Data included in messages from Vence CattleRider V2 collars

Collars can send three different types of messages, each of which has a different purpose.

1. GPS Location: reports animal location on an adjustable time interval
2. Device Status: reports status of various collar function attributes, sent once per hour
3. Shock Event: reports when collar is delivering stimuli (either sound or shock) to an animal

* Sent when an animal starts interacting with the boundary and every 70 seconds thereafter
* Would better be called an interaction message or management event message

Each message type includes data on different aspects of collar performance and functionality. Not all data is included in every message type.

Data reported in all message types:

* Collar ID: A unique collar identifier, in hexadecimal
  + The last 4 digits are unique to each collar and are easier to handle than the entire string
* Timestamp: Time when the message was sent. GMT time zone.
* Message type: exactly what it sounds like
* Reliable: Under the hood of collar functionality, told by Todd to ignore
* More: Under the hood of collar functionality, told by Todd to ignore
* Sequence: Under the hood of collar functionality, told by Todd to ignore

Additional data reported

GPS Location message:

* Latitude and Longitude: WGS 84 datum
* Accuracy: Parameter related to the accuracy of the GPS fix.
  + Smaller is better, but the value is not directly interpretable and is influenced by factors under the hood of collar function

Device Status message:

* Tracking State: a non-spatial indicator of where the animal is in relation to the boundary. Tracking state can take on the following values:
  + Basic Tracking: The collar is powered on and is sending GPS and Device Status messages
  + Vence Enabled: Virtual fences are programmed into the collar but the animal has not yet been inside the paddock
  + Vence Tracking: Virtual fences are programmed in the collar and the animal is inside the paddock
  + Shock Region: The animal is in the shock region
  + Sound Region: The animal is in the sound region
  + Out of Bounds: The animal has left the paddock
    - Collars reboot roughly every four hours to clear any errors, etc. If this happens when tracking state is Out of Bounds, the tracking state of the newly rebooted collar will show as Vence Enabled because the collar has not been inside the paddock since the reboot.
  + Vence Transition: An animal which previously left the paddock is in the shock/sound zones on its way back into the paddock
* Shock Count Cumulative: the cumulative number of shocks the collar has administered EVER
* Shock/Sound Disabled: True/False indicator of whether the collar is disabled
* Shock/Sound Suspended: True False indicator of whether the collar is suspended
* Shock/Sound Count Attempts: Shocks or sound cues which should have been given but were blocked because the collar was suspended or disabled
* Shock/Sound Count Applied: the number which were actually given
* Shock/Sound Count Suspend: ????
* Heading Reporting Enabled: True/False indicator of whether the collar is set to report animal heading
* Heading Management Enabled: True/False indicator of whether the collar is programed to alter animal management based on animal heading
* currVoltageMv: current battery voltage
* lastTxVoltageMv: battery voltage at the last transmission
* lastShockVoltageMv: battery voltage when the last shock was administered
* mmu/mcuTempDegC: Temperatures of internal sensors.
  + Has some correlation with animal body temperature
  + Can potentially be used for detecting which collars have fallen off - collars which have fallen of will have a larger diurnal temperature variation than collars which are still on animals
* Sequence Number: A counter of the number of Device Status messages sent since the last collar reset
  + Can be used to detect missed messages.

Shock Event message:

* Tracking State: a non-spatial indicator of where the animal is in relation to the boundary. For a description of the values tracking state can take, see the Device Status message.
* Shock Count Cumulative: the cumulative number of shocks the collar has administered EVER
* Shock/Sound Disabled: True/False indicator of whether the collar is disabled
* Shock/Sound Suspended: True False indicator of whether the collar is suspended
* Shock/Sound Event: True/False indicator of whether shocks or sounds were administered during that interaction with the boundary
* Shock/Sound Count: The number of shocks/sounds the collar has administered *since the last Shock Event message*
  + IMPORTANT NOTE: details of collar functionality – Shock Event messages are sent a maximum of every 70 seconds. However, once an animal has left the management zone, no final message is sent. The next shock event message will be sent the next time that animal interacts with the boundary. There is no way to tell if shock reported by these counters are for the current interaction, or were administered after the final shock event message during the previous interaction.
* Heading Reporting Enabled: True/False indicator of whether the collar is set to report animal heading
* Heading Management Enabled: True/False indicator of whether the collar is programed to alter animal management based on animal heading

Table 1: Data types included in each message type from Vence CattleRider V2 collars

|  | Message Type | | |
| --- | --- | --- | --- |
| Parameter | GPS Location | Device Status | Shock Event |
| Collar ID | X | X | X |
| Timestamp | X | X | X |
| Message Type | X | X | X |
| Latitude | X |  | X |
| Longitude | X |  | X |
| Accuracy | X |  |  |
| Shock Count Cumulative |  | X | X |
| Tracking State |  | X | X |
| Shock/Sound Disabled |  | X | X |
| Shock/Sound Suspended |  | X | X |
| Shock/Sound Attempts |  | X |  |
| Shock/Sound Applied |  | X |  |
| Shock/Sound Suspend |  | X |  |
| Shock/Sound Event |  |  | X |
| Shock/Sound Count |  |  | X |
| Heading Reporting Enabled |  | X | X |
| Heading Management Enabled |  | X | X |
| Voltages x3 |  | X |  |
| Temperatures x2 |  | X |  |
| Sequence Number |  | X |  |
| Reliable | X | X | X |
| More | X | X | X |
| Sequence | X | X | X |