SPOT-S User Guide

This user guide will give you all the essential information needed to interact with and deploy a Wildlife Computers SPOT-S tag.

WILDLIFE COMPUTERS

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Before you Begin

The information contained in this guide is designed to help you get the most from your deployment. In the guide, you will see the yellow icon highlighting information where special attention should be paid.

We recommend inexperienced users read this entire manual and take care to follow the guidance in the section Preparing a Tag for Deployment.

A Wildlife Computers Data Portal (Portal) account is recommended to view and manage your deployment data. Review the Portal and Tag Agent User Guide for instruction or visit wildlifecomputers.com to setup an account. At the end of this document, there is a list of key terms and concepts for reference.

About the SPOT-S

The Wildlife Computers SPOT-S tag generates locations and transmits to any Argos-enabled satellite. Learn more about Argos here: https://wildlifecomputers.com/data/technologies/argos/. Consecutive transmissions received in a single satellite pass are used to calculate the location of the tag and its host animal. See http://www.argos-system.org for more information on Doppler locations.

SPOT-S operates using solar energy. Tag operations are fully automated, and no tag setup is needed. The Argos effort, or transmissions per day, is automatically adjusted based on the solar energy captured. When it is time to make a transmission, the SPOT-S monitors its wet/dry sensors. As soon as the sensors indicate a dry condition, transmission is initiated.

Anatomy of a SPOT-S

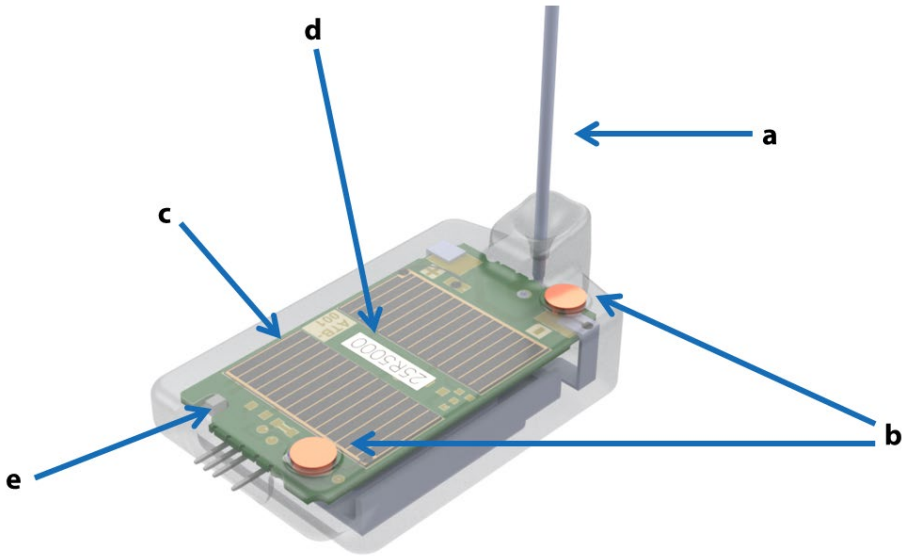


Figure 1—A SPOT-S tag showing: (a) Argos antenna, (b) wet/dry sensor, (c) solar panels, (d) serial number and (e) LED indicator light.

The Argos antenna is pre-covered with a coating to prevent fouling. ***Do not coat the antenna with any additional anti-fouling treatment.***

DO NOT cover the solar panels with tape or glue. Sunlight is essential for the tag to function normally. The only exception is if you choose to use Propspeed antifouling, which is clear and compatible with solar charging. See the section What is Antifouling Paint and Why You Should Apply It later in this user guide for more information.

The communications port and metal pins are where Wildlife Computers communicate with the tag during tag construction; the port **is NOT used in normal operation**. The metal pins can be covered when attaching the tag. To identify a tag and its deployment correctly and uniquely, always use the serial number—located between the two solar panels—and the Argos PTT ID (Platform Transmitter Terminal).

Tag States

SPOT-S tags have two states—Auto-Start and Start. Immersion in salt water and magnet swipes can be used to switch modes. And magnet swipes will also show the battery charge.

