

MICRO-TRAK 8000 MANUAL VER 1.2

The Micro-Trak 8000 Version 1.0 is a miniature APRS (Automatic Position Reporting System) transmitter operating on the North American APRS frequency standard of 144.390 MHz. and is also available on the European standard frequency of 144.800 MHz. The transmitter accepts a TinyTrak3 compatible DIP PIC. The entire assembly measures only 1 X 4.7 inches, and weighs less than one ounce! The Micro-Trak 8000 is a creation of VHS Products, and is distributed exclusively by Byonics. The MT-8000 is fundamentally a hybrid of two VHS Products designs, and combines the popular Micro-Trak 300 with the Micro-Amp, an amplifier capable of boosting the RF power output to in excess of 8 Watts.

The MT-8000 is extremely compact and light, due in part to the enclosed RF section. The Micro-Trak 8000 is provided as a fully assembled and populated printed circuit board subassembly. Completion and operation of the device will require simple programming, and providing power, antenna, and a GPS input. Tuning and peaking of the RF amplifier stage is desirable after any change of configuration, antenna, enclosure etc.,.

Because of its small size and light weight, the MT-8000 Version 1.2 is ideal for portable and airborne operations. Small size notwithstanding, the Micro-Trak 8000 has a power output in the range of 8-12 Watts, and is capable of operating at extremely long ranges. An on-board 5 volt regulator provides an optional 200 MA, power output for your GPS receiver. (Many applications, including the use of the device with hand-held GPS units, will not require the 5 volt output of the Micro-Trak.) The entire system runs well on 12-13.2 volts DC, and draws only about 10 milliamps in standby, and increases to 2 amperes during transmissions (which last approximately 1/3 of a second using MIC-E) when set for full power operation. The Micro-Trak 8000 has easily adjustable power settings for responsible and energy saving operation. Please note that the MT-8000 should not be operated directly from unregulated automotive power busses!

No case or package is provided with the Micro-Trak 8000, allowing the user to package the device according to their own unique needs. The design philosophy called for as small, light and basic a package as possible, with a high enough output for more critical and remote operations. The programming and GPS input connection is set up to use a DB9 Male connector (The same as a standard TinyTrak 3) by simply sliding the connector over the tabs and soldering it in place. The Micro-Trak can connect to a standard GPS receiver, such as the Byonics GPS-1 or GPS-2, directly through the DB9 connector, but it is important to remember that computer programming and communication uses a reversed connection, meaning you will need a female to female null modem cable, or a null modem adaptor and a gender-changer connector for programming your Micro-Trak. These cables and/or connectors are available from Byonics.

The combination of the Micro-Trak 8000 and the TinyTrak 3 PIC produces a hybrid that is capable of being adapted to virtually any portable APRS project. It is important to remember, that this is a transmit-only system, and may transmit coincidentally with other APRS transmitters. Complete information about TinyTrak and the Micro-Trak 8000, Version 1.2, as well as configuration software may be found at: <http://www.byonics.com/microtrak300> .E-Mail information requests about the Micro-Trak 8000 can be addressed to: microtrak300@byonics.com

Safety

The Micro-Trak 8000 is not designed for 100 % duty cycle (continuous) operation. It is designed for intermittent packets of data, as is typical in APRS operations. Use appropriate RF safety protocols when operating this transmitter. **Do not operate the device without having an antenna or RF dummy load connected to the antenna output! Do not operate the device into very high SWR antenna connections.** This can destroy not only the amplifier module but the entire RF section of the Micro-Trak 8000, and will not be serviced as a warranty repair.

RESOURCES

Please join the Micro-Trak and TinyTrack Yahoo User's Groups!

These sites can provide invaluable information by giving you access to thousands of users involved in every aspect of APRS, Ham radio, and specific applications that will get you going, or solve your problems, fast!

