GPS PTTs

Since 2001, when we first introduced our 70g GPS enhanced solar backpack PTT, we have worked our way through 5 generations of these PTTs, the latest weighing 22 grams. Since GPS provides accurate locations, our GPS enhanced PTTs have become the preferred tool for biologists worldwide.
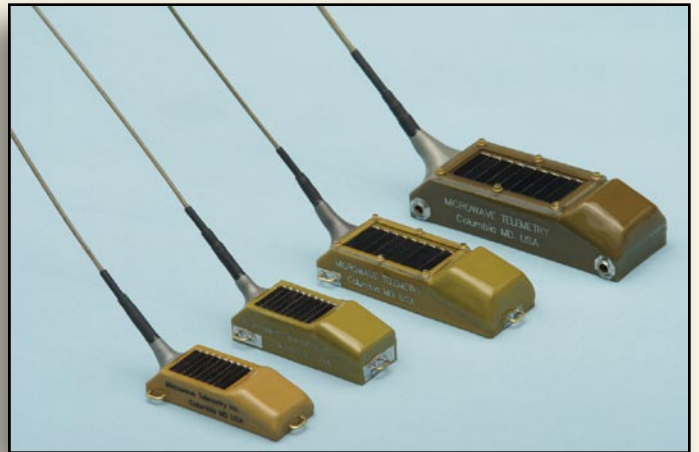
These units have several other advantages over conventional PTTs in addition to more precise locations (typically within 15 m). In areas where radio interference negatively affects the Argos system, only the odd message may reach the user. A single message from a GPS PTT equipped with 2D software can contain five accurate GPS fixes whereas Argos cannot locate a PTT with a single message. The larger solar GPS PTTs can give positions in 3D also, i.e., an altitude position as well as latitude and longitude and even heading and speed when the bird is flying. Additionally, with these devices, home range studies, where high spacial resolution of small movements of a bird within a habitat need to be documented, can now be carried out.

As newcomers join other biologists in this field, and as we add other capabilities to our PTTs, it has become increasingly obvious to us that the technology presents a learning curve. We are repeatedly asked questions by researchers attempting to figure out how to best employ the technology for their project.

Though our website does contain relevant information on our GPS PTTs, we present here a summary to help clarify information on our GPS PTTs.

MTI image archive

Our GPS PTTs range in size from 22g to 70g.

GPS

GPS enhanced PTTs make use of the Global Positioning System to record the precise location of a PTT rather than the Doppler location technique used by the Argos system to position conventional PTTs.

How does a GPS PTT function?

Our GPS enhanced PTTs are much more complex than standard "Doppler positioned" PTTs. They consist of four major subsystems: a GPS receiver and antenna, a microcomputer/datalogger, an Argos uplink transmitter and a solar powered energy source or battery. The microcomputer continually runs through a complex program controlling all of these subsystems.

Duty Cycles

Each unit is programmed with two independent duty cycles, defined by the customer's specifications.

The first duty cycle defines times when the unit will attempt to obtain GPS positions. These times are always "on the hour" and defined in local time.

The second duty cycle independently defines when the transmissions of the stored GPS data to Argos are made, similar to a conventional PTT. Typically this is on every third day. The precise times of the transmissions are calculated by the microcomputer to be when there is likely to be a "Satellite in view" (SiV™) above the horizon. Transmissions are restricted to within two of the six hour GMT windows defined by CLS for billing purposes, on any particular day.

Both of these duty cycles are defined by the customer within a simple table on our online Production Form. Up to five separate duty cycles can be defined for different seasons within the calendar year.

GPS Fixes

The GPS positions are stored onboard the unit until it is time to transmit them to Argos. At this point, they are assembled into messages and transmitted as "sensor data" in a series of Argos messages; a checksum is incorporated into each message that is later used to verify the integrity of the message. Dependent on whether the unit is programmed to collect 2D or 3D GPS fixes either five or three positions are contained in each Argos message. Experience has shown that about sixteen unique messages can typically be transmitted through the system on any given transmission day (e.g., every third day) which equates to 48 3D positions or 80 2D positions. In areas of heavy radio interference to the satellite the number of messages that get through the system are severely reduced.

Data Analysis

In order to retrieve these positions from the system it is very important to receive this data in the correct format from Argos and to receive all of the messages. Although the positions are plainly visible in the Argos message it is a tedious job to manually extract them.

We supply a "parsing" program that will extract the GPS positions from the raw Argos data and present them to you in a tabular form. This program can extract the data from 'DS' and 'DIAG' data files for multiple GPS PTTs and separate them into data sets for individual PTTs after verifying the embedded checksums. The latest version of this parser program can also output data in a Google Earth™ compatible format, as described elsewhere in this newsletter.

As you can see, a very complex set of processes are involved that result in showing you in precisely which tree your bird was sitting at 4 PM local time yesterday on the other side of the world!