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Spider 7 Instruction Manual

Applicable for both internal and external antenna variants of the Spider 7 with GPIO connection.

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Record of Revision and Approvals

RECORD OF REVISIONS AND APPROVALS					
Rev.	DD/MM/YY	Description	Pages Affected	Released by	Approved by
IR	17/11/15	Initial release	All	S. Ridder	D. Blackwell
2.0.0	22/12/15	Antenna information changed	5	S. Ridder	L. McCarthy
3.0.0	08/02/16	Antenna polarisation added	5	S. Ridder	D. Blackwell
4.0.0	24/01/17	Revised and broadened scope	All	D. Blackwell	L. McCarthy
5.0.0	1/06/17	Addition of GPIO configuration information	All	L. McCarthy	S. Williams

Appends:

- Minor Modification Summary Report
- Structure Test Procedure
- Electromagnetic Compatibility Test Procedure
- RTCA DO-160 Test Reports



1. Installation

1.1. Overview

While Spiders in the most part are operated as portable electronic devices, there are a number of settings where an operator may wish to obtain a field approval, engineering order, or modification approved by your local airworthiness regulator.

This can be a confusing and complex process. Given simplicity and excellence are two of Spidertracks' cornerstone principals we have put a significant effort into providing all the aeronautical data required to obtain these approvals. This includes the RTCA DO-160 test data, modification templates (created by an FAA Delegated Engineering representative) with simple effective test matrixes and drawings so that your local installer can seamlessly apply for any additional certification.

The high level document is enclosed at Annex D and all of the supporting documents and information is freely available on our [support website](#) or, if you need more help please call our helpful support team on +64 9 222 0016.

With over 5,000 Spider units in service and almost 6,000,000 flight hours tracked, we are confident we can help you through the often confusing and complex topic of aeronautical certification.

1.2. Positioning the Spider

Correct positioning of the Spider's antenna is critical in achieving effective performance from the Spidertracks system as a whole. This is not an issue with Spider products that connect to an external antenna as the visibility specification is met by virtue of the antenna installation, however, when installing any Spider product that has the antenna integrated within the device, particular attention is required. In this case the Spider should be mounted up on top of the instrument panel in the aircraft, as far forward under the glare shield as possible to maximise visibility with the sky, and free from any obstructions.

In order to function nominally, the Spider is required to receive GPS signal and then transmit that information, along with other flight data, to the Iridium satellite network. The GPS antenna is able to receive GPS information at any angle as long as it is not obstructed by metallic material, such as the centre windshield pillar, however, the Iridium antenna must have an unobstructed, horizon-horizon view of the sky in all directions to function nominally (Figure1). Obstructions consist of any metallic or carbon composite object, but also electrically heated windshield filaments that act as an RF shield whether they are turned on



or not (Faraday Cage effect). The Spider is able to transmit through glass, fibre glass, or plastic. Please see [installation examples](#) on our support website.

NB: If you are attempting to fit a Spider with integrated antenna into an aircraft with electrically heated windshields, please stop and contact your distributor for advice.

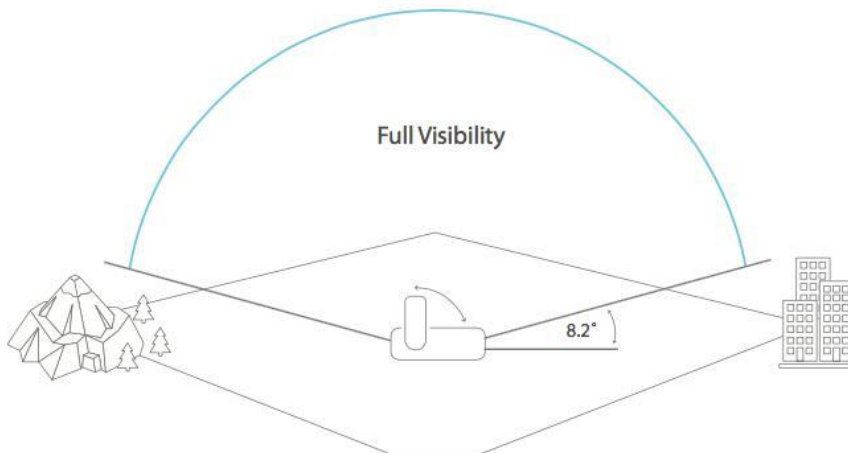


Figure 1: Visibility of the sky requirements for an Iridium transmitting product

The Spider is not subject to Specific Absorption Rate testing, however, it is recommended to have separation of at least 200mm between the device and a person.

