TELONICS
TELEMETRY-ELECTRONICS CONSULTANTS
932 E. IMPALA AVENUE • MESA, ARIZONA 85204-6699 U.S.A.
TEL (480) 892-4444 • FAX (480) 892-9139
E-MAIL info@telonics.com
www.telonics.com

August 17, 2010

VHF TRANSMITTING SUBSYSTEM HANDLING GUIDE

Please read this summary sheet immediately upon receipt of your transmitters and again prior to deployment of your units. Not all information concerning handling, deployment, and operation can be included in this short guide. Please contact the factory with any questions or concerns prior to deploying the units. Not all the information included in this guide may be relevant to your equipment, but the majority of the information is critical to your successful use of the transmitting subsystems. Telonics Transmitting subsystems are guaranteed against defects in materials and workmanship and specific warranty information can be found on the website for specific units. Note that the transmitter frequencies, pulse widths, pulse periods, and some additional specifications are provided on the Transmitter Test Data form provided with each shipment of transmitters.

INITIALIZING VHF TRANSMITTERS…TURNING UNITS ON/OFF

Most transmitting subsystems that are provided with power supplies and use a magnet taped to the unit as a means to keep the unit turned off during shipping and storage. The correct magnet position is often indicated by a line or blue arrow on the unit but on some configurations such as some implants there is no external indications of the correct position for the shutdown magnet. With transmitters designed for implantation the magnet is taped in place on the bag containing the implant, rather than on the implant itself, to avoid damaging the wax coating.

Upon receipt, we suggest the user first verify that the unit is not transmitting do to handling by receiving personnel. We also recommend that the user verify operation of each transmitter with a receiver to confirm that they can be properly tune to each transmitter frequency on the receiver to be used in the study. To do so, remove the magnet from one transmitter at a time, test that transmitter, and replace the magnet to assure the transmitter is off. This testing of one transmitter at a time is suggested because transmitters operating in very close proximity to the receiver (e.g. in the same room) may "bleed over" onto adjacent frequencies. Such "bleed over" resulting in what sounds like a “dull click” rather than a “clear tone” should not occur in the field because of the greater distance between the transmitters and receiver.

When storing transmitters, each transmitter should be tested with a receiver to verify that the magnet is properly positioned and the unit is off. If long-term storage is

anticipated, the magnet should be removed for one or two days each month to maintain proper battery condition. Be sure that during storage, magnets are not in close proximity (<1 inch) from each other and that the magnet is not placed on metal shelving. This is to avoid the flux field being canceled, and the transmitter unknowingly being turned on, thereby consuming battery capacity and reducing operational life. Once the transmitters are in storage, each frequency should again be checked on a receiver to be sure that the transmitters are indeed off.

When microprocessor-controlled transmitters are started, there should be an initial rapid series of 4-5 pulses which indicates proper start-up. (The length of the initial pulse may vary from unit to unit—this is normal.) If this rapid series of pulses is not heard, replace the magnet and leave it in place at least two seconds before attempting to restart the transmitter. This rapid series of pulses is only applicable to MK-8 and MK-9 microprocessor-controlled transmitters. CHP units do not have this initial series of rapid pulses. If you are uncertain about the type of transmitter electronics used in your configuration please contact the factory for clarification and to assure the proper start up and operation of your units.

Transmitting Subsystems built with MK8 Units - if the VHF microprocessor-controlled transmitting subsystems have a programmed duty cycle, special steps are required when starting the transmitters. The microprocessor-controlled transmitting subsystems do contain a clock, but not a “real time clock” or “RTC”. The clock is calibrated to time zero based on removal of the magnet. Because the clock is not a RTC and is not synchronized to calendar date and time of day, the magnets must be removed from the transmitters at the right time to assure proper duty cycling. If the goal of your study is for all of the units to turn on and off at specific times and dates, the magnets should all be removed at the same time. If the magnets are reattached after being pulled, the duty cycle will reset to the beginning and the unit will need to be reinitialized to start at the correct time.

MK9 Units - The microprocessor-controlled transmitting subsystems contain a real time clock or RTC and are synchronized to calendar date and time of day. The removal and replacement of the magnet is for turning the units on and off and does not affect the duty cycle start times.

NOTE: The VHF microprocessor-controlled transmitting subsystems have a normal operating temperature range of -40°C to +65°C. As a customer, you may have requested that your units be cold temperature tested to -40°C to ensure proper operation. At temperatures less than -40°C, the units could be affected. Several components in the transmitting electronics are not rated below -40°C. The batteries used to power the units are not rated for operations below -40°C. Conventional VHF telemetry units are subject to similar limitations. However, when the units are warmed to higher temperatures, they will resume normal operation…continuous pulsing. In the case of the microprocessor-controlled VHF transmitting subsystems, there is a possibility of the microprocessors resetting, in which the duty cycling could be interrupted and reset to the beginning of the cycle or even lose the RTC time.

