

StormTrooper / Bounty Hunter Real-Time Voice Changing Amp

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This document explains how to setup your trooper voice amp, operate it correctly, and use all the features available on the unit.

This package includes:

- 1) Trooper/Bounty Hunter voice effects board w/ 9V battery snap
- 2) Optional electret clip mic (omnidirectional)

You may also need:

- 1) 1/8" mono cable 
- 2) plastic project box or heat shrink wrap

You can also use the following compatible equipment with your voice amp:

- 1) Amplified speaker (Radio Shack #277-1008C)



- 2) PA amp



- 3) Directional electret microphone with boom (Radio Shack #33-3012)

- 4) Tie-clip electret mic (Radio Shack #33-3013)



SECTION A. - OVERVIEW

Your voice amp transforms your voice in real time to sound like a helmeted trooper, a bounty hunter, or a modulated bounty hunter. When in trooper mode, the board also adds in automatic push-to-talk end clicks and static, replicating the comm system sounds typical of stormtrooper speech.

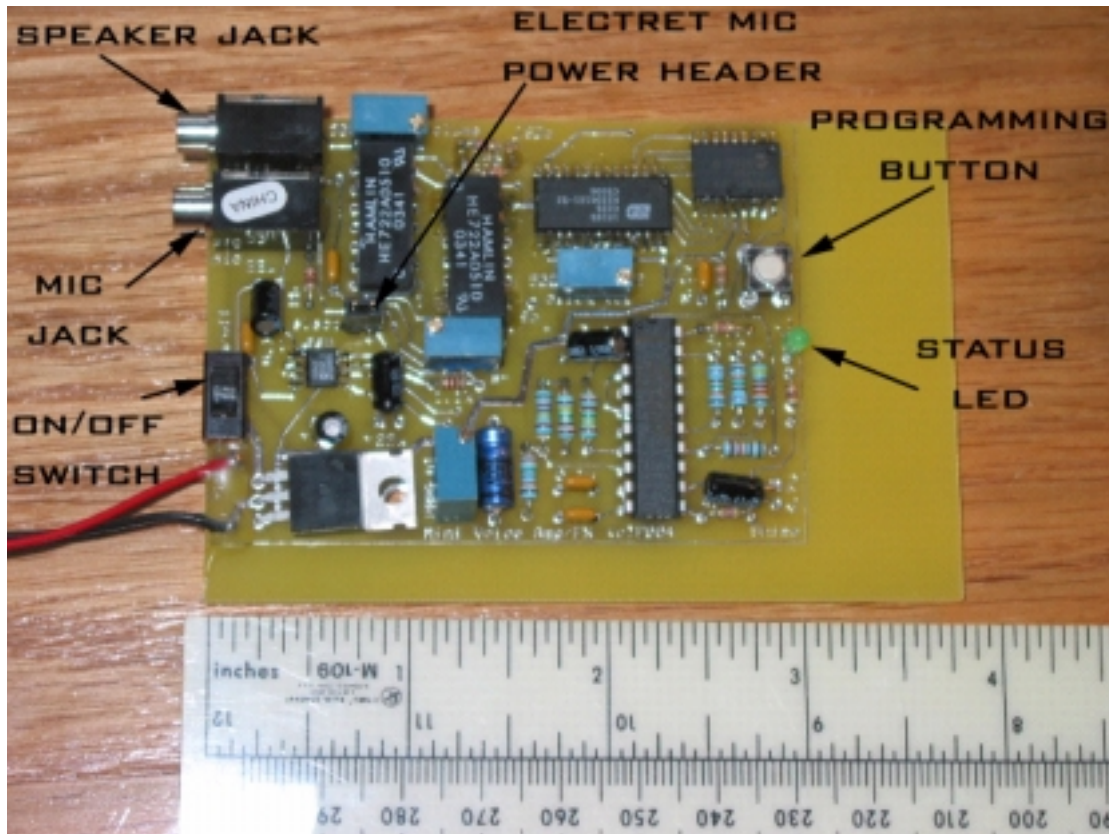
This voice board also features several innovations not found in any other voice amp in its class:

- 1) Programmable auto VOX on/off circuitry
- 2) Auto mic closing timeout to prevent feedback
- 3) Tunable onboard voice compressor – compression ratios of 1:1 up to 15:1
- 4) Low-power operation for longer battery life
- 5) Tunable voice effect for trooper or bounty hunter (*2 different bounty hunter voices*)
- 6) Board chooses from six different click/static end-of-speech sound effects for trooper effect
- 7) Volume control for voice effect and sound effects
- 8) Compatible with all (Radio Shack) type amplified speakers.
- 9) Uses any electret mic – board even supplies phantom mic power

The voice board will run off any DC power supply from 6V-18V. A single 9V alkaline battery will do fine. A fresh alkaline 9V battery will last around 6-8 hours continuously on. If the board behaves poorly, try replacing the battery.

NOTE: Handle your board as you would any piece of delicate electronics! Do not get it wet and do not handle it without grounding yourself first! Even a static shock can destroy the delicate components on the board. I suggest when installing the board, insulate it with non-static foam, hot glue, heat wrap, or other material. Handle the board around its edges when moving it. We are not responsible for boards that are rendered useless by improper handling.

Next is a picture of the trooper voice board with annotations.



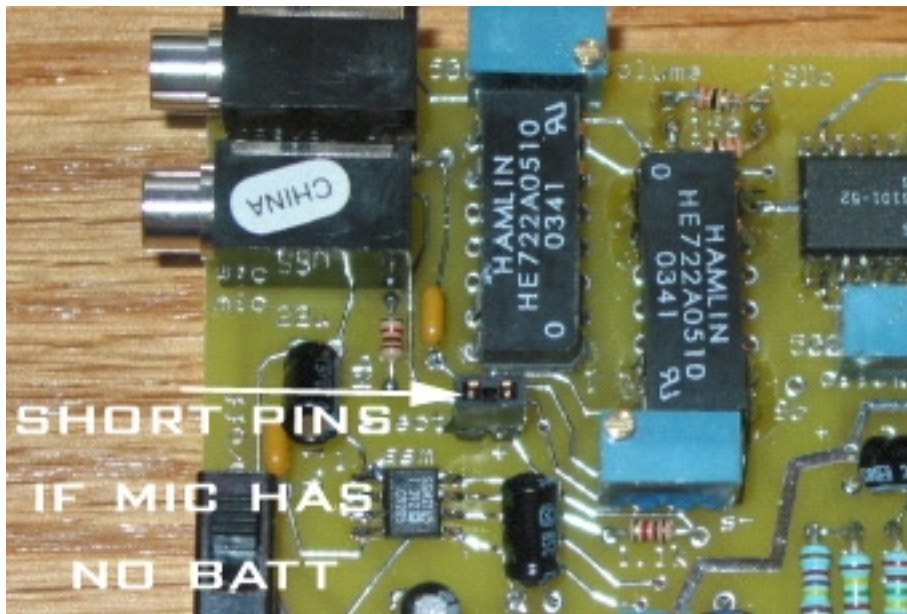
SECTION B. - OPERATION

Microphone setup:

Plug in your microphone and amplified speaker using an 1/8" cable. If you already own a Radio Shack amplified speaker (#277-1008C or the common black PA speaker), you can use this with your trooper amp. You may have to dial down the output volume in order to avoid too much feedback. See Section C on how to do this.

If you are using an electret mic that **DOES NOT** have an external battery, you will have to use the shorting terminal to enable power to the electret mic. See the below pic for details on how to do this. If you have a mic that has an external battery and on/off switch (similar to Radio Shack #33-3012), you can leave the 2 gold pins on the board disconnected. By shorting these two gold pins together, you are providing power to the mic. For the optional mic, you must short the pins together for it to operate.

NOTE: A condenser mic will not work with the board, as the output will be too low for you to hear.