Secure the Spider to the airframe using the bracket supplied. Please allow 12 hours for the VHB tape to cure.

1.3. External antenna

Specification requires a passive antenna that satisfies the following criteria:

- able to receive L1 GPS signal on 1575.42 MHz; and,
- able to transmit L-band frequencies between 1616.0 - 1624.5 MHz; and,
- is ideally tuned as close to these frequencies as possible (bandwidth); and,
- VSWR is less than 2:1; and,
- has 50 ohm impedance; and,
- a radiation pattern that is hemispherical (i.e. it points to the sky in all directions);
- polarisation is right-hand for both Iridium and GPS.



There are many options for this antenna, ideally there will be one available on the aircraft already. Spidertracks does have experience with an antenna (P/N: S67-1575-109) manufactured by Sensor Systems (Appendix E). This carries an FAA TSO-C129.

The Spider is a low power transmitting device (mW range). Minimising losses between the device and the antenna should be considered in the installation process. There should be not more than 2dB of losses between the two components, including insertions. Antenna cable should be RG-178 or similar. In the case where a cable of significant length is required, it may be necessary to use a higher grade.

1.4. Power

Power supply must be stable in the range of 10 V - 32 V DC and capable of delivering at least 1.5 A peak current. The Spider is supplied with a 2m auxiliary power lead and can be connected directly to an auxiliary power outlet. The power lead is fuse protected within the cigarette lighter adapter plug.

As auxiliary power sockets wear they can become loose and disrupt the power supply to the Spider, which in turn can lead to unreliable performance (see 4.1). In more permanent installations it is recommended to hard-wire the lead to the avionics bus. This is generally considered a minor modification when conducted by a LAME or certified technician (Appendix D).

NB: If removing the auxiliary plug to hard-wire into the aircraft's power, the Spider must be protected by a 3A in line fuse.

1.5. Keypad

The remote keypad provides I/O functionality and should be mounted somewhere practical in the cockpit but within reach of the pilot(s). The keypad is on a 2m lead and connects to the Spider's Mini USB port.

1.6. General Purpose Input Output

The General Purpose Input Output (GPIO) allows signals from equipment on the aircraft to be sent through the Spider to the Spidertracks website, e.g., Take off and Landing messages from the helicopter collective switch.





Figure 2. Components supplied with GPIO: Bulgin connector, 10 x pins, and cable



Figure. 3. GPIO pins as looking from the front face of the Spider



1.6.1. Pin Description

Table 1. GPIO pin descriptions

Pin	GPIO Cable Colour	Name	Description
1	Red	Non-isolated +3.3 VDC voltage signal	The +3.3VDC rail is intended to power such things as input sensors It is currently limited to 100mA to protect the Spider in the event that this output is shorted
2	Black	Non-isolated ground	General purpose ground
3	Grey	Non-isolated input 1 with basic protection	The basic protection consists of current limiting resistors and TVS diodes There is provision for adjusting the default Low-Pass frequency of 106kHz
4	Yellow	Non-isolated input 2 or analogue input	Maximum voltage is +3.3 VDC
5	Orange	Isolated output ground	The isolated outputs share a common ground connection. This is separated from the Spider Ground
6	Blue	Isolated output 1	The isolated output has an open collector configuration. The specification must be strictly followed. An open collector output allows the 3rd party to pull the voltage up to a large range of voltages and the Spider will drive this voltage low to activate the output. IMPORTANT <ul style="list-style-type: none"> • Maximum voltage is +80 VDC • Maximum current must be kept < 30 mA • This is done by selecting an appropriate resistor value • Failure to limit the current and/or voltage will result in permanent damage to that particular output port
7	Brown	Isolated output 2	
8	Purple	Isolated input ground	The isolated inputs share a common ground connection. This is separated from the Spider Ground
9	White	Isolated input 1	Voltage input range of +3.3 VDC ~ +12VDC (Absolute Max +15 VDC) without 620 ohm resistor. Voltage input range of +9 VDC ~ +32VDC with 620 ohm resistor. IMPORTANT <ul style="list-style-type: none"> • Failure to limit the current and/or voltage will result in permanent damage to that particular input port
10	Green	Isolated input 2	

The Isolated GPIO input is quite different to the Non-isolated GPIO input:



- To detect a situation where it is either ground or no ground, we should use a Non-isolated GPIO input
- In a situation where we need to detect a signal, either a voltage or a ground, we should use an Isolated GPIO input.
- We should always make use of the Isolated GPIO input common ground pin when we want to use an Isolated GPIO input
- The voltage or ground must be recognised by the Spider GPIO interface for it to work

