Riz PD-8 RUP-15 HF Transceiver

Carbon Microphone Modification (and PA BIAS setting)

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INTRODUCTION

Although this piece of equipment was originally designed for war, it is an interesting paradox that it has now fallen into the hands of many Radio Amateur Operators who, by their efforts to communicate on the HF bands, promote better understanding and tolerance of their fellow man throughout the earth.

To promote further use by Radio Amateurs - and not in any way to promote or glorify war - here is my modification which unlocks the quality of the Riz PD-8 (RUP-15) and allows it to be enjoyed.

THE BACKGROUND

This transceiver operates in CW, LSB and AM (actually LSB + carrier) modes, producing around 10 to 15 watts output. The PA is practically indestructible!

Many Radio Amateurs must have bought this piece of equipment, being very happy to discover that it is LSB rather than USB - then finding, to their horror, that the voice transmission is so bad as to be almost totally unreadable!

Provided that it has not been "re-adjusted" by a screwdriver expert - this equipment is excellent in all aspects of its design - with just one exception - the choice of a Carbon Microphone rather than Moving Coil type! Sadly, this choice of microphone has given this radio an undeserved bad reprutation.

If you own, or are thinking of buying one of these sets, it is absolutely essential that you perform this modification.

THE MICROPHONE MODIFICATION

First obtain, from various surplus sources (or old equipment), a British Army Earpiece (green) or Microphone Insert (red) as shown below.

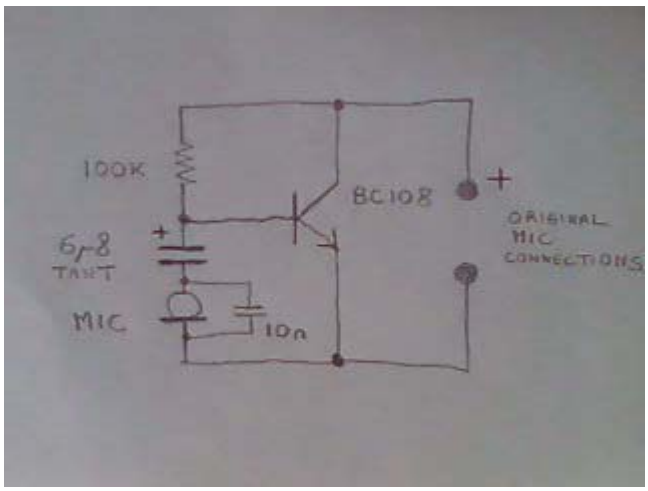
These inserts can be positively identified by measuring the DC resistance which will be 42 ohms at around 20 degrees C.

You can use either the red (mic) or green (earpiece) insert as the new microphone for your Riz PD-8 handset, but, in my opinion, the green insert gives a slightly better audio response and marginally higher output. This is despite the green insert really being intended as an earpiece!

You now need to build a very small and deceptively simple amplifier, using just a single transistor, to bring this microphone output up to the level of the original carbon microphone insert. This amplifier has only four components which can be built directly onto solder tags on the back of the new mic insert. You can make a "crude-but-effective" job - or, take your time to build a small board which will mount directly onto the screw terminals of the insert. If you decide to build a board, it can be made just the right size to slot into the handle of the handset when the insert is put into place - when it will also prevent the mic insert rotating when screwing on the mic cover...

THE CIRCUIT

The circuit is shown below. The transistor may be any of the BC107/BC108/BC109 types. The 6.8 microfarad tantalum bead capacitor can be replaced by 4u7 or 10u, but don't depart further than that from the nominal value. Ensure that you connect the tanatalum capacitor with the +ve end to the base of the transistor. The 10 nanofarad capacitor across the mic insert terminals is to prevent RF getting into the amplifier. The 100k resistor is, primarily, to define the working point for the transistor - but also helps provide "thump-free" push-to-talk operation as described below.



CIRCUIT DESCRIPTION

When the handset press-to-talk switch is operated, the transceiver supplies approximately 6 volts to the +ve microphone terminal via a 470 ohm resistor (not shown), this being the original energisation current for the carbon microphone insert. Just 60 microamps of current flow from the +ve mic connector through the 6u8 capacitor and the mic insert. This current is so small as to not damage the mic insert in any way - but it slowly charges the 6u8 capacitor until the voltage at the base of the transistor reaches approximately 0.7 volts, thus turning the transistor on. This takes less than half a second to acomplish - but does give the amplifier a desirable "slow fade-on" characteristic which prevents any "cllicks and bangs" being transmitted when pressing the push-to-talk.

The 6u8 capacitor also helps to define the low frequency roll-off for the microphone circuit, thus ensuring that all the radiated transmitter power is used for the useful part of the audio spectrum. This makes this equipment surprisingly able to communicate despite the low power output.

As the bias voltage on the base of the transistor slowly rises to around 0.7 volts after pressing the PTT, the transistor begins to draw current which is supplied by the 470 ohm resistor in the transceiver. This steadily reduces the voltage on the +ve terminal for the original mic insert, thus reducing the base current supplied via the 100k resistor until the stable working point is reached.

When an audio input is made to the microphone, the audio-signal current is fed to the base-emitter junction via the 6u8 capacitor resulting in an audio voltage appearing on the collector of the transistor. This audio voltage signal is approximately the same amplitude as was produced by the original carbon mic

insert - but with far less distortion and unwanted low frequency response.

