

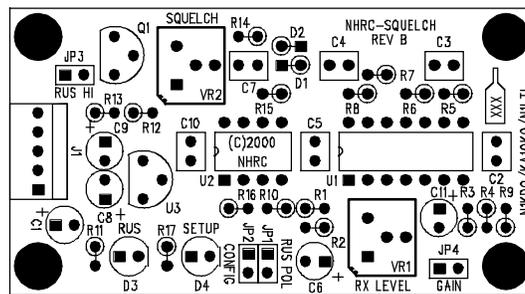
NHRC-Squelch Users Guide

These instructions will guide you in the installation and adjustment of the NHRC-Squelch.

Introduction

Thank you for purchasing the NHRC-Squelch module. The NHRC Squelch was designed with a fresh approach at signal to noise squelch operation for narrow band FM receivers. The NHRC-Squelch features automatic variable hysteresis. This feature allows the CAS signal produced to “follow” fading signals into the noise and will provide instant squelch closure for stronger signals. The NHRC-Squelch can be interfaced to most any modern repeater controller. The NHRC-Squelch should provide years of carefree operation as its simple design is based on modern embedded controller technology with minimal parts count.

Electrical Connections



Board Layout

J1 Connector Pinout

Pin	Use
1	+12 Volts DC
2	Discriminator Audio Input
3	Ground (-)
4	CAS (RUS) Output
5	Ground (-)

Power Requirements

The NHRC-Squelch requires 8 to 15 V DC. Power (+12V) is connected to J1 pin 1 and Ground (-) to J1 pin 5. *Warning: The NHRC-Squelch is NOT reverse polarity protected. Reverse polarity will destroy the unit and void your warranty.*

Audio input is connected to J1 pin 2. Apply discriminator audio here. Note that this is the output from the discriminator of your receiver. **Speaker audio will not work!** In most GE and Motorola receivers this signal is commonly obtained from the high side of the existing squelch pot. Consult the service manual or contact the manufacturer of your particular receiver for more info on identifying a source of discriminator in your radio. NHRC cannot provide info on finding the discriminator in your radio.

The CAS (Carrier Operated Switch) output is provided at J1 pin 4. This is an open drain output capable of sinking approximately 20mA @ 12V. Installing jumper JP3 will enable the on board “pull up” resistor when required.

Setup and Operation

Initial Setup

Verify proper electrical connections before applying power. Apply power to the receiver and the NHRC-Squelch, and make sure that no signal is present on the receiver. Disconnect the antenna if necessary. Adjust the audio input level control VR1 (labeled “RX LEVEL” on the PC board) until the red “SETUP” LED D4 just stops flashing. The steady-state red LED indicates that you are providing sufficient signal to the microprocessor for proper squelch operation.

If you cannot get the red “SETUP” LED to stop flashing, there may not be sufficient input level. In this case, additional gain can be selected by removing the “GAIN” jumper JP4. Remove JP4 and re-adjust VR1 until the red “SETUP” LED stops flashing.

When VR1 is properly adjusted, the red “SETUP” LED D4 will not flash, or may occasionally flash when there is no signal present on the receiver. It is normal for D4 to flash when a signal is present.

Adjust the “SQUELCH” pot VR2 for desired squelch threshold. The green “RUS” LED D3 indicates squelch activity. See the “Setting the CAS output polarity” section below to understand how to interpret the “RUS” LED.

Setting the CAS output polarity

The NHRC Squelch can be configured for active high or active low operation by the installation or removal of JP1 “RUS POL” polarity jumper. With the jumper removed the open drain output is configured for active low (pull to ground). The green “RUS” LED D3 will illuminate when the squelch is “open”. Installing a shorting jumper in JP1 “RUS POL” configures the CAS output to be active high. In this mode the open drain output will “open” or turn off when the squelch opens. With JP1 jumpered the green “RUS” LED D3 will illuminate when the squelch closes. An on board “pull up” resistor can be enabled by placing a shorting jumper on JP3 “RUS HI”. This will cause the output to switch between 12V and ground depending on polarity selected.

Configuring the NHRC-Squelch delay times for the receivers band of operation

“CONFIG” jumper JP2 changes the amount of hysteresis the delay circuit will exhibit. The delay times are 0, 100, 200, 400 milliseconds, unless doubled to 0, 200, 400, 800 milliseconds by the installation of the “CONFIG” jumper JP2. For VHF high-band and UHF receivers, NHRC recommends that the jumper **NOT** be installed.

For VHF low-band where fading is more pronounced, installation of “CONFIG” jumper JP2 is recommended. This will allow more hysteresis so the squelch will follow deeply fading signals into the noise before finally closing. Full quieting signals will still squelch immediately.

Theory of Operation and Troubleshooting

The NHRC Squelch amplifies the input signal in op-amp U1B. This amplified input signal is high pass filtered by op-amp U1C. The resulting signal is buffered and rectified to produce a DC level proportional to the level of noise on the input signal. No input signal produces all noise and 4.5V DC level and a full quieting signal will yield 0V DC (zero) out of the rectifier circuit. The rectified noise level is passed on to the microprocessor at pin 6. When troubleshooting your setup you should see 4.5V DC at U2 pin 6. If A DC level of 4.5V at U2 pin 6 with an un-squelched receiver cannot be obtained you probably do not have enough drive from your discriminator into the first op-amp U1B or your input signal is from a filtered (de-emphasized) audio source such as a speaker output.

The microprocessor continuously monitors the noise level and the signal quality is evaluated 250 times a second. Based on calculated noise level, the CAS delay is adjusted as the signal to noise ratio of the receiver changes.