI

Owner's Manual

October 2020

Thank you for purchasing a HardWay RangeMaster. Here are some things you should know: There will be a test later.

The HardWay RangeMaster is an accurate reproduction of the original legendary Dallas Rangemaster Treble Booster of 1966. There are a total of 10 Generation VI units built, numbered from RM01 to RM10. The serial number is written on the bottom outside of the unit, and on the inside, near the terminal strip.

Not very many original Dallas Rangemasters were built (nobody knows how many) and they were hard to find, even in the 1960s, even in England, where they were made. Moving ahead to the 21st century, I saw an original one on eBay the other day, listed for $5,000.

The Rangemaster is a simple circuit, centered around a Germanium transistor (usually a Mullard OC44 or NTK 275 or a Mullard OC 71). The circuit consists of 1 transistor, 3 resistors, 4 capacitors, a potentiometer, a switch, and a battery.

The preset pot was usually 10K or 20K. The boost knob was scratchy when adjusted, due to the DC voltage present on the pot. This is the way the original was designed; it is normal for this device.

The Gen. VI HardWay RangeMasters use OC44, OC71, SFT306, or CV7003 Germanium transistors; they are all very similar in specification to the OC44 (I can't tell the difference in tone or behavior). The gain of the Germanium transistors used in the series ranged from 71 to 117. (True gain, which is apparent gain minus leakage.)

Two of the three resistors are used to bias the transistor; their values will be different from unit to unit, because each transistor is slightly different and is biased to the middle of its range. On the inside of the RangeMaster you will find the gain measurements of the transistor used in your device and the values of the bias resistors for that particular transistor. Here is an example:

OC44	(the type of Germanium transistor)	
hFE	78	(True Gain [apparent gain minus leakage])
Ic	.023	(leakage in mA)
Re	3K9	(Emitter bias resistor value)
Rb1	37K	(Base bias resistor value

Each Germanium transistor in each RangeMaster is biased at a battery voltage of 8.2 VDC. This is about mid-way between a new battery and a dead battery, and insures that you will get optimum performance of your RangeMaster throughout the life of the 9V battery. A 9V “wall wart” supply is not an option; this is a PNP device. Almost all "stomp boxes" are NPN. You cannot power the HardWay RangeMaster from a 9VDC supply, since almost all of them are negative ground, and the RangeMaster is positive ground.

Germanium transistors are temperature sensitive. I bias the transistors at 70 degrees F.

In the summer, or under hot lights, the temperature rises, and the gain of the transistor will rise. Just something to be aware of. (This is true of the FuzzFace, another legendary vintage Germanium effect, and it has been said that Stevie Ray Vaughn liked his FuzzFace to be hot, so he could take advantage of the extra gain.)

The transistor is in a socket, so is removable in the event of failure or if you want to change to a different transistor. For your information, the transistor should be inserted into the socket with the Collector leg (usually marked with a dot or a notch) on the right when looking at the face of the device. If you replace or change the transistor you should check the bias.

CHECKING BIAS: (Use a fresh battery, unplug both jacks, turn unit off, remove cover.)

Set your DMM for DC Volts.

(facing the front of the unit, the terminal strip has 6 pins - numbered from right to left.)

Attach the black (ground) lead to pin #1

Attach the red (positive) lead to pin #2 (the collector leg)

Turn on unit.

You would like to see between -6.5 and -7.2 Volts (Remember the OC44 is PNP, so Positive ground)

If the measurement is out of range, you need to change the bias resistor values to bring it into range, or you may need to replace the transistor.

OPERATION:

The RangeMaster is not a "Stomp Box". It was meant to reside comfortably on the top of your amp. The switch was not really meant to be switched on while playing (you either played with it ON or OFF; no switching during a solo).

The Boost control is sensitive, and as mentioned earlier, scratchy, so it, too, was meant to be set at the "sweet spot" and then left alone. Some nice distortion, gain, and harmonics are evident even at low Boost settings. Turning the Boost up just makes it more aggressive. And louder.

The RangeMaster is not exactly delicate, but it does not appreciate rough handling, and dropping it or throwing it around can have negative outcomes. Warning.

Unplug your RangeMaster and turn it off when you are done playing with it. If you don't, you will drain the battery, and then you will have to undo the screws holding on the cover and replace the battery. this is a pain, so you will learn to turn it off when you are not using it. The 9V battery lasts a very long time if you keep it turned off when not in use.

The RangeMaster should be the only device between your guitar and your amp. Because it is a PNP device, and because of circuit impedance peculiarities, it doesn't do well when connected to other boxes. You won't hurt anything if you try it with multiple devices, but you might not like it.

