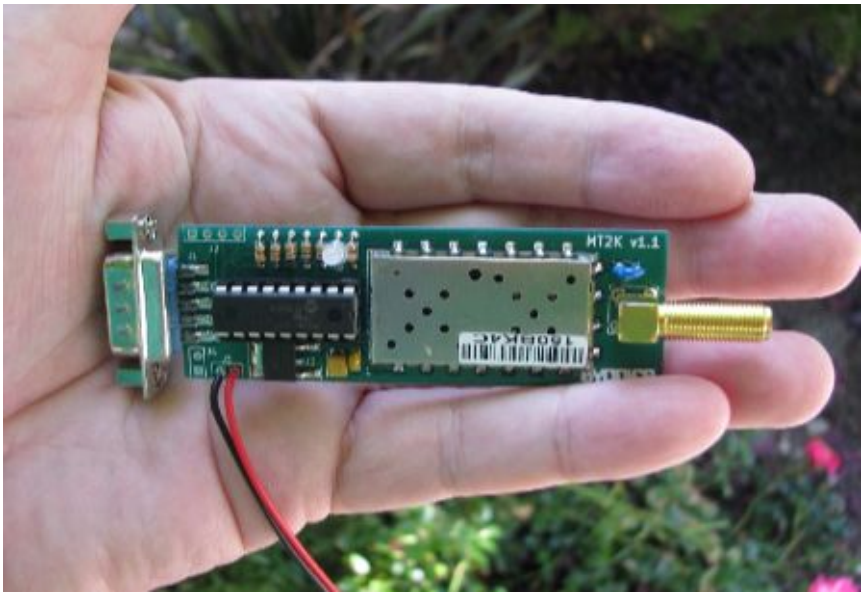
Micro-Trak 2000 APRS™ Transmitter Manual

Version 0.2

OVERVIEW

The Micro-Trak 2000 (MT2K) is a frequency agile, 2 Watt, programmable miniature APRS™ (Automatic Position Reporting System) transmitter capable of operating from 144 to 148 MHz. The MT-2000 is a higher power replacement for our discontinued MT-400, and is designed primarily, but by no means exclusively, for high altitude meteorological balloons, and other applications requiring mid-power transmitters with minimal size and weight. The MT-2000 is intended primarily for use as an air-to-ground, or ground-to-air transmitter, and is not optimal for all terrestrial applications.



The transmitter utilizes a special version of the TinyTrak3 controller and may not be compatible with all Byonics firmware versions. The device may be ordered pre-programmed, and programming cables are available for the end user to change the configuration at any time. The Configuration Program, currently version 1.4.6, may be downloaded for free from the Byonics website. The entire assembly measures only 1 X 3.1 inches (Not including optionally installed DB-9 connector) and weighs less than one ounce. The Micro-Trak 2000 is a creation of VHS Products, and is distributed exclusively by Byonics at http://www.byonics.com

APPLICATIONS

The MT-2000 is extremely compact and light, due in part to the enclosed RF section. The Micro-Trak 2000 is provided as a partially assembled and populated printed circuit board assembly, with the SMA RF connector installed, and the DB-9 connector included, but not installed, to allow for flexibility and minimal size and weight in your particular application. Your application, for instance, may utilize a directly wired OEM style GPS receiver wired directly to the PC board.

Completion and operation of the device will require simple programming (May be ordered pre-programmed) and providing power, antenna, and a GPS input. The Micro- Trak 2000 is shipped tested, but specifics of the configuration programming may vary between user applications, and purchasing a programming cable is strongly recommended. (Byonics TT-USB programming cable; http://www.byonics.com/cables/usb.php)

Small size not withstanding, the Micro-Trak 2000 is capable of power output in excess of 2 Watts, and is capable of operating at extremely long air-to-ground ranges. An on-board 5 volt regulator provides an optional 50 mA, power output for your GPS receiver. With the DB-9 connector directly soldered to the board as shown in the photo above, a Byonics “hockey-puck” style GPS is “plug and play, with a regulated 5 VDC available on pin 4. For applications utilizing a directly soldered GPS, the same pins available on the DB-9 are made

available as through-hole connections next to their respective edge connections. Connecting an OEM style GPS requires only three solder-joints: +5 Positive (usually red in most brands) Ground (usually Black) and Serial out (from the GPS, usually Green). While these are industry standards, not that not all GPS receivers may use the same color scheme, and the GPS documentation should be reviewed before installation. This color scheme does apply to Byonics GPS receivers.