Mic header pins for electret mic with no external battery power

Turning on the unit:

When you switch on your amp (using the onboard power switch), the onboard LED will blink. If the LED blinks once, this tells the user that the board is using the "default" settings described below. If the LED blinks twice, this tells the user that the board is using the settings that were last modified by you. The below table summarizes this operation:

On powerup, LED blinks:	Meaning:
Once	Board is using default settings: VOX on threshold = 2 VOX off threshold = 2 VOX auto timeout = 2.5 sec Static sound effects = on Modulated bounty hunter mode = off
Twice	Board is using last user settings

Basic operation:

Once the board has booted up, the mic by default is “closed”. This means the mic is electronically disconnected from the speaker. This feature rids of any feedback that you would normally hear when the volume if up too loud if the mic were constantly “open”.

VOX thresholds (opening and closing the mic):

When you have broken squelch by talking into the mic (the VOX on threshold), the mic will electronically “open” and send your modified voice to the speaker for you to hear. Once you stop talking and have gone below squelch (the VOX off threshold), the unit will close the mic and then play out one of many random click/static sound effects. When you have broken squelch, the onboard LED will also light while you are talking. The LED extinguishes once you are done talking or the VOX timeout has expired.

VOX auto timeout:

Another feature is the VOX timeout. By default, it is set to 2.5 seconds. When you break squelch, the board will automatically close the mic after 2.5 seconds. This novel feature also helps rid of feedback that would continue forever after you were done speaking. If you finish speaking before the timeout period, you will hear the static/click combo (if enabled). If you are not finished speaking in the timeout period, your speech will automatically be cut off. So, you have to set the VOX timeout period to match your typical conversation times. It is best to keep talking short so you can get rid of any feedback that would start howling through the speaker once you stopped talking.

SECTION C. - Programming different user settings:

The voice amp has 5 functions that are controlled by the onboard pushbutton. These functions are included to help mitigate feedback and to enable different voice effects. The programmable settings are:

- 1) VOX auto timeout setting
- 2) VOX on threshold setting (opens mic)
- 3) VOX off threshold setting (closes mic)
- 4) Toggle click/end static sounds on or off
- 5) Toggle Bounty Hunter voice modulation mode

Each will be discussed in detail. The unit contains very sophisticated software that requires you to follow the setup procedures in order to get the best performance from the voice amp. **PLEASE READ!!!**

NOTE: Unplug the microphone while changing any of the settings. After changing a setting, plug the mic back in. This way you can discern the number of LED blinks and ensure proper programming of the below settings.

Each of the above settings are modified by pressing the onboard pushbutton for a desired amount of time, then releasing the button. The below table specifies how to change each setting.

Setting	Hold button down for	Board responds with...	Value range	Default value
Increment the VOX auto timeout	Less than 1 sec	2 short beeps	2.5 sec – 60 sec	2.5 sec
Increment the VOX on threshold	1 – 2 sec	1 long beep – 1 short beep	1 (low) – 8 (high)	2
Increment the VOX off threshold	2 – 5 sec	1 long beep – 1 short beep + LED blinks once	1 (low) – 8 (high)	2
Toggle Static Sounds ON/OFF	5-10 sec	1 long beep – 1 short beep + LED blinks twice	On/off	ON
Toggle Bounty Hunter voice modulation (Boushh effect)	Over 10 sec	1 long beep – 1 short beep + LED blinks 3x	On/off	OFF

Table 1. – Changing board settings

Setting 1: VOX auto timeout

When the unit is turned on, the mic is “closed”, meaning that you can turn up your speaker as loud as you like with no feedback. Once the mic “opens”, you can hear your voice but also experience feedback if the volume is up too loud. The VOX auto timeout helps out with constant feedback by closing the mic after a specified time period. By default, once you start talking, the VOX auto timeout is set to 2.5 seconds. If you continue talking after 2.5 sec, the board will close the mic no matter what. By pressing the pushbutton for less than a second, you can increment the timeout period by 2.5 sec each press. When you have pressed the button 24 times (60 sec), it will automatically roll back around to 2.5 seconds again.

When you press the button and release it, the board will respond with 2 short beeps. The new setting is also stored in the board’s memory, so when you power the unit on again it will remember your settings.