TinyTrack Yahoo Users' Group

<http://groups.yahoo.com/group/TinyTrak/>

TinyTrack 4 Yahoo Users' Group

<http://www.byonics.com/tinytrak4/>

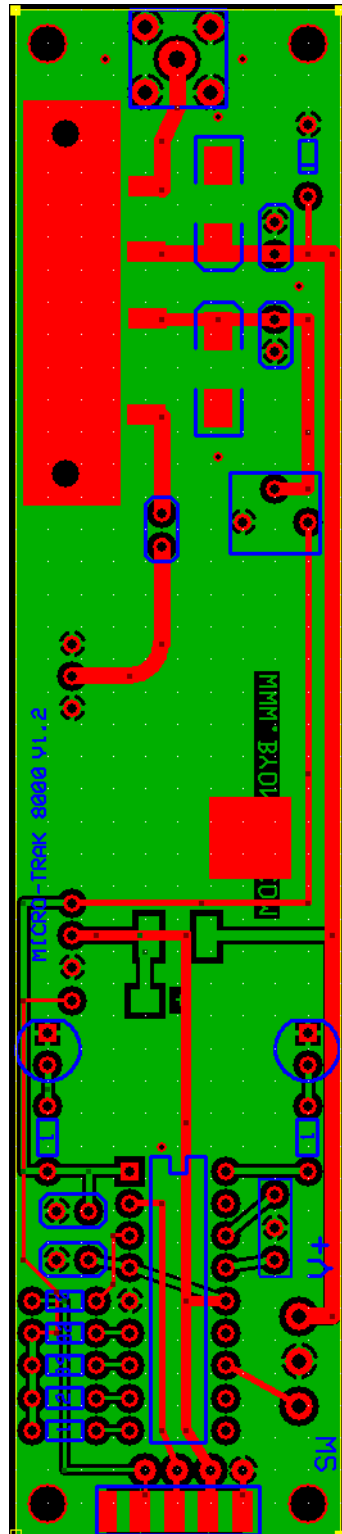
Micro-Trak Yahoo Users' Group

<http://groups.yahoo.com/group/MicroTrak/>



Micro-Trak 8000 VER 1.2 Printed Circuit Board

(Note: Top ground plane screen not shown for clarity)



Adjusting the amplifier stage

Set the trimmer potentiometer to the center position. Make sure that you have connected a dummy load, or at least an antenna, to the amplifier output before connecting power. Ideally, you would use an RF power meter and a dummy load to adjust your system. If this is not available, you can use an Ammeter (with a range of at least 2 Amperes) in the power supply line to your Micro-Trak.

Using a small screwdriver, quickly adjust the trimmer potentiometer on the Micro-Trak for maximum power output or current draw during transmissions. You can cause the unit to transmit by disconnecting and reapplying power. Higher power levels will of course result in higher power consumption, and shorter battery life. Also, keep in mind that polite hams do not use more power than is necessary. One or two watts output power is almost always enough if there is a digipeater in your area. Most of the power adjustment will occur within a few degrees of the center position of the potentiometer. Using a volt meter, verify that the voltage on the amplifier gate (the second pin from the left on the RF amp module) does not exceed 3 volts during transmissions!

It is a good idea to monitor your transmissions for testing. One simple way of doing this is to install the AGWPE program on your computer, which when connected to a radio receiver tuned to 144.390 or 144.800, will display decoded radio packets. You can download a Hamware version for free here:

<http://www.sv2agw.com/downloads/default.htm>

Deviation Adjustments

The Micro-Trak 8000 is pre-set for optimum deviation. Occasionally, digipeaters will exhibit varying tolerances for FM deviation, accepting either only exceptionally wide or narrow deviation levels. The deviation level of a Micro-Trak 8000 may be adjusted by a technician, using either an FM deviation meter, or a packet decoder (TNC and computer, Kenwood APRS radio, AGWPE, etc.) The procedure is delicate and can destroy the unit if done ham-handedly, and repairs to damaged units will not be covered under warranty. That being said, the MT-8000 RF module (sealed metal can transmitter module) should have the label covering the top peeled back in the lower right hand corner of the device. (This is the corner closest to the red LED) a small non-metallic flat-bladed toll may be used to adjust the deviation. The deviation control will occur within a very narrow window of rotation, so adjustments will be made in very small increments. Do not be tempted to try adjustments to the other controls under the label. You will detune or destroy the module. Cover the deviation hole with the label or a small piece of tape.