Some applications, including the use of the device with hand-held GPS units, will not require the 5 volt output of the Micro-Track. The entire system runs well on 7.5 to 15 Volts, DC, and draws only about 10 milliamps in standby, and increases to 700 mA during transmissions, which typically last 1/3 to ½ second typically not more than every 120 seconds, and a standby current of approximately 30 mA is drawn as long as a GPS is connected. (Virtually all of the ambient current is drawn by the GPS receiver)

PROGRAMMING

The programming and GPS input connection is setup to use a DB9 Male connector (Included but not soldered on except by special order) by simply sliding the connector over the matching tabs. The MT-2000 can be programmed using the Byonics TT USB cable, which will provide power and serial data to the MT-2000 without having to connect external power. The programming cable and free USB drivers are available on the Byonics website. Programming and GPS connections may also be made on the through hole pads of J1 (DB-9) and/or J2. It is important to note that it will be impossible to program the MT-2000 while the GPS is connected, so the GPS must be unplugged or disconnected during programming. Note that the DB-9 connector is not wired in the conventional RS-232 connector fashion, and that pins 2 and 3 are “reversed” in respect to a standard serial cable.

In the event that you decide on an installation that does not require the DB-9 connector to be permanently installed, programming can be accomplished by connecting the DB-9 connector into the programming cable, and sliding the connector over the tabs, while lifting the DB-9 connector to ensure a solid connection (an extra set of hands may be required for this). A perfectly viable alternative is to connect the DB-9 connector to the top edge connectors with a short length of hookup wire which can be easily removed after programming.

The DB-9 connector may be soldered to the board. Although only four of the pads on the top of the board are used, all of the pins should be soldered to assure a solid mechanical connection. The four layer bottom pads should be heavily tinned with a soldering iron. This will allow the DB-9 connector to slide over the pads with an interference fit. Set the end of the DB-9 flat on a table with the MT-2000 oriented vertically and visually check the board to make sure that all of the connector pins are perfectly aligned with the board edge connectors. If all the pins are in proper alignment on both the top and bottom of the board, carefully “tack” the two outside connectors on the bottom of the board while verifying that the connector remains straight. If it all looks good, solder the remaining bottom pins. Then solder the five top side connector pins to the PC board, making sure that the gaps between the board and the pins are filled and the solder has not jumped across any other pin connections.

POWER SUPPLY

DC power input is made by wire of directly soldering wires to the JS input pins. A direct wire input was selected for this model to avoid a bulky terminal block connector, so care must be taken not to allow these power wires to become fatigued, as they can fray or break off. Note that the positive input lead is on the right, but a polarity protection diode in the power supply section of the MT-2000 will prevent damage from accidentally reversing the power leads. Alkaline battery packs, such as a 6 pack cartridge of AA(9 Volt) batteries are fine for low altitude operations (Kites, RC aircraft, etc) For high altitude operations, we recommend ONLY Energizer “Ultimate Lithium” AA batteries in either the 6 or 8 pack cartridges (9 or 12 Volts) and High-Altitude enabled

GPS Receivers (Most GPS receivers are capped at 60,000 feet) like the Byonics GPS5HA or GPS5HAOEM.

ALTERNATIVE CONFIGURATION

Like most TT3-based products, the MT-2000 is capable of storing two completely independent sets of configuration profiles, which are entered during the computer configuration process. Jack J4 provides an output for a SPST switch to manually select the desired the configuration. More information about programming is available in the TT3 Configuration manual which may be downloaded from the Byonics website. (Web link?)

RF OUTPUT CONNECTOR

The footprint and connector for the RF output is for a female, right angle SMA connector. The MT-2000 is very flexible in the type of antennae it will accept, ordinarily, air to ground antennae do not require enormous gain, but the need for antenna gain increase with proximity to the ground. For high altitude balloon applications, we recommend the Byonics V6 center-fed half-wave antenna. Use care when inserting mating connectors into the SMA connector on the PC board. Off-axis insertion can easily cause bent pins in the male connector and damage the mating receptacle on the MT-2000. SMA connectors should not be constantly removed and reconnected, as they have a connection cycle service life. The MT-2000 installation should not place any significant strain on either the SMA or DB-9 Connector.