Rule of thumb: The shorter the timeout period, the shorter sentences you can say before being auto cut off – but you will not experience much feedback with this method since the mic is automatically closed after a short speaking session. The longer you make the timeout period, the longer you can talk in a session – but feedback can start up if you stop talking well before the timeout period. This is a tradeoff you will have to experiment with.

Setting 2: VOX “on” threshold

This is also known as the squelch point. When you talk into the mic, your voice volume must surpass this threshold before the mic is “opened”. When the mic is open, your voice is sent to the speaker. The higher the VOX on setting, the more voice volume you need to trigger the mic – and ambient noise will not keep the mic constantly open in error. The default setting is 2, which is a nominal VOX on level. If background noise is keeping the mic open, increment this setting by one button press and try again. For higher VOX on thresholds, you may find it necessary to blow into the mic to get it to open, then talk normally.

When you press the button and release it, the board will respond with 1 short beep and 1 long beep. The new setting is also stored in the board’s memory, so when you power the unit on again it will remember your settings.

Setting 3: VOX “off” threshold

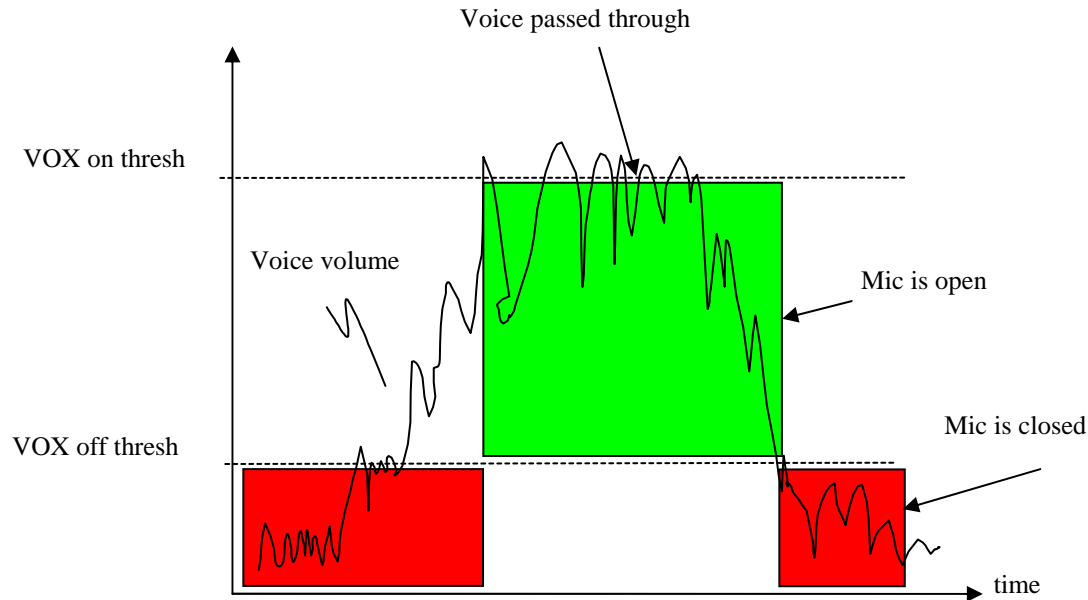
Instead of using one squelch point (like in a CB radio), your voice board uses a dual squelch. After you have triggered the mic using the VOX on threshold, the board monitors your voice volume until it goes below a second (lower) threshold. Once your voice volume tapers off below the VOX off threshold, the board determines that you are done talking and proceeds to automatically output a random click/static sound effect.

The default setting is 2, which is a nominal VOX off level. By default, both the VOX on and off levels are equal, simulating a normal single-level squelch. If the mic is never closing after talking a couple words, increment this setting by one button press and try again.

NOTE: If you make the off threshold greater than the on threshold, the board will ALWAYS keep the mic open.

When you press the button and release it, the board will respond by blinking the LED once, then playing one short beep and one long beep. The new setting is also stored in the board’s memory, so when you power the unit on again it will remember your settings.