Auto-Start—when in Auto-Start mode, the SPOT-S tag will automatically deploy when submerged in seawater. To determine if a tag is in Auto-Start, Swipe a magnet a single time. If in Auto-Start, the tag will show three double blinks followed by one long blink and then one to three (depending on capacity) slow blinks (see Battery Charge Breaths).

Auto-Start mode is used for storage and shipping. In this mode, the tag does not transmit, and the battery can only be charged up to a maximum of 60%. This limit is intentional. Maintaining a 60% charge protects battery health, maximizes long-term storage life, and is required for safe shipping.

Start—when in Start mode, a SPOT-S tag is running, and data are transmitted to Argos satellites. To determine if a tag is in Start, swipe a magnet a single time. If in Start, the tag will show 10 rapid blinks followed by one long blink and then one to three (depending on capacity) slow blinks (see Battery Charge Breaths).

Change a Tag's State Using a Magnet

A timed magnet swipe can be used to change the state of a SPOT between Auto-Start and Start modes.

First, swipe the magnet and wait for the tag to indicate its current state (see Tag States). If a magnet is swiped a second time during the long blink (several seconds), the tag state will toggle and not show the one to three battery capacity blinks. Instead, the tag will change to the opposite state. The second swipe must happen during the long blink (Figure 2).

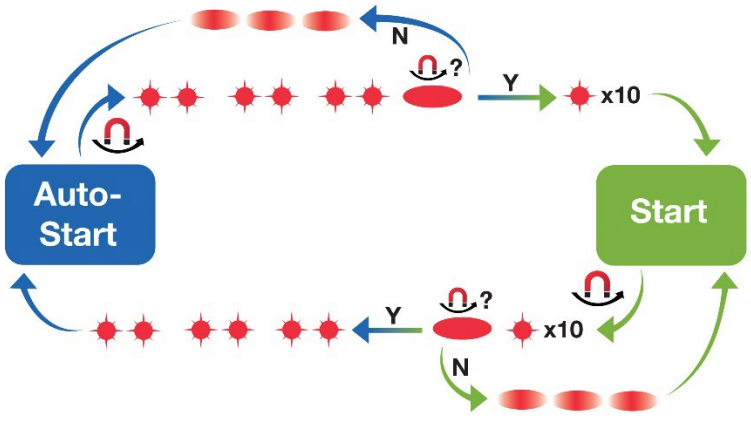


Figure 2—tag states and light patterns.

If the tag shows a charge state of two blinks or “breaths” (see Battery Charge Breaths), it has enough battery power to transmit for the first 24 hours of deployment.

When a tag is in Start mode, it distributes its transmissions throughout the day. The total number of transmissions is automatically adjusted based on the tag’s available battery charge over each twenty-four-hour period.

If the battery charge drops below five percent, the tag switches to a reduced-transmission pattern. These limited transmissions confirm the tag is still functioning, but they usually are not sufficient to produce location data.

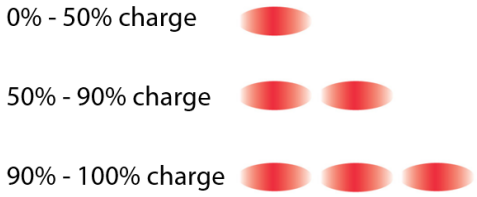
Low-charge situations can occur when feathers cover the solar panels, preventing charging, or when daylight hours are short.

Preparing a Tag for Deployment

Before you deploy your tags, review the SPOT-S Pre-Deployment Checklist.

Battery Charge Breaths

A "breath” is a slow LED illumination cycle in which the light gradually brightens to full intensity and then fades off. The tag’s LED will make battery capacity blinks or “breaths” to indicate charge level:



SPOT-S tags arrive in Auto-Start mode. Auto-Start mode has a maximum allowed charge of 60% (two blinks or “breaths”) which maximizes storage life and is required for shipping. At 60% charge, the tag will transmit for 24 hours. This is sufficient for collecting locations at the beginning of the deployment.

Once the tag is started, the tag will maintain a 100% charge (three blinks or breaths) with several hours of sun exposure per day.

To ensure tags are at 60% charge before deployment, ensure they are in Auto-Start mode and place them outside in the shade. Do not place tags in direct sunlight to charge them. This can overheat and damage the batteries. While on animals, tags will be cooled by seawater.

