AFSK Demodulator Board with Current-Loop Output
mfg. by Eric Volpe for Greenkeys subscribers, Feb 2011. (contact epvgk@limpoc.com for info)

The board is a straightforward application of the NJM2211 FSK decoder chip. It accepts an audio signal and decodes it into on and off keying of a teletype current loop circuit via an optical isolator which protects your computer or radio from the high voltage and inductive spikes on the loop. It has the additional feature that when it's not locked on to a signal, it keeps the the loop closed so that the attached teletype machines won't clatter away or print gibberish.

The board was designed to be cheap and small, and as such it does not include various bells and whistles such as the ability to invert mark and space. As is, it will correctly decode the ITTY signal, and if you're getting audio from a radio, it's probably a sideband receiver where you can switch to the opposite sideband, which achieves the same thing. The board does not provide the loop current – like a keyboard or tape reader, it just makes and breaks the existing circuit. The output can handle 60 or 20mA loop and is safe to 200 volts. There's been discussion on the Greenkeys mailing list about how to make a loop supply, if you need one.

George Hutchison W7TTY's excellent ITTY service can be found at http://rtty.com and is a perfect source of AFSK data for this board. In addition, there are many web-accessible software defined radios available to the public. An index of them can be found at http://websdr.org – choose one, find a signal, plug your computer's audio output into this board, and watch your machine print the traffic!

Instructions:
Connect a power supply: 6 to 12vdc, please observe correct polarity marked on the board. It only draws about 20 mA, so nearly anything will do, even a 9 volt battery. Connect the LOOP terminals in series with your teletype current loop.

Attach an audio signal to the “audio input” connector. The chip's datasheet says it's happy with signals from 2mV to 3Vrms. I've found it to work fine with the output of my laptop or HF receiver at any reasonable volume level. Computers with a stereo output may output audio on only one of the two channels, so you may need to try both to get a signal. Note that the audio and power inputs share a ground. (but the loop is completely isolated)

Watch the two LEDs. The red (right) LED indicates that a signal has been detected and locked in; the left (blue) LED shows the decoded signal itself, so it should be flickering along with the data. The preassembled boards are going out already set to the ITTY frequencies (2125Hz mark, 2295 Hz space, 170 Hz shift) so you may not need to adjust anything.

Once the LOCK light is on solid and the DATA light is flickering, power up your machine and it should start printing text. The sample printout included with your board (if preassembled) was generated from ITTY by the actual board shipped to you. Apologies if it contains any objectionable content; it's just a random few lines ITTY sent while I was testing.

To adjust center frequency and/or shift:
Note that the trimmer is a 12-turn pot. All the way one direction gives a center frequency of about 1000 Hz, while the other extreme gives a center frequency of about 2900 Hz. The best way to adjust is find the lowest position where the red LOCK light starts to come on, then find the high position where it starts to flicker off, and set the trimmer right in between. It's not too critical. There is also a “Wide/Narrow” jumper – if you wish to decode RTTY signals with very small shifts like 23 or 85 Hz, you may need to switch it to “NRW” to get reliable decoding. Likewise if you want to decode large shifts like 850Hz, you may need it set it “WIDE.” For normal 170 Hz shift, it doesn't really matter and can stay on “WIDE.” For extreme shifts, the LOCK light may still flicker even though data is decoding successfully. You can replace the trimmer with an external 20k pot for more convenient adjustment of the center frequency.

A couple of notes for those doing their own assembly: resistor R6 is marked 2k, but you may have received a 2.1k or 2.2k resistor. The value is not critical as it just sets the brightness of the blue LED. You may receive any of a number of equivalent 6-pin optocouplers, in place of the HSR312. Most kits come with a small blue nonpolarized 10uF capacitor for C20; you can ignore the polarity marking on the board. The LEDs are installed with the long lead toward the bottom, blue on the left, red on the right. The value markings on the caps are easier to see with a magnifying glass. 0.022uF=“223”, 0.1uF=“104” 1.0uF = “105” etc. The 2N7000 FET is quite static sensitive, so be careful handling it. If you got your board preassembled, don't worry about any of this. The silkscreen says “250v max” but the snubber diodes actually limit this to 200v.