Here is a diagram of how the squelch works. Once your voice volume surpasses the VOX on thresh, the mic is opened. The mic stays open until your voice volume goes below the VOX off threshold. You can see if you make the VOX off thresh greater than the VOX on thresh, the unit will always keep the mic opened once triggered.



Setting 4: End static sound effects on/off flag

Pushing the button between 5-10 sec will toggle the end click and static sound effects on and off. By default, the static sounds are enabled. But if you are using the voice amp in a bounty hunter costume, you might want to disable the end static and clicks sounds. This setting allows you to do this.

Setting 5: Bounty Hunter voice modulation on/off flag

Pushing the button for more than 10 sec will enable the voice modulation mode for the 2nd bounty hunter voice effect. This gives more of a “Boush” type voice effect. If you are using the voice amp in a bounty hunter costume, you might want to disable the end static and clicks sounds shown above. Pushing the button a second time for more than 10 secs will disable this voice modulation.

CHANGING USER SETTINGS BACK TO DEFAULT VALUES

If you ever want to reprogram the user settings for your board (as outlined in Section C), or just go back to the default settings, there is an easy way to do this:

- 1) Turn off your board
- 2) Hold down the pushbutton
- 3) Power on the board
- 4) Wait 1 second, then let go of the pushbutton.
- 5) The board will respond by blinking the LED once. This confirms that all stored values were reset back to factory defaults. You can now reprogram the board as outlined in this section.

BOUNTY HUNTER VOICE

This voice amp can also replicate a good bounty hunter “Fett” OR “Boushh” type voice. So you can use the board for 2 different bounty hunter voice effects!

If you turn the bandwidth (trooper effect) potentiometer counterclockwise (shown in the next Section D. pics) , it will let in more high frequency voice. This replicates a more tinny Fett type voice. You can also turn off the default end

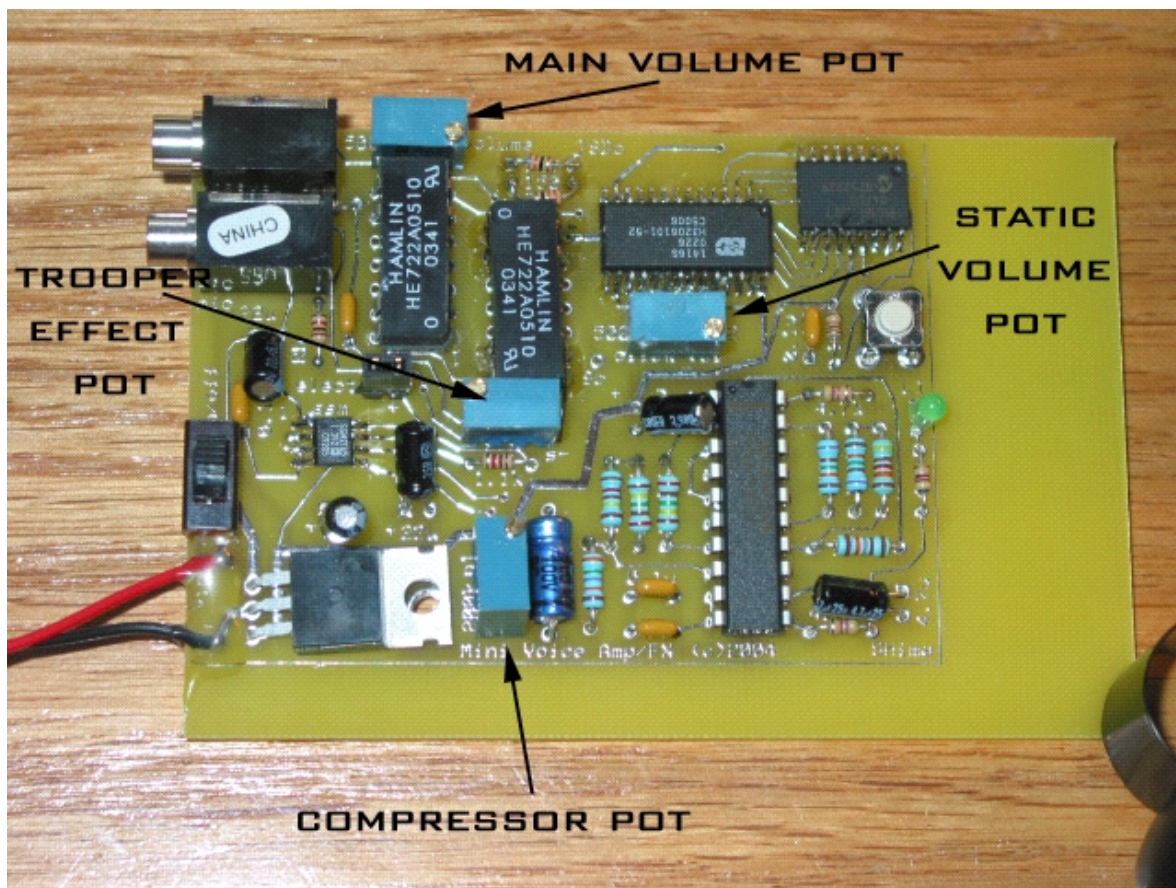
static sounds (as shown in Section C.) to transform the trooper amp into a bounty hunter voice amp! Reference Section D to see how to change the voice effect from a trooper effect to a bounty hunter effect.