LED INDICATOR

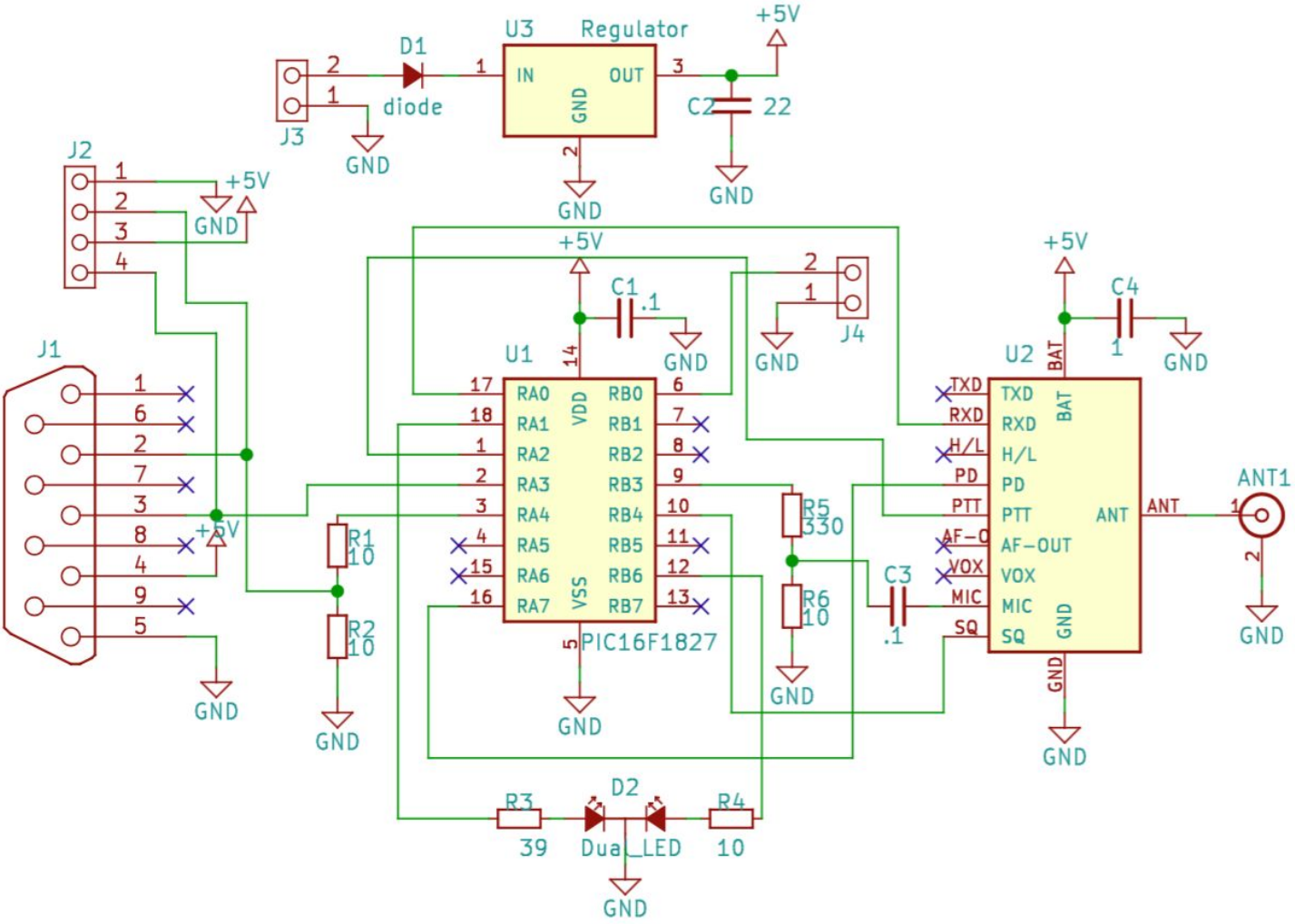
The MT-2000 has a single bi-color (red/green) LED to report on the unit's status. There is no "power on" indicator per se. On initially powering the unit, the red/green LED status light will flash indicating the unit is starting up. If the red/green LED flashes continuously, you may have a low battery or damaged antenna causing excessive SWR, and this should be investigated and resolved. Shortly after applying power, the MT-2000 will send a "start-up" ("Here I am world") packet unless this feature is deactivated in the configuration software. When the MT-2000 recognizes a GPS signal, the green (Segment) will begin to flash. Once the GPS acquires valid data (i.e., A "good position report ") the green LED will light solidly green. After initially recognizing a valid GPS signal, the green LED segment will stay lit continuously, and a packet should then be transmitted immediately. This transmission is indicated by the red LED segment, and since the red and green LED will be lit simultaneously, the LED may appear yellow.

SPECIFICATIONS

PC board size	1X3.1 (inches) Not including RF connector and DB-9 projection
Overall length w/conn	4.125 (inches)
Supply Voltage	7.2-24 VDC
Ambient current	< 5 mA
TX Current	700 mA
RF Output	>2 Watts @ 9 VDC
DC Power output	+5 VDC, regulated on DB-9 pin 4
Weight (No connectors)	.5 Ounces

Weight (DB-9 and SMA)	.9 Ounces

SCHEMATIC



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