Caution! When the loop is connected, there is potentially dangerous high voltage present on the board! Use at your own risk, etc.

Teletype AFSK Demodulator with current loop output

(see NJM2211 datasheet for demod details)

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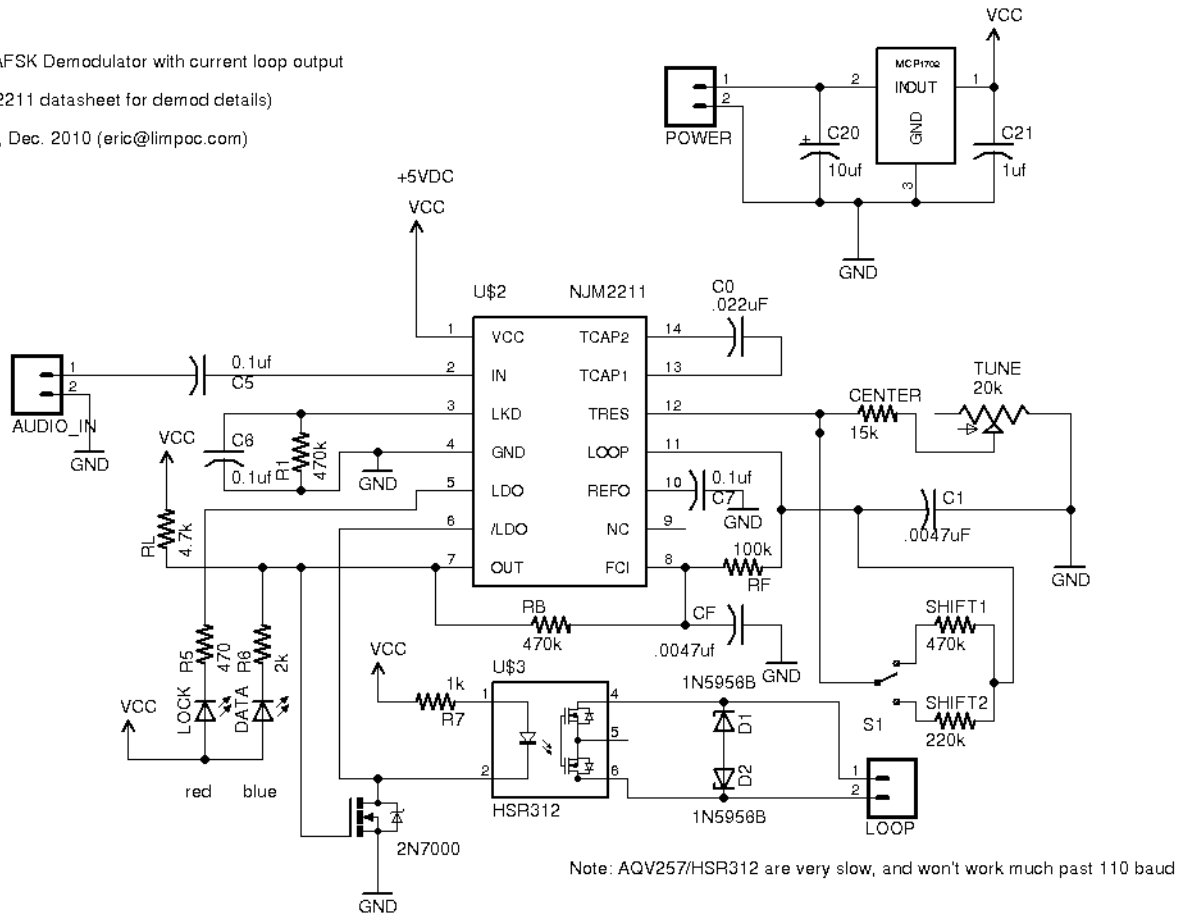

Note: AQV257/HSR312 are very slow, and won't work much past 110 baud