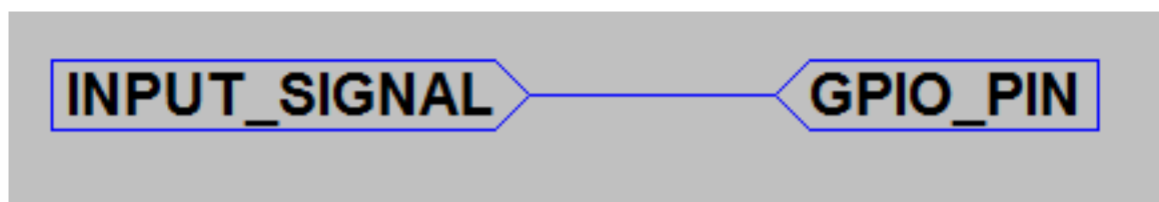
1.6.2. Input Signal Classification

The following are suggested installations based on the above case numbers and associated input signals.

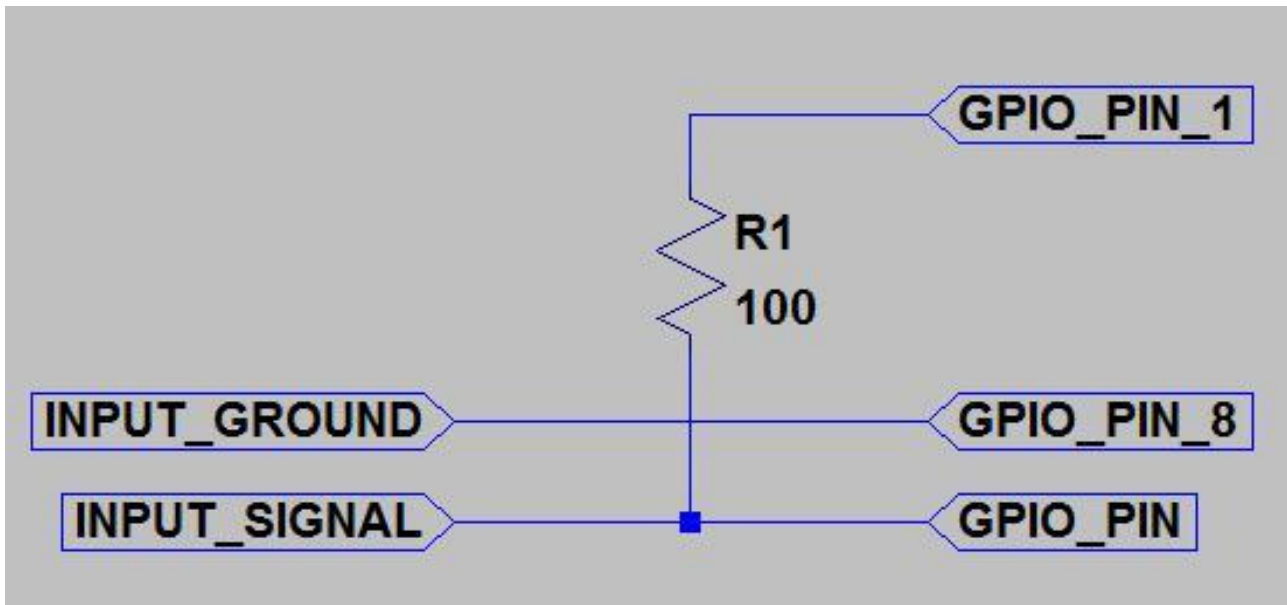
Table 2: Input signal cases

Case	Input Signal	Example Input Signal Value	GPIO Input Pin
1	Ground/Disconnect	ground/no ground	Pin 3 or Pin 4
2			Pin 9 or Pin 10
3			Pin 9 or Pin 10
4	Voltage/Ground with signal isolation (signal separation is done by a diode)	24V/ground 12V/ground	Pin 3 or Pin 4
5			Pin 9 or Pin 10
6	Voltage/Ground	24V/ground 12V/ground	Pin 3 or Pin 4
7	Voltage/Voltage	24V/1V, input source voltage is 24V	Pin 9 or Pin 10 Note in this case only one isolated input pin can be used since pin 9 and pin 10 share the common ground pin 8.
8			Pin 3 or Pin 4 A NO (normally open) relay is used in this case.