To obtain the Boushh type voice effect, follow the above instructions and also enable the voice modulation flag shown in the previous section. The added voice modulation will replicate the Boushh like bounty hunter effect.

SECTION D. – TUNING VOLUME, VOICE COMPRESSOR, AND VOICE EFFECT

Below is a pic of all the tunable potentiometers on the board, with their functions listed.

NOTE: All the potentiometers on the trooper board require 20 full turns in order to span the entire range.



Changing volume:

The trooper board has two blue potentiometers that control the volume. The above pic shows the main volume control pot and the click/static volume pot. You should first tune the volume of the static sound effects to match your speaking voice volume. Then you can tune the overall volume to match the input of your amplified speaker.

The blue pots require **20 turns** to span the range of volume. Use a small screwdriver to turn the screw on top of the pot. With the board oriented in the picture above, turning the **screw clockwise will lower the volume level**. Turning the screw counterclockwise raises the volume. This is true for both volume pots. You will have to turn the screw at least 5 times to notice any difference. 20 turns in any one direction will span the entire volume range.

Changing trooper effect to bounty hunter voice effect:

There is also a potentiometer onboard that controls how much high frequency voice is allowed through. Turning this pot **clockwise results in a more refined trooper voice**. Turning the screw counterclockwise results in a **bounty hunter** voice. Turn the pot then talk into the mic to hear the difference.

Changing voice compression:

The mic input also goes through a voice compressor. A compressor makes all of your words the same volume, resulting in a more “in your face” effect. If you have ever listened to a movie commercial, the announcer that has a very pronounced voice with equal volume for all words. This is a good example of vocal compression.

More compression results in softer spoken words receiving more gain, making them sound louder. Loudly spoken words are gained down some. There is also a limiter, which limits the output of the mic. So if you yell into the mic, the output is well behaved and still discernable. A vocal compression of 1:1 is equivalent to normal speaking. A maximum vocal compression of 15:1 provides a large amount of vocal gain, giving the “in your face” effect. More compression is also good if the mic is farther from your mouth than normal. If the mic is far away, then the compressor will amplify the mic signal more. The correct amount of compression can also make your words more legible to outsiders, since volume between all words is maximized.