Operating Voltages

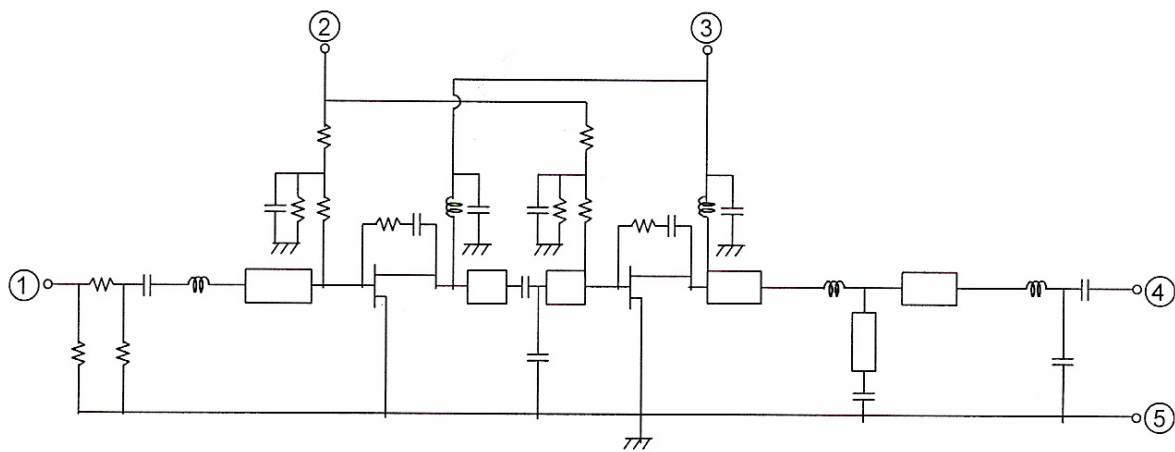
The Micro-Trak 8000 will run with reduced power at lower voltages, and should not be powered by voltages exceeding 13.2 volts, including unregulated automotive voltages. Note that the power inout to the Micro-Trak uses a three terminal screw binding post. On side is marked "V+" (the power input) The center input is Ground, and the input marked "SW" is the configuration switch input, which is switched to ground to change configurations. Take care not to mix these up. Like all MOSFET devices, the device can be damaged by static or high voltages, including static charges that may build up on mobile antennae in thunderstorms or dry areas. Use static protection procedures on antennae other than portables whips.

Thank you for purchasing the Micro-Trak 8000! The Micro-Trak 8000 is intended for licensed ham radio operators only, other applications, while possible, may not be prudent given the absence of heat sinks on this device. Power output may be different with a range of variables, and no particular power output is guaranteed. Operating the amplifier for excessively long continuous periods, or into poorly matched antennae or other loads, may destroy your module. MOSFET modules will not be replaced under warranty, but replacement parts will be available for nominal fees. This amplifier was designed for qualified radio technicians. RF safety measures should always be paramount. Even 8 watts of RF power can cause damage under certain circumstances.

The schematic diagram illustrates the internal circuitry of the VHS Products Micro-Trak 8000 V 1.2, divided into three main sections:

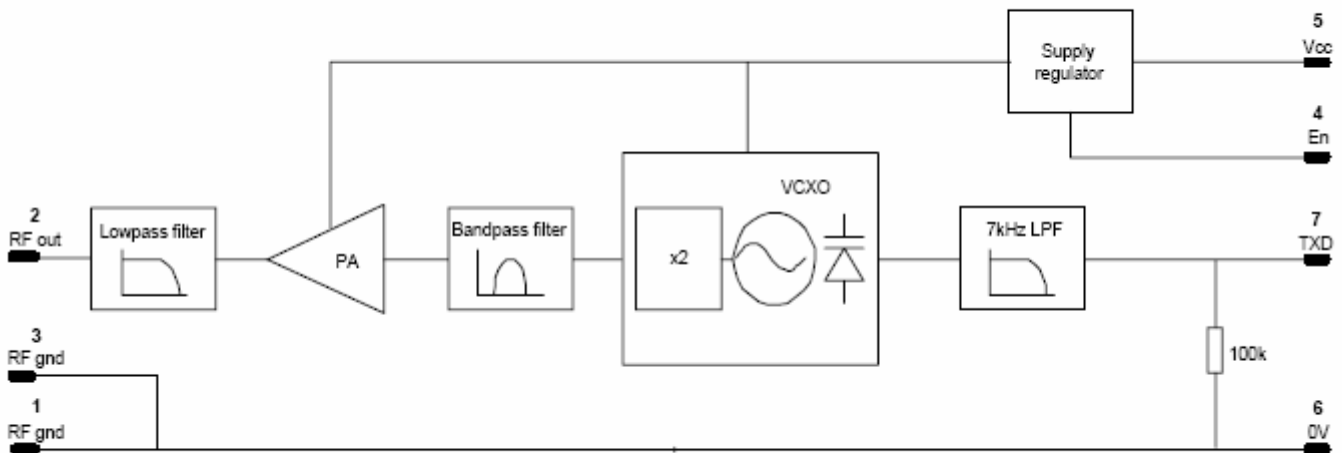
- RF SECTION:** This section contains the HX-1 module and the RF amplifier (U1Amp). The HX-1 module has a Data input, an Enable input, and a +5V supply. The RF amplifier (U1Amp) is a 1N914 diode-based amplifier. It has an RF Input (10 pF), an RF Output (300 mW), and an RF Output (< 9 Watts). The amplifier is powered by a +12V supply and has a feedback network consisting of a 200K resistor and a 4700 pF capacitor. The output is connected to a 1N914 diode.
- ENCODER SECTION:** This section contains the PIC16F628 microcontroller and the HX-1 module. The PIC16F628 has a VDD supply (+5V), a VSS supply (Ground), and a PTT input (12). The HX-1 module has a Data input, an Enable input, and a +5V supply. The PIC16F628 is connected to the HX-1 module via a 10K resistor. The PIC16F628 also has a PTT output (11) connected to a PTT Red LED and a GPS input (10) connected to a GPS Green LED.
- ENCODER/GPS POWER SUPPLY:** This section shows the power supply for the encoder and GPS modules. It features a 7805 voltage regulator (A) that takes a +12V input and provides a +5V output. The output is filtered by a 10 Mfd capacitor.

Amplifier RF Module Equivalent Circuit



This circuit reflects the basic components of the MOSFET RF module used in the Micro-Trak 8000.

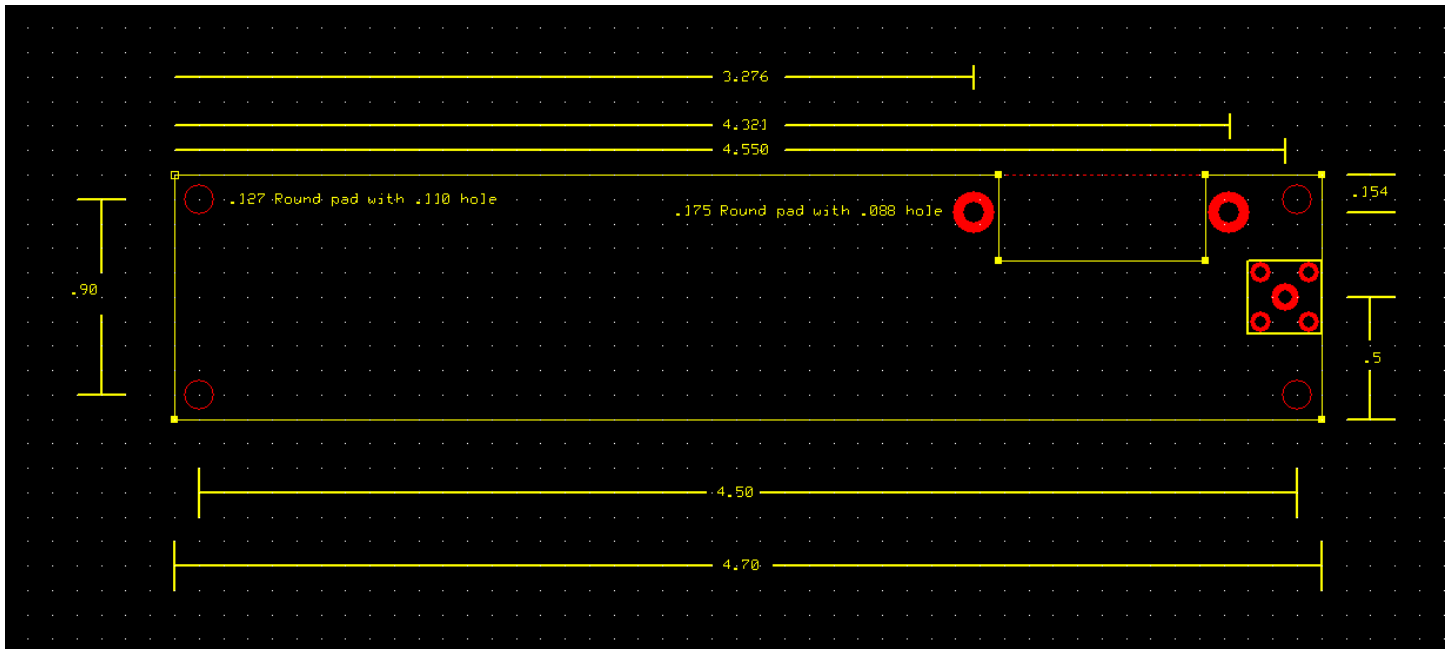
The pins shown are 1 through 5. Looking at the module from left to right, you will see pins 1 through 4, with the metal case and mounting flanges represented by pin 5, Ground. The amplifier you will note uses band pass filters internally to minimize any out of band signals. These filters effectively limit the spectrum of the amplifier to ham and public service bands.



