W4RT Electronics™
A Division of
CyberAir Development Corporation
www.w4rt.com
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MAX PUNCH for the MH-31™

W4RT One BIG Punch Speech Compressor and Heil HC-4 & HC-5 Elements

The MAX PUNCH (MP-31) for the Yaesu MH-31 microphone is an accessory for any radio that uses the Yaesu MH-31 microphone having 5 VDC power. The MP-31 module comprises the W4RT One BIG Punch Speech Compressor and both of the Heil Sound HC-4 and HC-5 microphone elements. The MH-31 TONE switch is used to select between the combination of the HC-4 element and One BIG Punch (OBP) or the HC-5 element alone. In general, most users prefer to use the OBP/HC-4 selection for HF operations and the HC-5 selection for FM operations.

Please READ the following BEFORE INSTALLING your MAX PUNCH.

Installation is not trivial, so you should be confident that you have the tools, skills and experience needed to do the job correctly. You can damage your MAX PUNCH and MH-31, so be very careful. *W4RT Electronics assumes NO responsibility for any damage that may be caused by your installation.* Further, W4RT Electronics doesn't provide technical assistance during your installation. If you need help, then have W4RT Electronics perform the installation for the stated fee on www.w4rt.com BEFORE you attempt the install.

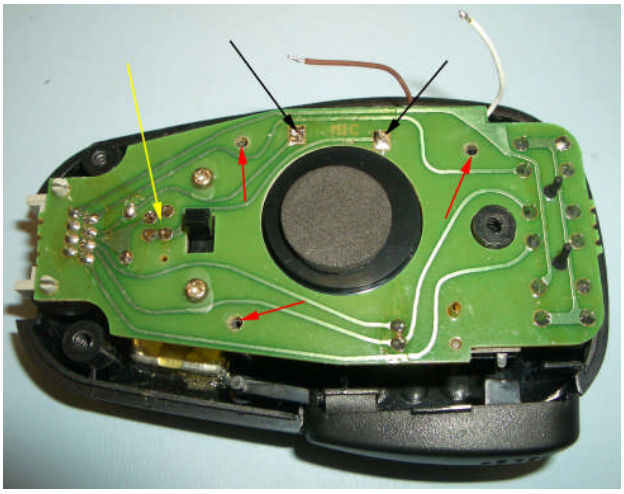

Figure 1.

WARNING:
The MAX PUNCH module is designed for systems having 5 VDC only. Radio such as the FT-817, FT-857, and FT-897 all provide 5 VDC power to the MH-31 microphone. The application of other voltage levels may damage the MAX PUNCH module.

1. Remove the back cover from the MH-31.
2. Desolder the four pads next to the switch (yellow arrow).
3. Desolder the two MIC leads from the pads (black arrows).
4. Next, remove the three (3) screws holding the PCB in place (red arrows – screws already removed in photograph).

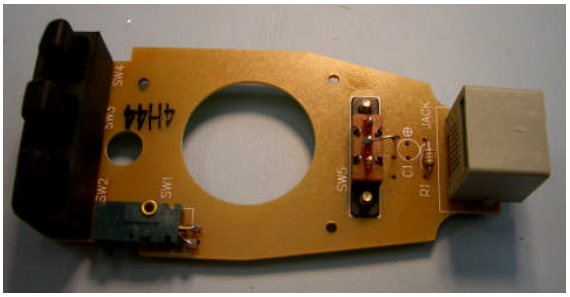

Figure 2.

5. See Fig. 2. Remove capacitor C1.
6. Remove the wire from SW5 adjacent to capacitor C1 "+" mark.
7. Insert the wire from the center lug of SW5 into the hole that was vacated by removing the wire in Step 6.

