Thank you for purchasing a TAPR product. The associated software and directions can be obtained from the web. Here is some basic information and a link to the documentation:

## The TR-Plus Transmit/Receive Switch **for Pure Signal**

The [HPSDR](http://www.openhpsdr.org/) PowerSDR software has been extended by Warren Pratt, NR0V, to incorporate [Pure Signal](https://sdrzone.com/index.php?option=com_easyblog&view=entry&id=34&Itemid=488) adaptive predistortion, which uses digital magic to improve the performance of HF amplifiers. It can reduce the intermodulation distortion ("IMD") comminly known as "splatter" by 10 dB more more. John Ackermann, N8UR has done some testing of Pure Signal and posted the results at [febo.com](http://www.febo.com/pages/hpsdr/puresignal/).

Pure Signal requires that a sample of the transmitted signal, picked up at the output of the final amplifier, be fed back into the HPSDR receiver for processing. It's important that the sampled signal is at least 10dB stronger than any leakage or "crosstalk" from the rest of the transmitter chain. What you need is a T/R switch that handles four connections (transmitter, receiver, antenna, and sampler input) without allowing the transmit signal to leak back to the receiver, other than via the sampler. The ANAN series radios don't support that requirement without modifications and external components.

The TR-Plus is one way to provide the necessary switching and isolation requirements. It meets N8UR's design goal of creating a T/R switch that would support Pure Signal with the ANAN-10 radio without having to make any irreversible modifications to the radio.

TR-Plus is not limited to use for Pure Signal -- it's a general purpose T/R switch and requires only 12 volts and a standard ground-on-TX keying signal. It can be used, for example, to switch a Mercury/Penny pair, or for any 100W class receiver/transmitter combination.

You will need to provide a keying signal from Hermes to the TR-Plus board. This is available at pin 25 of J16 (an easy way to access this, and other useful signals, is via the [TAPR](http://www.tapr.org/) [Hermes Breakout Board](https://www.tapr.org/kits_hermes_breakout.html).)

#### Performance

There are two specifications that are important for any T/R switch: power handling capability, and switching time.

The relays used in the TR-Plus are the same as those used in the T/R switching section of the TAPR [Alex Filter](http://www.tapr.org/kits_alex.html). Based on measurements and experience, these relays can handle 100W at HF/6M.

Measuring between the ANT and TX connectors, the delay from applying the KEY signal is less than 1.5ms, which should be fast enough for most applications.

The third characteristic is only of moderate importance for a normal T/R switch, but critical for Pure Signal work. That is the isolation between the receiver and the transmitter. To work properly, Pure Signal wants to see about 0dBm of sampled signal. Crosstalk from other signal paths should be 10-20dB below that level. If you use a 100W amplifier, that is +50dBm, the leakage from that should be down at least 60 to 70dB.

In designing the TR-Plus, a lot of care was taken to avoid crosstalk and the results are pretty good. At 20M, the isolation between RX and TX ports is nearly 70dB, dropping to 54 dB at 6M. These values are sufficient for good Pure Signal operation without using other tricks (except perhaps at 6M).

Manual: <https://web.tapr.org/~n8ur/TR-Plus_Manual.pdf>

Contact us at **contact@tapr.org** for assistance, help or troubleshooting.

Best Regards, TAPR