Block Diagram of Narrow Band FM Transmitter Module.

Block diagram of sealed RF Narrow band Modulator. Note that the circuit uses a high quality crystal-controlled design, and pays particular attention to input and output filtering for spectral purity.

Micro-Trak 8000 mounting footprint (Versions 1.1 and 1.2)



APRS TRACKERS:

Welcome to APRS!

Bob Bruninga, WB4APR See <http://www.ew.usna.edu/~bruninga/localinfo.html>



Thank you for investing in this exciting aspect of the Ham radio hobby. You will find APRS as a great real-time communications and information distribution system that keeps everyone informed of all surrounding APRS and other Ham Radio activity and that also facilitates communications by data and voice among all members of the APRS network.

In that regard, APRS was intended to be a two-way communications system between operators. Although you have purchased an APRS "Tracking Device" which is sometimes connected to only a transmitter, you can still fully participate as an operator in the APRS net. The best way to do that is to connect your APRS tracking device to a transceiver and although the receiver is not used for data, the receiver and speaker can still be fully used as an APRS "intercom" channel for back-channel voice coordination. In effect, you get dual use out of the radio (Data and Voice)!

As noted on the web page above, placing the receiver in the Beacon Text of your tracker, your position report can also then see how to you in the voice net as needed. If you use the frequency will show up properly on everyone else's here. This way, other operators can then easily channel and make needed contact. Although any can be used, we recommend using a radio with to the APRS data channel (144.39 in the USA). is muted to all packets, yet you can be called by PL-100. Another advantage of this method is that your speaker also becomes a "radar detector" to other simplex range. This is called "Voice Alert".



frequency of your voice everyone that receives contact you, and include proper format then your displays such as shown tune to your calling voice calling channel CTCSS-100 and tuned This way, your speaker voice by anyone using

Including your own voice monitoring frequency in all of your packets is just part of the use of the APRS *frequency* parameter. Under the New-N Paradigm, the locally recommended voice repeater for all travelers is also being transmitted by most digipeaters as an object. This informs travelers in the area, what frequency is useful to them right there, right now. These objects show up in the station list of all APRS stations for easy visibility as shown above.

If your tracker device has its own transmitter and no receiver, you can still include your monitoring voice contact frequency in a periodic beacon to facilitate communications with you even if you are not onboard. If not a frequency, you might consider including your email address instead. If not in every packet, then once every 10 minutes is suggested.

Both of these methods, Voice Alert and local Frequency Objects fulfill the objective in APRS of facilitating communications between all operators in any situation.

Enjoy! Bob, WB4APR