If the user is supplying their own power supply, the transmitter electronics provided by Telonics still include a reed switch to allow on/off switching via a magnet. After connection of the power supply, shut the transmitter off with a magnet and then restart it by removing the magnet. This assures proper start-up, which is not always accomplished by simply connecting power. Be sure not to apply excessive voltage or reverse-voltage to the transmitter!

Remove the magnet and verify transmitter operation before deploying the transmitter.

COLLAR MOUNTED TRANSMITTERS:

Overall performance of your telemetry system depends on many factors, including the characteristics of both the receiving and transmitting subsystems, the environment in which tracking is conducted, and the specific characteristics and behavior of the animal which is being tracked. The manner in which the transmitting antenna is deployed on collar mounted transmitters is also an important consideration, and a few important technical realities must be carefully considered in such deployments. All materials, even multi-stranded stainless steel cables, fatigue. Any exposed portion of the antenna will ultimately break as a result of this metal fatigue. The time frame may vary from weeks, to months, to years, depending on the species and percentage of antenna exposed. If the antenna breaks before the battery capacity is fully utilized, the result will be a reduction in range performance. The more antenna broken away, the more limited the range. In addition, the antenna cannot be wrapped back on itself, or brought in close proximity to the metal canister housing the transmitter, without reducing the range performance due to proximity effects. Therefore, in many cases a compromise must be achieved, protecting as much antenna as possible without exposing the remainder of the antenna to the negative effects of proximity. We hope an acceptable compromise has already been established in discussions between you as the principal investigator and our technical staff. The instructions below should aid you when deploying your transmitter collars on animals.

MONOPOLE WHIP ANTENNAS:

The large majority of Telonics transmitters are supplied with a monopole, whip antenna. When mounted on a collar for attachment to an animal, one of two basic designs is typically used. In the first design, the antenna is completely internal, or at least as much of the antenna as possible is internal. When the antenna cable is longer than the collar, an exposed portion extends out the end of the collar material. With the second design, the antenna is exited from the collar material somewhere along the length of the collar. For reference sake, we call the first type of antennas "Internal", and the second type "External". During the process of ordering your transmitters and collars, you where probably asked whether you preferred an Internal or External antenna, and the collars where built accordingly.

When specified as External, antennas are typically exited from the collar prior to the first adjustment hole. This allows for protection of the maximum amount of antenna possible, given the range of neck circumferences and preference for an external antenna as specified by the researcher at the time of order. External Antennas generally require no special modification prior to deployment; however, the researcher should realize that external portion of the antenna is subject to eventual breakage as indicated above. On animals with relatively small necks, or on collars designed for a wide range of neck circumferences, the exposed section of antenna can be quite long. The longer the exposed portion of antenna the more likely it will be that the antenna will break in a shorter period of time after deployment. We typically recommend that no more than 6 inches of antenna is external to the collar. Loss of the exposed portion of the antenna can result in significant reduction in system range performance.

Internal Antennas (i.e. those with the antenna cable enclosed completely within the collar or exiting out the end of collars when collar length is shorter than antenna length) are utilized for many animals, especially those which are predictably likely to break off any external portion of an antenna. With most carnivores, and in a number of other applications, Internal Antennas are left completely enclosed within the collar when the collar is deployed on the animal. This affords maximum protection to the antenna. In some other applications, the researcher may elect to order collars with Internal Antennas, but then exit the antenna from the collar themselves when collaring each animal. Diagram 1 illustrates exiting of the antenna 75-80% of the distance around the circumference of the neck. Deployment of the antenna in this manner provides the improved power radiation of an External Antenna, while allowing a greater portion of the antenna to be kept internal (and protected from breakage) as opposed to the External Antenna design described above. When exiting the antenna, the biologist should cut a small hole in the outer collar material and carefully withdraw the antenna from the collar. Care should be taken to be sure not to damage the antenna or its plastic coating when exiting the antenna from the collar.

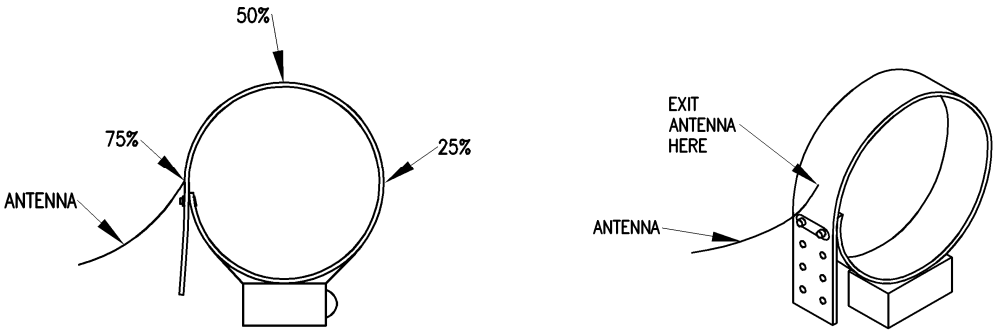

DIAGRAM 1

DIPOLE ANTENNAS:

On large species of animals it is sometimes possible to use a dipole antenna, in which case the transmitter appears to have two antennas. One antenna is called the "hot antenna" and the other the "cold antenna" as shown in Diagram 2. The most important antenna is the hot antenna, and it is the one most protected by the collar. The second antenna is usually only partially protected in the collar. The exposed portion of the cold antenna will break after a time. The additional range provided by the dipole may be enjoyed until the antenna breaks. In order to gain the benefits of the dipole the two antennas must remain as far apart as possible. The ideal case is shown in Diagram 3 to be 180° apart. Little benefit is realized if the tips of the two antennas are brought within 8"-12". If, as in Diagram 4, the tips of the two antennas are brought closer together than 8"-12", the range of the transmitting subsystem is actually degraded.

