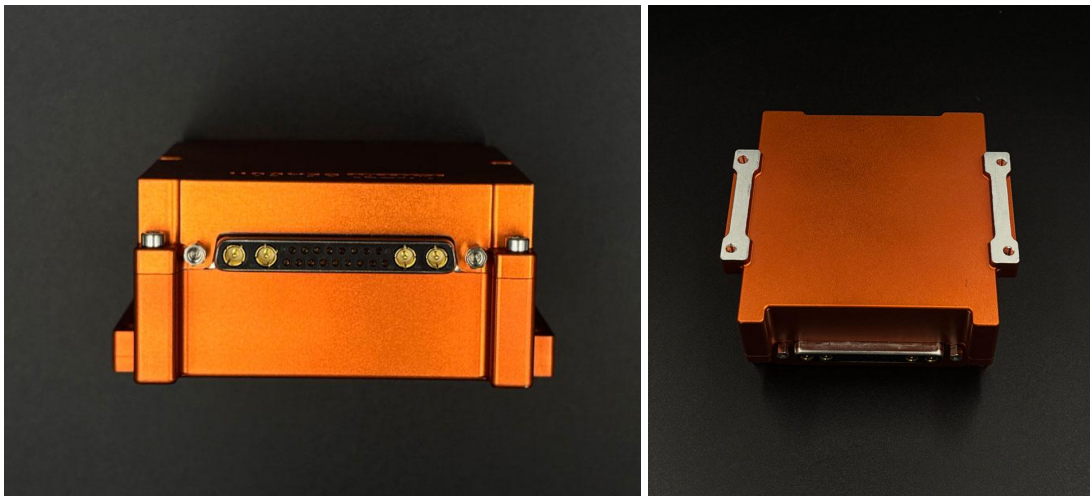


## Beacon M

### Datasheet

Hardware revision: C, Document revision date: 20/03/2026



## Application

The Beacon is designed to provide a way to restore the normal operations of a satellite in the event of partial failure or anomaly. It independently collects and transmits satellite health data (telemetry), primarily for anomaly root cause analysis. This device has an independent power supply (batteries), an attitude determination system, and a GNSS module for precise orbital parameter estimation. It also provides a 2-way continuous connection to mission control.

The Beacon allows the satellite operations team to receive a constant telemetry stream. It has been specifically designed to function during operational anomalies and outside of the normal operating conditions for the LEO satellites, providing a backup communication system that can be used for critical satellite firmware updates and regaining control of the satellite.



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## Features

- Real-time<sup>1</sup> 24/7 telemetry independent of the orbital position or attitude control
- Designed to operate for up to 3 weeks after the main satellite bus failure
- Can sustain micro-debris collision
- Supports all common satellite internal networks (USART, CAN-FD, SPI, and I2C)
- Can connect directly to satellite components
- Can send commands to the onboard computer and send back responses
- It can be used to update firmware on microcontrollers and OS-based OBCs
- All communication packets to and from the satellite bus are hardware-encrypted (AES 256-bit)
- ANT61 provides a real-time command and control interface for the customers, where commands remain cryptographically opaque to ANT61 and intermediaries
- Beacon is made in Australia, which means **light-weight export controls** (non-ITAR), and it doesn't require a separate spectrum license for data exchange<sup>2</sup>
- TRL-7 from Q1 2024, TRL-9 in Q2 2027

## Operational description

### Typical operation

The Beacon collects data from its own internal sensors and satellite subsystem as well as telemetry coming from the OBC and then sends this data over real-time link to the satellite operator's mission control software.

The Beacon also accepts commands to be sent to the satellite bus to enable the operator's team to control their satellite via the Beacon.