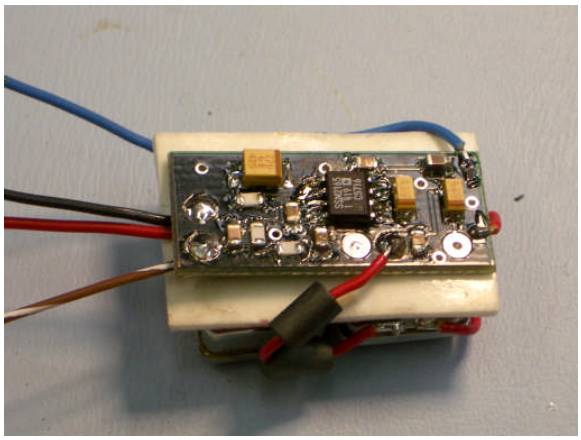

Figure 3.

8. Figure 3 shows the MAX PUNCH module. The four leads are as follows:
   8.1. BLACK = ground
   8.2. RED = +5 VDC
   8.3. BROWN/WHITE = HC-4/OBP output
   8.4. BLUE = HC-5 output
   (Heil sometimes varies this color)

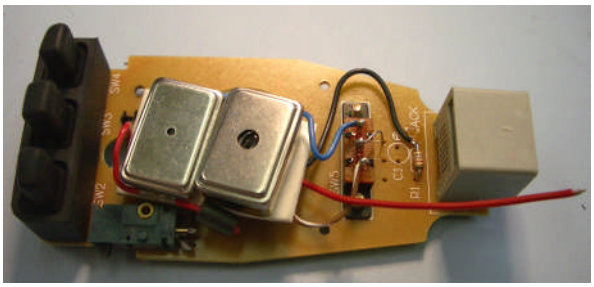

Figure 4.

9. As shown in Fig. 4, attach the wires as follows:
   9.1. BLACK to R1 next to C1 "+" mark.
   9.2. BLUE to SW5 lug next to C1 "+" mark.
   9.3. BROWN/WHITE to the remaining SW5 lug.

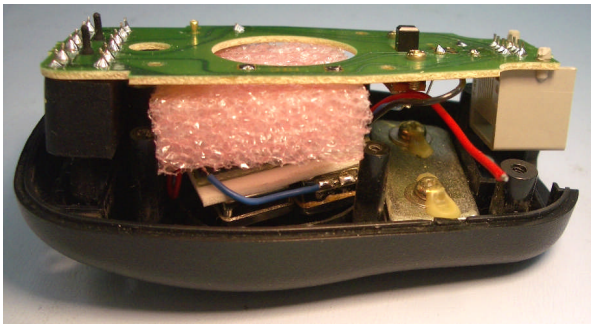

Figure 5.

10. As shown in Fig. 5, place the supplied foam between the OBP and the MH-31 PCB. Bring out the red wire as shown.

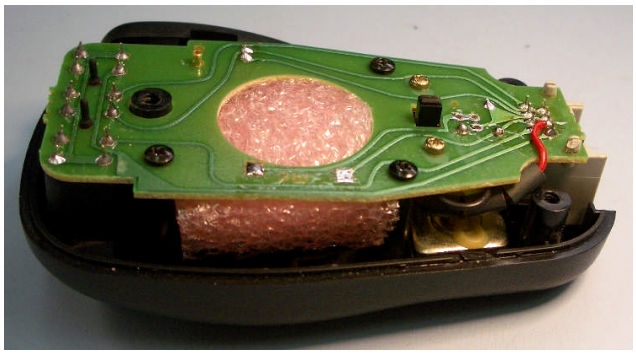

Figure 6.

11. Replace the three (3) screws that hold the MH-31 PCB in place.
12. Solder the pad by SW5 where the wire was moved to from the center lug.
13. Place the four (4) ferrite beads onto the RED wire as shown.

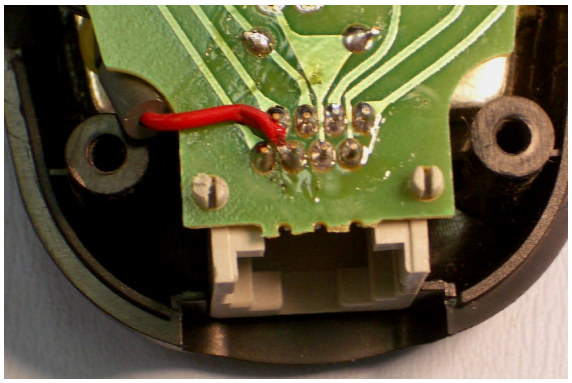

Figure 7.