THE PHYSICAL MODIFICATION

The original Carbon Microphone insert should be removed, followed by the spring-loaded carrier for it - after removing two small screws. (See picures below) Place the two small screws, the mic insert and the spring-loaded carrier into a bag and keep it - just in case you want to restore the original.

Now build a small ampllifier onto the back of the new mic insert, using either a home made board - or "ugly fashion" by simply soldering the components together using their own leads. Finally, identify which of the two original wires to the mic insert is the positive (or, maybe easier, use an ohmeter to identify the ground wire!) and finally solder these two onto your new circuit on the back of the new mic insert, keeping the polarity as shown in the circuit drawing above.

The new mic insert (either red or green type) will fit perfectly inside the rubber ring which held the original carbon mic insert, producing a finished job which looks "factory-manufactured".

As a final touch, place a thin sheet of "cling-film" (used for wrapping sandwiches) inside the screw-on mic cover to prevent corrosion by breath.

Make sure the mic insert doesn't rotate as you screw-on the mic cover - as this will probably disrupt your carefully soldered components.

Now - listen to your own transmission and enjoy the crisp audio! The difference between the original carbon mic insert and the modified arrangement is like night and day!

---------- END OF CARBON MIC MODIFICATION ----------

SETTING THE PA BIAS

THE BACKGROUND

I have worked on approximately 20 of these sets and have found that every one of them had the PA bias adjustment potentiometer turned fully anti-clockwise which gives the minimum standing current. This current is usually around 1 milliamp which is far too small and produces severe cross-over distortion on SSB.

The bias circuit is well designed and does not really need the adjustment potentiometer. Provided everything is working correctly and no unauthorised changes have been made to the circuit, you may turn the bias potentiometer fully clockwise which will give a standing bias condition of approximately 1 watt dissipation in each of the two PA transistors - and truly excellent SSB quality. The bias is temperature-

compensated by using a third transistor of the same type as the two final amplifiers - and mounted on the same heat sink.

HOW TO MAKE THE PA BIAS ADJUSTMENT

This procedure gives you a fairly simple way of checking that you have around a watt of bias for each PA transistor without having an adaptor plug available to run the set when it is out of its case. Use a 50 ohm dummy load while doing these tests to help prevent RF getting into your test meter or power supply.

Measure and make a note of the total 12 volt supply current taken by the set when it is set to SSB transmit with no speech input.

Remove the set from the case and place it on a working surface with the control panel facing you. The PA board is located at the front-left and is part number 7300. Close to the front of this board, you should be able to identify a potentiometer marked R15. This is the bias adjustment. Note the position of this potentiometer, then turn it to ensure that it is fully anti-clockwise (minimum bias).

Reinsert the set into its case and measure and note the 12 volt cupply current again on SSB transmit with no speech input.

Now repeat the above operation - but turn the bias potentiometer (R15) fully clockwise and measure and note the current again.

The difference in current between bias fully ON and bias fully OFF should be around 200 milliamps at 12 volts.

When the PA bias is fully ON, the 12 volt supply current should be around 200mA greater than when the PA bias was fully OFF.

Do not be concerned about having the bias potentiometer fully clockwise! After checking the circuit design, I can confirm that there is no need for this bias potentiometer - it may be a lagacy from a previous product using this PA driver board. The circuit is a "current mirror" type and the actual bias current on all the sets I have worked on gives around 1 watt for each of the two transistors - exactly as expected - when the bias control is set to maximum.

It has been confirmed on my own set that the PA standing bias current reduces as the PA heatsink gets warm - and increases as it gets cold - and there is absolutely no tendency to thermal runaway. This is with the PA bias control (R15) set to maximum. I am therefore recommending exactly what I am using!

When running on a 13.8 volt supply, my set takes 1.86 amps when switched to SSB transmit with no audio - and this slowly rises to 1.9 amps over 30 seconds as the PA transistor junctions warm-up. Once their heat gets into the heat-sink, the thermal compensation transistor takes control, thus preventing the bias current rising any further. Your set should be within 10 percent of these values.

IF YOU HAVE A PROBLEM

If setting the PA bias (R15) fully clockwise gives you much more than 200 milliamps current increase in the 12 volt supply, then someone has made changes - or there is a fault. You can back the control off a little from fully clockwise (say 30 degrees of rotation) and measure again until you get around 200mA greater than when the control was set fully anticlockwise.

If you do not see a potentiometer R15, then you probably have an old version of the PA driver board.

CONCLUSION

This information has been produced in the hope that it is understandable to both old and new Radio Amateurs. It is the result of many hours of careful work on these radios on an electronic test bench -

when the true quality of the circuitry and build was fully appreciated - and it was decided that the poor choice of carbon microphone should no longer be allowed to give the radio a bad reputation!

Thank you to KP Jung (DH4PY) of greenradio.de who agreed to host this information on his website

I hope you enjoy the Riz PD-8 with the correctly adjusted PA and modified microphone! - 73 de G8LUL - Roland

Working with electricity can be dangerous!
If someone wants to follow this description- it is his own responsibility.
In spite of careful research I refuse to be responsible for any damage to radios or persons that may result from this information.