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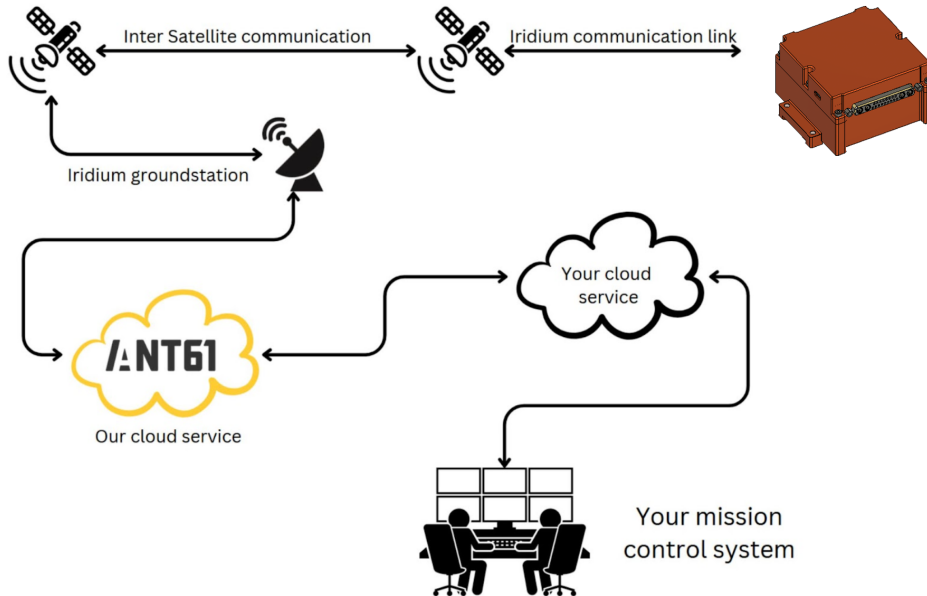
<sup>1</sup> 5 to 10 seconds delay between the transmission of the message and it's availability for consumption in the ANT61 real-time telemetry API.

<sup>2</sup> Beacon uses inter-satellite links for communication with RF license held by the constellation operator (Iridium)

For cable selection/manufacturing assistance, additional connectivity options (Ethernet, Spacewire, etc.), CAD models, or additional information, contact us at [enquiries@ant61.com](mailto:enquiries@ant61.com)

## Operations overview

The Beacon users use relay constellation( inter-satellite links) to establish a continuous, two-way connection between your satellite in orbit and mission control software on the ground. This connection is then used to send Beacon telemetry as well as satellite telemetry and commands.



## Minimal integration

The Beacon needs direct access to the following:

- Satellite deployment switch (Normally Closed) in order to begin active operation right after the deployment and satisfy launch provider requirements
- Main power line to monitor the characteristics of the line that can be crucial in anomaly detection
- At least two (and up to four) L1 antennas positioned on the opposite sides of the satellite that will be facing away from the Earth (towards higher orbit or horizon)

## Recommended integration

In order to maximise the utility of the Beacon as a means to restore the normal operation of a failed satellite, the following additional integration is highly recommended:

- Access to the internal satellite bus network to collect additional telemetry data and provide a way for the satellite operator to interact with the satellite bus via the Beacon
- Integrated support for the satellite's flight computer firmware/software update. Most satellites can be restored after an anomaly by a software update.

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- Direct redundant data lines to the critical satellite components (see [Connectivity](#) section)
- Direct access to de-orbiting hardware (dragsail, EM tether, etc) to allow the customer to de-orbit their satellite if it's impossible to recover from a failure and the onboard computer is damaged and is unable to control this hardware.



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## Maximum ratings

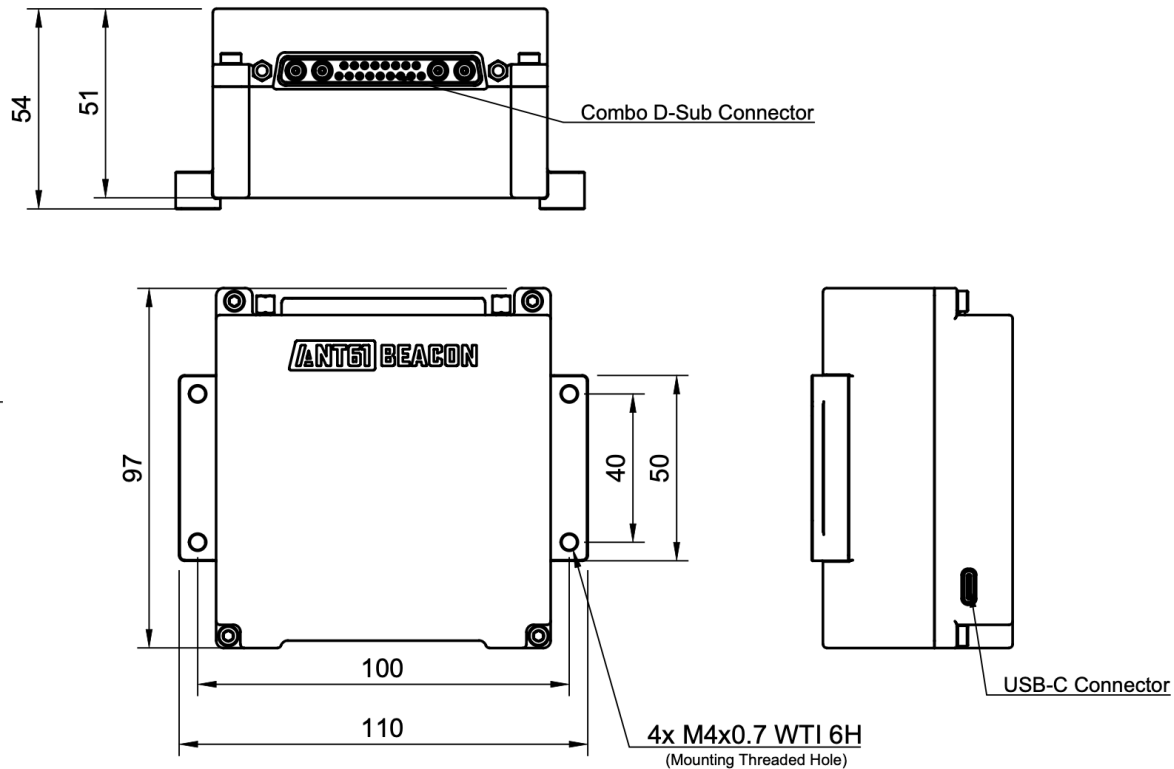
| Parameter                       | Value        | Units |
|---------------------------------|--------------|-------|
| Operating temperature           | -45 to +70   | °C    |
| Shock                           | 10           | g     |
| Voltage on the power input line | 9 to 36      | V     |
| Voltage on +3.3V IO lines       | +2.9 to +3.6 | V     |
| Highest supported orbit         | 700          | Km    |
| Design life in LEO              | 7            | years |