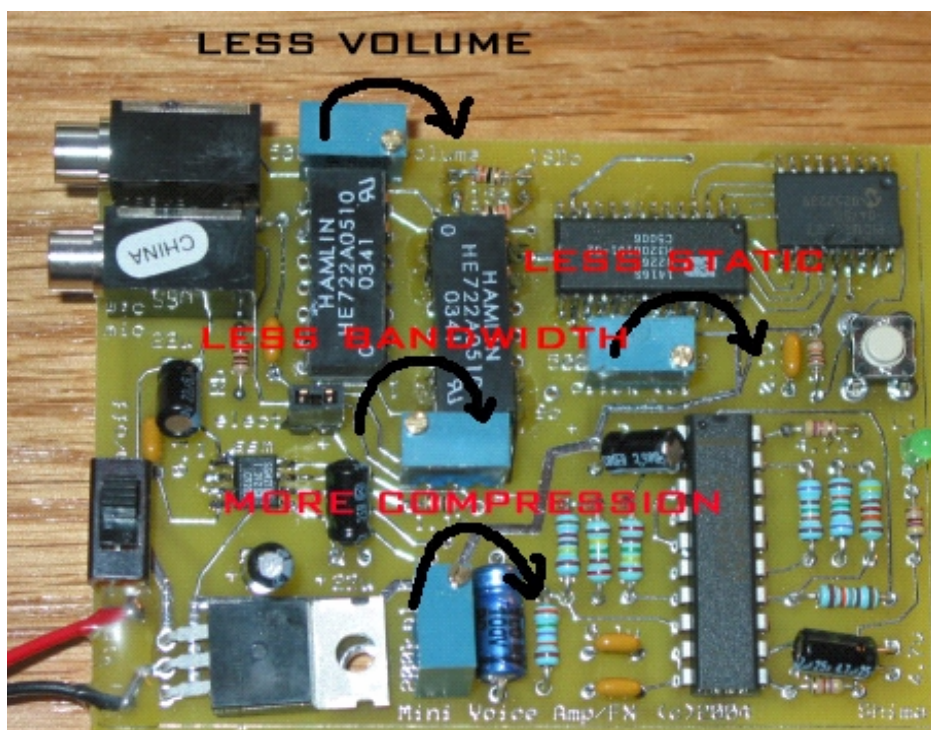
To increase the compression, turn the screw on the compression pot clockwise as shown. This will increase the compression from 1:1 up to 15:1. So, each turn of the screw will give you an increase of around 1x:1. Turning the screw counterclockwise will decrease compression.

***NOTE:** If you have set the vocal compression very high, a potential side effect is more feedback howling. This is because the gain of the mic on low level signals is greatly amplified, causing more feedback to happen when the mic is open and you are not talking. This is a tradeoff that needs experimentation to get right. If you are experiencing way too much feedback, then back off the vocal compression until it subsides.*

***TIP:** If you want to hear the effect of different compression settings, connect the trooper board to your computer’s sound card input. You can record several vocal passages using several different compression settings. You will be able to hear the difference in vocal volume over your passage by playing back the different recordings.*

Here is a table summarizing the tuning of all the onboard pots.

Potentiometer	Turn clockwise (20 turns max)	Turn counterclockwise (20 turns max)
Static volume	Lowers volume	Raises volume
Main volume	Lowers volume	Raises volume
Vocal compressor	Raises compression	Lowers compression
Voice effect	More trooper effect	More bounty hunter effect



FEEDBACK TROUBLESHOOTING

If you are having problems with feedback, you will have to try one or more of the following:

- 1) Move the mic farther away from the speaker
- 2) Turn the volume down on the amplified speaker
- 3) Turn down the vocal compression - a 1:1 compression will result in less feedback.
- 4) Use a directional microphone, such as the Radio Shack boom mic model #33-3012

***Rule of Thumb:** The closer the mic and speaker are, the worse this feedback is. Even if you eliminate feedback in this extreme case, the slightest movement of your head will cause a new feedback path. As the speaker and mic are separated, you will have more "leeway" in your head movement before feedback ensues.*

You can also make sure you are using the default auto VOX timeout of 2.5 sec, and limit all your sentences/words to 2 seconds or under. This will allow the board to close the mic quickly after you are done speaking, squelching any feedback.

***TIP:** If you are having problems with feedback howling after you are done talking, try blowing into the mic or saying something else. Feedback typically reduces in volume when you are talking or making noise into the mic. You can do this until the mic auto closes to reduce any feedback from occurring.*

Remember, feedback is always there, it is just a matter of how much you can attenuate it. Feedback is also directly proportional to volume, so the more you turn up your speaker, the more feedback you will experience. Our Vortex voice amp is the only unit capable of tackling difficult feedback paths by using advanced algorithms.