The RangeMaster likes tube amps. It is not so fond of solid-state amps, and you won't get the best performance out of the unit when plugged into a solid-state amp.

I hope you have many years of enjoyment with your HardWay RangeMaster.

If you have any questions or comments, you can always email me at d.hayward@hardway-vintage.com

Thanks again, and

Best Regards,

Don

HardWay RangeMaster Gen. VI

3-position Boost Frequency Control

Approximate Frequency Cutoff

The formula for cutoff frequency is $f = 1 / (2 \times \pi \times R \times C)$

Telecaster pickup 7800 Ω
(A humbucker is about twice that, so the freq. would be half)

Capacitance			Freq.	
Middle	**Stock**	0.00005 Farads	**408**	Hz
Position 1	**Wide**	0.00015 Farads	**136**	Hz
Position 3	**Full**	0.00053 Farads	**38**	Hz
Alternate Stock*		0.000068	300	Hz

Pos 1 is 0.01 & Stock in parallel
Pos 3 is 0.047 & Stock in parallel
* Original Rangemasters sometimes had this value

String	Frequency	Scientific pitch notation
1 (E)	329.63 Hz	E4
2 (B)	246.94 Hz	B3
3 (G)	196.00 Hz	G3
4 (D)	146.83 Hz	D3
5 (A)	110.00 Hz	A2
6 (E)	82.41 Hz	E2

Highest note on guitar (24 frets) 1318.51 Hz

The **RangeMaster** is a treble booster.
In its stock configuration, the .005µF input capacitor set the cutoff at ~408 Hz. Everything above this frequency was boosted.

On the guitar, that means anything higher than the G# on the high E string (G# 4) is boosted.

That's anything from the fourth fret on the high E string on up. (And of course, any equivalent frequencies played on other strings.)

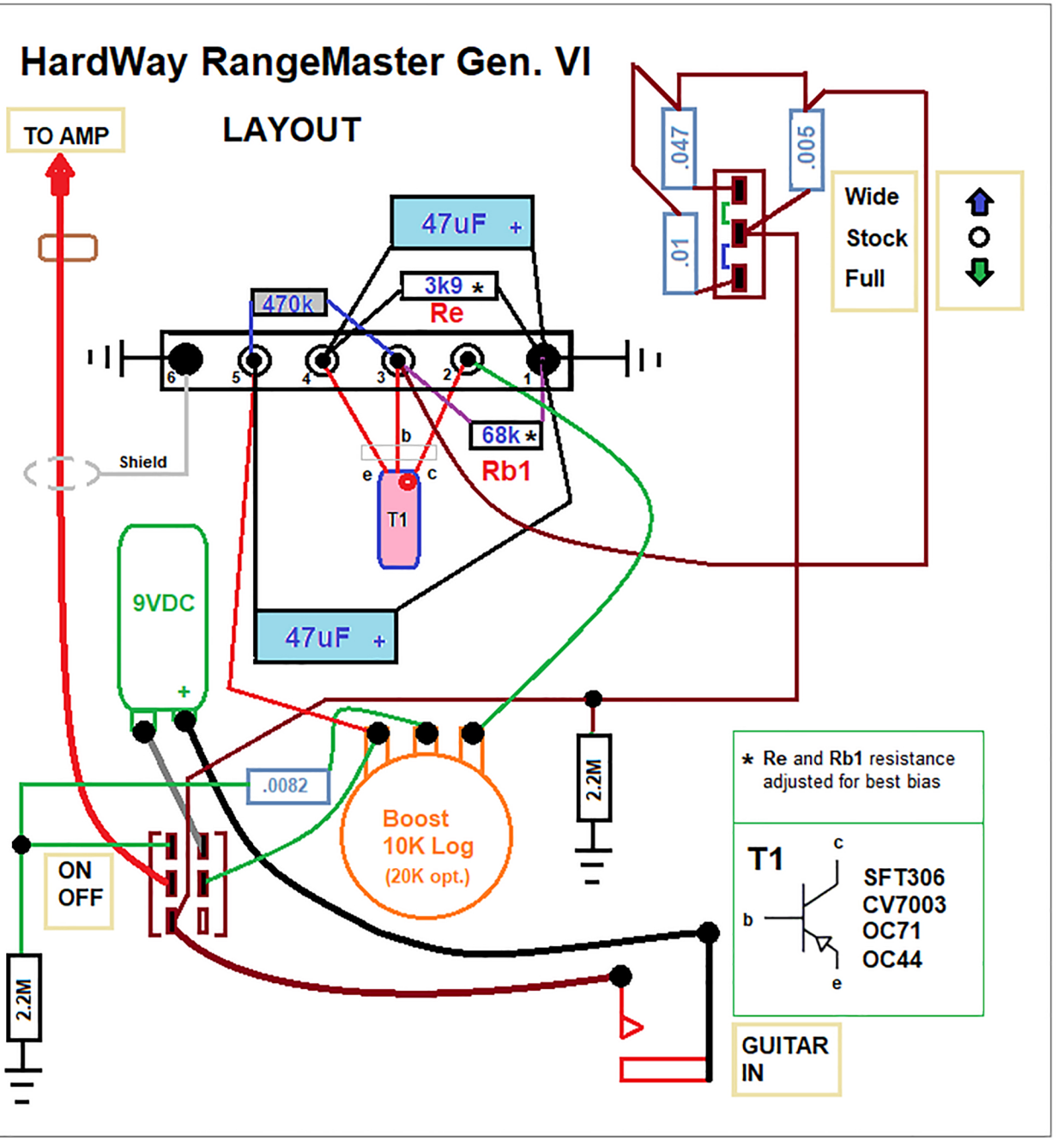
The Gen. VI modification to the input capacitor widens the range of the boost to include more of the lower guitar frequencies.