14. Solder the RED wire to the RJ-45 connector pin as shown in Fig. 7. The connection is made to the first row, second pin from the left with respect to the screws holding the RJ-45 connector in place.

OPERATION

The MH-31 TONE switch (SW5) selects which Heil microphone element is utilized. Position 2 selects the HC-4 element and the One BIG Punch. Position 1 selects the Heil HC-5 element without the One BIG Punch.

Remember to adjust your microphone gains for best punch and articulation. You might also try adjusting the T LSB CAR and T USB CAR to better fit your voice power spectrum to the FT-8x7 (see your radio's manual). On-the-air testing at reasonably strong signal levels (S-9 for example) is suggested. If the signal is too weak or strong, you may not achieve the best adjustments.

One BIG Punch™
Brief Technical Description

One BIG Punch is based upon a widely used microphone conditioner that includes a microphone preamplifier with variable compression and noise gating. The SSM2165 integrated circuit utilized is manufactured by Analog Devices and was designed for improving voice clarity in communications and public address systems. This device features low noise and distortion, variable compression ratio, automatic limiting to prevent overload, adjustable release time, and a noise gate to prevent amplification of noise or hum. In order to avoid artifacts that result from hard clipping techniques, this processor uses three different signal transformation regions. W4RT Electronics selected the several adjustments to provide the ***best general talk power and articulation performance*** for users of the FT-817, FT-857, and FT-897.

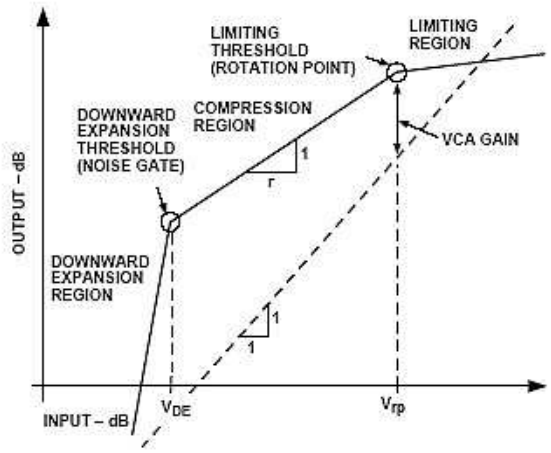

Figure 8. Input/Output Characteristics of the SSM2165 (ref. Fig. 2, Analog Devices SSM2165 Application Note).

Figure 8 illustrates the general input/output characteristics of the One BIG Punch. The input is shown along the abscissa in dB and the output is shown on the ordinate in dB. As is evident by examination of the figure, there are three signal transformation regions, viz., limiting, compression, and downward expansion regions. The SSM2165 has several fixed parameters. These are the rotation point (V_{rp}), downward expansion threshold (V_{DE}), and the gains associated with the limiting and downward expansion regions. With no processing, the input/output transformation is linear with unity gain and is illustrated in Fig. 8 by the dashed line having a slope of 1:1 or unity. The compression region is where your voice is normally processed and has a compression ratio (or slope) of r:1 as illustrated in Fig. 8. This roughly 40 dB region extends between V_{DE} and V_{rp}. The action of the integral voltage-controlled amplifier in the SSM2165 is shown in Fig. 1 as the distance between the normal line (1:1 slope) and the rotation point (rp). This is one of the W4RT Electronics selected parameters. The compression ratio in the limiting region is fixed by Analog Devices at approximately 10:1 (this means that a -10 dB change in the input results in a -1 dB change in the output). If any of your voice peaks reach into this limiting region, they are rather strongly compressed, NOT clipped. Any input signals below the downward expansion threshold V_{DE} are expanded at a ratio of about 1:3, i.e., a change in the input of -1 dB results in change in the output of -3 dB. This feature is very important for FT-8x7 users since it helps to mitigate the pickup of background and circuit noises.

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