MIC PLACEMENT ISSUES

For the tie-clip mic (Radio Shack #33-3013), I have found it best to place it right under your lower lip. This gives you maximum sensitivity and loudness. Experimentation will give the best results. If you are getting too many breath sounds, you can also use a mic windscreen to combat this. If you use the boom mic (#33-3012), the headset is

more comfortable and can be worn under your helmet. The boom mic also has a unidirectional mic, which will help reduce feedback. The tie-clip mic has an omnidirectional mic, which gives better voice pickup but increases potential feedback. Typical electret mics are omnidirectional, so consult the above list for feedback mitigation.

MOUNTING THE UNIT

If you are using the voice amp with a standard set of trooper armor, you can put the board anywhere you see fit. Try and keep the unit away from water, sweat, or condensation, as these are not good for any set of electronics!! You can fit everything in your helmet, chest plate, etc.

I would also recommend that you encase the board in heat shrink wrap, a project box, or other enclosure – particularly if you mount it in your helmet. Sweat, water, condensation can make the board behave oddly and short out components.

Also note if you are mounting speakers in your helmet, this is a feedback nightmare. You may end up having too little volume with this setup. Moving the speaker outside the helmet will give you a better chance at high volume and lower feedback howling.

The below pic shows one such location that is concealable but still provides a good amount of volume.



PROTECTING THE UNIT

If you are mounting the unit inside your helmet, **you want to make sure you do not get it wet.** That includes condensation, sweat, etc. These things can short out the board and render it inoperable. A good way to protect the board is to use epoxy, hot glue, or even heat shrink wrap. If your board gets wet or stops operating, turn it off and let it air dry completely before turning it back on. We can assist you with heat shrinking your board using a standard hair dryer.

TROUBLESHOOTING FAQ

Q: My unit keeps triggering off ambient noise, what do I do?

A: Increase the VOX on threshold until the unit does not do this. Each board needs its own calibration, so please follow the above instructions for setting up the board properly.

Q: I never hear any end clicks or static played out.

A: Increase the VOX off threshold. This means the auto timeout period is always being met (default is 2.5 sec). If the auto timeout period is reached, then NO static sounds are played out (this is so you don't have too many erroneous static sounds played out). To rectify this, you need to increase the VOX off thresh. This way after you are done talking the board will play out the end static sounds before the auto timeout period is reached.

Q: I am experiencing more feedback than my previous system, why?

A: Feedback for one system is not the same for a different system. Since the gain for different boards is not constant, feedback can increase/decrease for a given speaker/mic configuration you have set up. That is the nature of feedback. If you want to reduce feedback, try repositioning the speakers and mic, turn down the compressor until you have a 1:1 gain, and use a directional microphone. Feedback is a direct function of gain, which includes the compressor gain, the speaker gain (volume), system gain, and distant between mic and speakers.

Q: My mic is not working, why?

A: Make sure if you have an UNPOWERED electret mic, makes sure that the 2 header pins are shorted together using the provided shorting block as shown before. If you are using a Radio Shack powered mic, you must remove the shorting block from the 2 header pins.

Q: I am trying to tune the board but am not hearing any significant changes?

A: When you are tuning the board using the onboard potentiometers, be aware that to go from one end to another, you must turn the pot screw 25 times! So if you are going from max compression to a 1:1 compression, try turning the pot 25 times (full rotations) and then test again. If you are fine tuning the board, try to turn the pot 4 rotations at a time. You should start to hear incremental changes in the voice effect. Turning the pot 1-2 times wont really make much of a difference.

Any questions, email: hyperdyne@hyperdynelabs.com if you are having difficulties setting up the unit. Good luck and enjoy!!!!

NOTICE: There is no warranty on kits. It is your responsibility to install the board. Opened kits cannot be returned. Be careful if you plan to use a battery source that is capable of delivering alot of current. Contact a professional if you need assistance. Hyperdyne Labs assumes no responsibility for the misuse of this kit.