The chart to the left shows the cutoff change by adding a capacitance in parallel to the stock tone cap. The auxilliary cap can be switched.

The most common "Full Range" capacitor is .01 µF in parallel with the stock .005, which changes the cutoff to 136 Hz. A big change, very noticable.

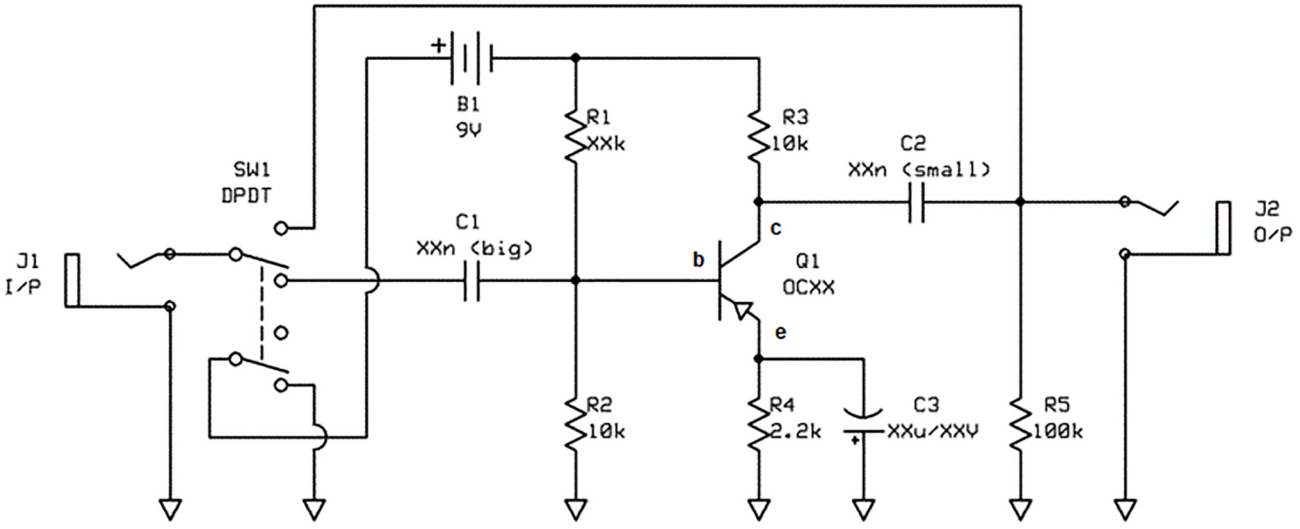
A true "Full Range" though, would be a .047 µF in parallel, which changes the cutoff to 38 Hz, and includes all the open strings of a guitar.

The modification here uses a 3-way switch for the three settings described.


HardWay RangeMaster Gen. VI
LAYOUT
TO AMP
47uF +
3k9 *
Re
470k
6
5
4
3
2
1
Shield
b
e
c
T1
68k *
Rb1
47uF +
9VDC
+
.0082
Boost
10K Log
(20K opt.)
2.2M
ON
OFF
2.2M
.047
.005
.01
Wide
Stock
Full
* Re and Rb1 resistance adjusted for best bias
T1
c
b
e
SFT306
CV7003
OC71
OC44
GUITAR
IN

DALLAS RANGEMASTER TREBLE BOOSTER

Germanium PNP



(1966)