## Physical characteristics

| Parameter | Comments | Value       | Units |
|-----------|----------|-------------|-------|
| Mass      |          | 700         | g     |
| Height    |          | 56.0 ± 0.2  | mm    |
| Width     |          | 97.0 ± 0.2  | mm    |
| Length    |          | 110.0 ± 0.2 | mm    |

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## Mechanical layout



## Matching connectors and cabling

### Combo D-Sub connector

The Combo D-Sub connector is used to connect antennas, power and data lines.

Any male 21W4 D-Sub connector with 50Ohm coaxial contacts can be used, for example, Norcomp [682M21WA4PL001](#).

### USB-C connector

The USB-C umbilical connector is used for ground testing and allows your team to start using the Beacon the day it is delivered. The Beacon operation logs can be accessed via USB-C via serial interface. Additionally, the Beacon can be charged via the USB-C port as well.

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## Connectors pinout

### Combo D-Sub connector

The Combo D-Sub connector has four coaxial contacts that are used for antenna connection and 17 signal and power pins that are divided into two groups:

- The function of the fixed pins (**marked in red**) – is set and can not be changed without hardware modification (such modification is possible, but will add 8 weeks to the lead time and may incur additional cost)
- The function of the flexible pins (**marked in blue**) – can be adjusted based on your connectivity preferences without any increase in lead time or cost.

The pin number corresponds to the [G125-2242096F1 connector datasheet](#).

### Default pinout (RS-422)

| Pin | Function                            | Pin   | Function      |
|-----|-------------------------------------|-------|---------------|
| 1   | I2C_A_SDA                           | 10    | RS-422 RX-    |
| 2   | I2C_A_SCL                           | 11    | RS-422 RX+    |
| 3   | GPIO (PPS)                          | 12    | RS-422 TX+    |
| 4   | USART_A_RX                          | 13    | RS-422 TX-    |
| 5   | USART_A_TX                          | 14    | CANFD_A_H     |
| 6   | Shutdown signal input 3.3V          | 15    | CANFD_A_L     |
| 7   | Deployment Switch (normally closed) | 16    | Signal ground |
| 8   | Signal ground                       | 17    | Power supply  |
| 9   | Power ground (supply return)        | shell | Signal ground |



## RS-485 configuration

| Pin | Function                            | Pin   | Function      |
|-----|-------------------------------------|-------|---------------|
| 1   | I2C_A_SDA                           | 10    | RS-485 RX-    |
| 2   | I2C_A_SCL                           | 11    | RS-485 RX+    |
| 3   | GPIO (PPS)                          | 12    | RS-485 TX+    |
| 4   | USART_A_RX                          | 13    | RS-485 TX-    |
| 5   | USART_A_TX                          | 14    | CANFD_A_H     |
| 6   | Shutdown signal input 3.3V          | 15    | CANFD_A_L     |
| 7   | Deployment Switch (normally closed) | 16    | Signal ground |
| 8   | Signal ground                       | 17    | Power supply  |
| 9   | Power ground (supply return)        | shell | Signal ground |