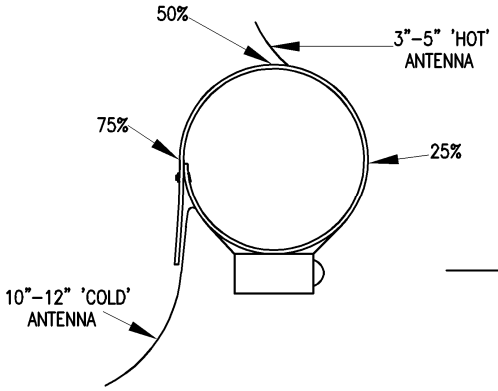

DIAGRAM 2

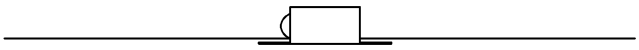

DIAGRAM 3

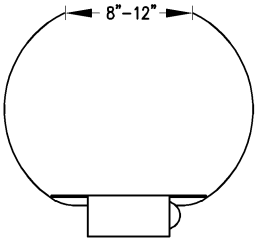

DIAGRAM 4

BREAKAWAY/EXPANSION COLLARS:

Breakaway and expansion collars present special collar design challenges. The time frame for breakaway to occur can vary dramatically, depending upon environmental conditions for a given study site, and behavior of individual animals. Actual breakaway times, or performance of an expandable collar can only be determined empirically for a given species in a given environment. Telonics is quite willing to offer available technical information or to aid the researcher in establishing estimates of breakaway and expansion times prior to the initiation of a large scale instrumentation effort. However, stated breakaway times or expansion performance are gross approximations only, and are not subject to warranty.

IMPLANTABLE TRANSMITTERS:

As previously mentioned, the magnets used to turn implantable transmitters off are attached to a plastic bag enclosing the implant, rather than to the implant itself, so as to avoid damage to the wax coating. Care must also be taken not to expose implants to extreme temperatures. The wax coating is designed for use at physiological temperatures. Excessive heat will melt the wax, and excessive cold can cause the wax to crack. Both should be avoided.

Implants should be "sterilized" prior to use. For example, soaking the implants in a dilute solution of Zephiran Chloride for approximately 24 hours has proved successful. Use of alcohol is not recommended because there has been some evidence of alcohol adversely reacting with the polymers used in sealing some implants. For more information on implant sterilization, request a reprint of "Sterilization of Implantable Transmitters" from the *Telonics Quarterly* 7(3):3-4 or download a copy of this note from the website.

If transmitters include temperature sensors, a calibration curve of pulse period relative to temperature should be established prior to use. A circulating water bath should be utilized, and the transmitters should be allowed to stabilize at each calibration temperature. The relationship between pulse period and temperature is not linear, so a sufficient number of calibration points should be utilized to achieve a proper curve over the range of temperatures of interest.

Most implantable transmitters utilize internal antennas. There are, however, some implants which utilize flexible whip antennas. The ends of these whips have been sealed to prevent fraying. The length of the whips is as decided at the time of order. If, for some reason, the whips need to be shortened please contact our laboratory.

AVIAN ATTACHMENTS:

A wide range of attachment methods have been utilized on birds, and a discussion of all these is well beyond the scope of this paper. Even within a generalized attachment method; for example, backpacks, a number of different materials, harness designs, and fitting techniques have been utilized. Your transmitters have been designed for the type of attachment specified at the time of order.

TRANSMITTER MODULES SUPPLIED WITHOUT POWER SUPPLIES

Telonics offers many customized collar and attachment designs to meet the needs of individual research objectives. However, we also provide the transmitter, battery and all interconnects sealed in a metal canister ready to be mounted on a collar, harness etc. as supplied by the researcher. For users who prefer to provide their own power supply, packaging and attachment, we also supply transmitter electronics alone. Under such

circumstances, the researcher assumes all responsibility for proper completion of the transmitting subsystem. We will be happy to provide technical advice or review a design upon the request of the researcher. We assume no responsibility for problems resulting from designs which have not received prior approval from Telonics.

CONCLUSION:

It is a generally accepted fact in the wildlife field that Telonics stands behind our products. You will find our staff eager to assist you in achieving your goals at any time during the course of your study. Those researchers who have been most successful have not hesitated to seek information prior to procuring equipment and beginning their work, and have maintained active avenues of communication throughout their projects. Please call prior to the deployment of the transmitters if you have any questions, or if we can be of additional assistance. We want to help you be successful.

GOOD LUCK IN YOUR WORK!