Tag Preparation and Attachment

Backmount SPOT-S tags are shipped with a sheet of heavy-duty white polyester peel-ply applied to the bottom surface. When the peel ply is removed, it exposes a clean, contamination-free bonding surface.

Attachment Instructions

- Before removing the peel ply, lightly sand the sides of the tag. Take care not to remove or damage any antifouling paint or coating on the top surface.
- Immediately prior to attachment, remove the peel ply fabric.
- Apply epoxy to the bottom of the tag.
- Attach the tag to the animal according to your approved procedure.

Recommendations

- If your application process includes sterilization, sterilize the tag with the peel ply fabric still in place.
- Do not touch the exposed bonding surface after the peel ply has been removed; only epoxy should contact this surface.
- Surfaces covered with peel ply should not be sanded.

Argos PTT ID

The PTT ID is used to identify the tag within the satellite system. The SPOT-S tag was pre-programmed with a PTT ID at Wildlife Computers. Be sure to note the PTT ID or serial number and any animal ID, to link the tagged animal to the Argos locations generated by the tag.

Pre-deployment Test

We strongly recommend conducting an Argos transmission test before deploying the tag. To perform the test, put the tag in Start and place the tag outdoors in a shaded area for about three hours. This allows time for several satellite passes, which occur every 30 minutes. The tag does not need full sky exposure—placing it under a tree or beside a building is fine.

After the test period, verify that the tag successfully transmitted by checking for received messages in the Wildlife Computers Data Portal or through the CLS web portal.

Viewing Tag Locations

The Wildlife Computers Data Portal is a cloud-based service for accessing, storing, and managing deployment data. In the Portal, you can view maps of the tag locations and download the locations for additional analysis. More information on using the Portal can be found in the "My Data" section of the Wildlife Computers Data Portal & Tag Agent User Guide.

Tag Storage and Battery Maintenance

Proper tag storage is important to maximize the life and performance of the battery. If stored properly, the battery could last two years or longer.

- Put the tag(s) in Auto-Start mode before storage.
- Store tag(s) in a cool, dry location (do not refrigerate).
- Allow antenna(s) to rest in a naturally straight position to prevent permanent bending.
- Every three months, place the tag(s) outdoors in the shade for a total of eight hours of daylight.
- Before returning the tag(s) to storage, confirm the battery charge is between 50% and 90%, indicated by two slow blinks.

We strongly recommend doing a pre-deployment Argos test after any extended storage. Contact Wildlife Computers for more information on proper storage, alternative lighting, or tag performance after long term storage.

Additional Information

Technical Specifications

Below are specifications of the SPOT-S-433 tag. See the specific data sheet for your tag.

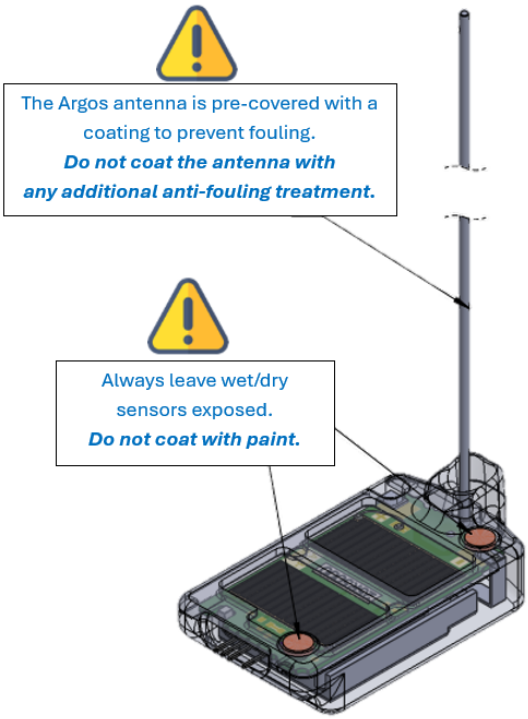
Tag Weight (excluding neoprene	8.2 grams
Dimensions (LxWxH)	37 mm x 19 mm x 8 mm
Pressure Rating	Tested to 400 m depth
Operating Frequency	401.678 MHz
Operating Life	Unlimited with solar
Sensors	Temperature, battery voltage, solar, wet/dry
Operating Temperature Range	-5° C to 60° C as specified by battery manufacturer
Charging Temperature Range	0° C to 45° C as specified by battery manufacturer
Battery Charging	Solar
Battery	Lithium polymer rechargeable battery
RF Power Output	Maximum 500 mW, typically 200 mW when deployed
Tag On/Off Protocol	Magnet swipes, Seawater