## Custom configuration

If you are after particular connectivity options, we can customise the pinout for you based on the [connectivity options](#).

| Pin | Function                            | Pin   | Function      |
|-----|-------------------------------------|-------|---------------|
| 1   | Custom                              | 10    | Custom        |
| 2   | Custom                              | 11    | Custom        |
| 3   | Custom                              | 12    | Custom        |
| 4   | Custom                              | 13    | Custom        |
| 5   | Custom                              | 14    | CANFD_A_H     |
| 6   | Shutdown signal input 3.3V          | 15    | CANFD_A_L     |
| 7   | Deployment Switch (normally closed) | 16    | Signal ground |
| 8   | Signal ground                       | 17    | Power supply  |
| 9   | Power ground (supply return)        | shell | Signal ground |

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## Electrical characteristics

| Parameter                                                    | Comments                      | Value | Units |
|--------------------------------------------------------------|-------------------------------|-------|-------|
| Normal power consumption, average                            |                               | 3     | W     |
| Normal power consumption, peak                               | 1.5% duty cycle / 15ms bursts | 14    | W     |
| Power consumption while charging internal batteries, average |                               | 10    | W     |
| Power consumption while charging internal batteries, peak    | 1.5% duty cycle / 15ms bursts | 21    | W     |

## Radio characteristics

| Parameter                                  | Comments                                        | Value              | Units |
|--------------------------------------------|-------------------------------------------------|--------------------|-------|
| Certification                              | Contains FCC, ICES and IC-certified transceiver |                    |       |
| Bandwidth (receiving from mission control) |                                                 | 2                  | kbps  |
| Bandwidth (sending to mission control)     |                                                 | 2                  | kbps  |
| Frequency Range                            | Transmission                                    | 1,616.0 to 1,626.5 | MHz   |
| Frequency Range                            | Reception                                       | 1,559.0 to 1,626.5 | MHz   |
| Input/Output Impedance                     |                                                 | 50                 | Ohm   |
| Max Cable loss permitted                   |                                                 | 2                  | dB    |
| Max antenna gain                           |                                                 | 3                  | dBi   |
| Average RF power output                    |                                                 | 0.6                | W     |
| Peak RF power output                       |                                                 | 7                  | W     |

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## Satellite bus connectivity options

Beacon provides the following connectivity options that can be set up to maximise compatibility with the satellite bus. All data lines have ESD protection.

### USART

External devices can be connected via three double-redundant USART lines

### CAN-FD

The Beacon can be connected to one CAN-FD network with bandwidth up to 500 kbit/s

### SPI

Up to 5 SPI devices can be connected with a bandwidth of up to 50Mbit/s

### I2C FM+

Up to four I2C devices can be connected with bandwidth up to 1Mbit/s

### GPIO

5 general-purpose digital I/O pins can be configured for connection to various devices and sensors

### Analog IO

Two analog I/O pins can be configured for integration with external devices.

## Telemetry

### Data collected by the Beacon

The Beacon collects the orbital parameters and attitude information, as well as collisions, vibrations and temperature, and characteristics of the power bus using built-in hardware. Additionally, when connected

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to the satellite bus, the Beacon can collect telemetry data from the bus and the individual devices it is integrated with.

## Data provided by the Beacon to the satellite

If required, the Beacon can provide raw data from GNSS, such as NMEA messages, PPS, accurate time, current orbit parameters and attitude.

## Data security

ANT61 takes utmost care when dealing with the customer's data processed by the Beacon. The data is encrypted and protected from interference throughout the whole transmission process.

The Beacon uses an inter-satellite Iridium network that uses FIPS-140-2 and ASC22FO encryption, protected against interference and is currently used<sup>3</sup> by the US DoD and the US Government for transmission of sensitive data. On the ground, there is a secure connection between the Iridium network and ANT61 infrastructure secured by Amazon Web Services. In addition, all customer-originated or customer-terminated data is encrypted with hardware encryption on the Beacon and is only accessible to the customer, remaining completely opaque to the ANT61 team.

## Data integrity

ANT61 uses multiple redundant layers of storage and telemetry processing, ensuring that no message is lost even in a catastrophic event.

## Missing anything?

We're happy to provide more information about the Beacon.

Contact us at [enquiries@ant61.com](mailto:enquiries@ant61.com) or via the form at <https://ant61.com/beacon>

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<sup>3</sup> See [Iridium for National Security](#) for more details

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