Glossary of Terms

- Argos location—a location generated from uplinks received during a satellite pass. Get more information about how the Argos system works here: http://www.argos-system.org/web/en/391-faq-general-questions.php
- Argos uplink/transmit—a radio transmission intended for the Argos satellite system.
- Breath—a slow LED illumination cycle in which the light gradually brightens to full intensity and then fades off.
- Location uplink—a transmission intended to generate an Argos location. These uplinks can also carry a data message payload. Multiple uplinks are required to generate an Argos location.
- PTT (ID)—the Platform Transmitter Terminal ID uniquely identifies a transmitter for the satellite system. The ID comprises a decimal number and a hexadecimal (base 16) number.
- Satellite pass—The time when a particular satellite travels overhead and in-view of the tag.
- Start/Auto-Start—tag states. When started, the tag will generate locations and/or collect sensor data. Auto-Start is used to store and/or charge the tags.
- Tag Portal—the cloud-based service offered by Wildlife Computers for data viewing and remote tag setup.

What is Antifouling Paint and Why You Should Apply It

Heavily fouled tags are hugely detrimental to tagging studies as fouling growth impedes the tag's transmitting performance. Especially for deployments in tropical waters, it is imperative that tags be protected against marine growth.



Wildlife Computers leaves the decision to apply antifoul coating after manufacturing and before deployment entirely to the researcher's discretion. Excluding animals that regularly haul-out, ***we strongly recommend that tags be treated with antifouling coating to ensure the best possible chance of a successful deployment as Wildlife Computers does not provide warranty against biofouling.***

Wildlife Computers endorses Propspeed for tags with solar charging. Propspeed is a foul-release silicon coating, not an antifoul, that impedes biofouling adhesion while still allowing solar charge. Propspeed is clear, non-toxic, and widely available. Propspeed relies on movement for its effectiveness—the more water moves over its surface, the better it performs, as marine growth cannot get a grip to grow. Propspeed can last up to a year and is mostly non-toxic, according to the manufacturer.

Wildlife Computers offers an optional service to sand, mask, and paint tags with Propspeed antifouling and coat the wet/dry sensors with conductive polymer. Wildlife Computers offers Propspeed antifouling painting at a charge of $100 per tag prior to shipping.

[Instructions on how to apply Propspeed to the SPOT-S-433]

The wet/dry sensors should never be covered or coated with antifouling paint. Seawater contact is essential to these sensors for correct operation. Use masking tape to protect the wet/dry sensors when painting.

Resources

International Paints Primer-Propspeed is available in three kit sizes depending on the size of the area you are coating. Propspeed creates a chemical and physical bond between the metal substrate, primer, and topcoat. Propspeed can be used in fresh or salt water.

Learn More:

- Propspeed Safety Brochure: https://propspeed.com/docs/default-source/propspeed-documents/sdspropspeed-clear-coat.pdf?sfvrsn=1b4ce518_2
- Propspeed Technical Documentation: https://propspeed.com/docs/default-source/propspeed-documents/tds-propspeed-clear-coat.pdf?sfvrsn=39c4d6b6_2
- Propspeed Application Manual: https://propspeed.com/docs/default-source/propspeed-documents/propspeed-application-manual.pdf?sfvrsn=a3b9b832_2

Contacting Wildlife Computers

U.S. and International

Members of the Wildlife Computers technical sales and support team are in Redmond, WA, USA, and Havelock North, New Zealand, allowing us to cover promptly a wide range of time zones.

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For Asian Clients

While we welcome your direct correspondence, we recommend that you contact our colleague, Yong Huang, for assistance. Mr. Huang understands the special purchase processes for your countries and will provide you with the best service for the best price. He also is fluent in Japanese, Chinese, and English.

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