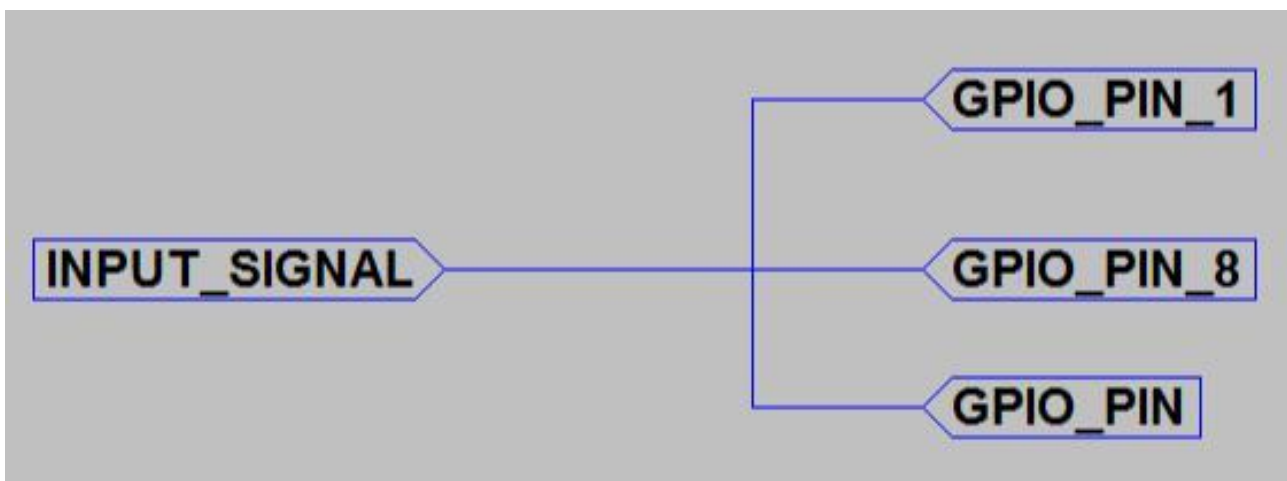
Case 1:



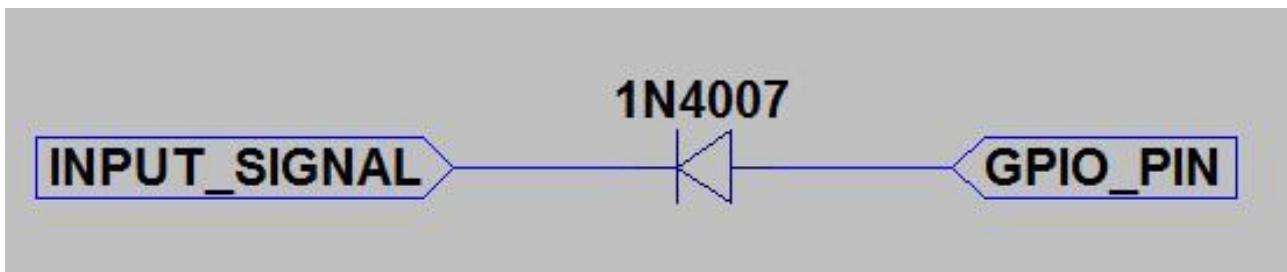
Case 2:



Case 3:

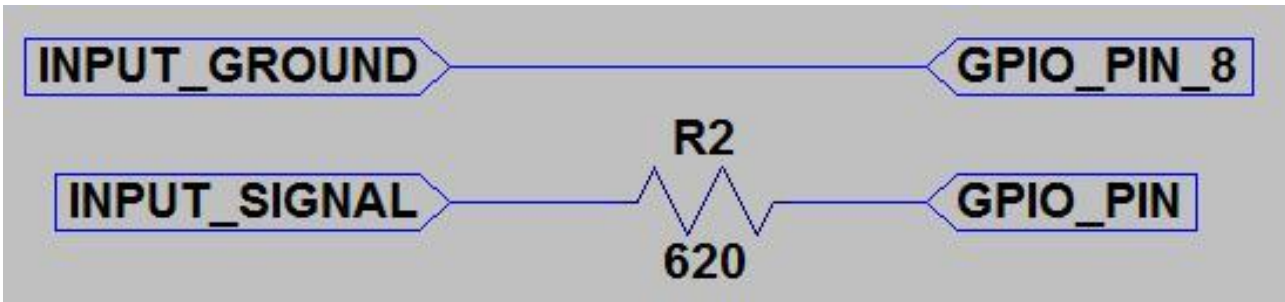


Case 4:

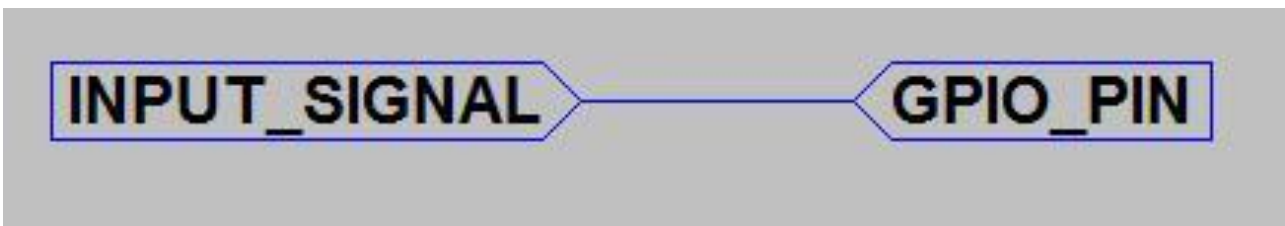


Case 5:

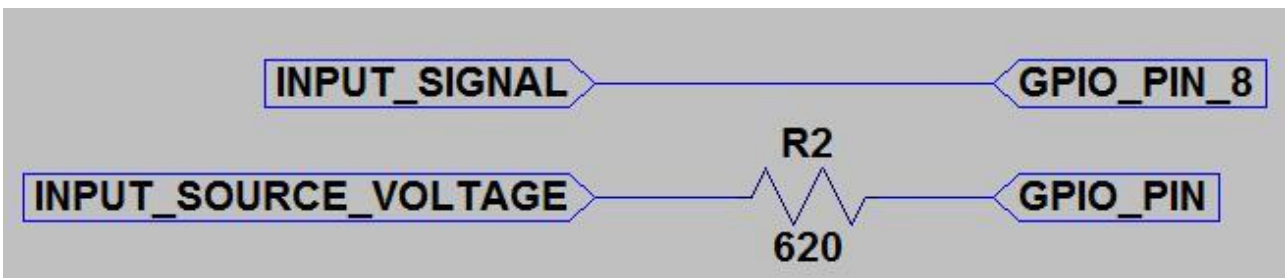




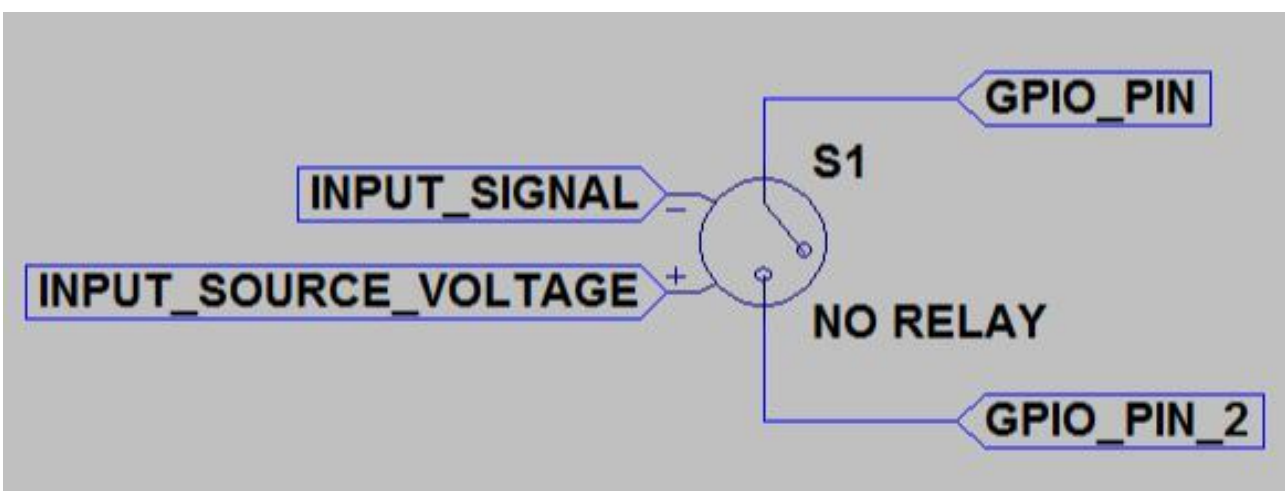
Case 6:



Case 7:



Case 8:



1.6.3. Website Configuration

An administrator of your account can configure the GPIO at any time from the go.spidertracks.com website. They need to login to the organisation settings of the organisation the Spider is registered.

Go to Event Logging menu on the left hand menu bar.

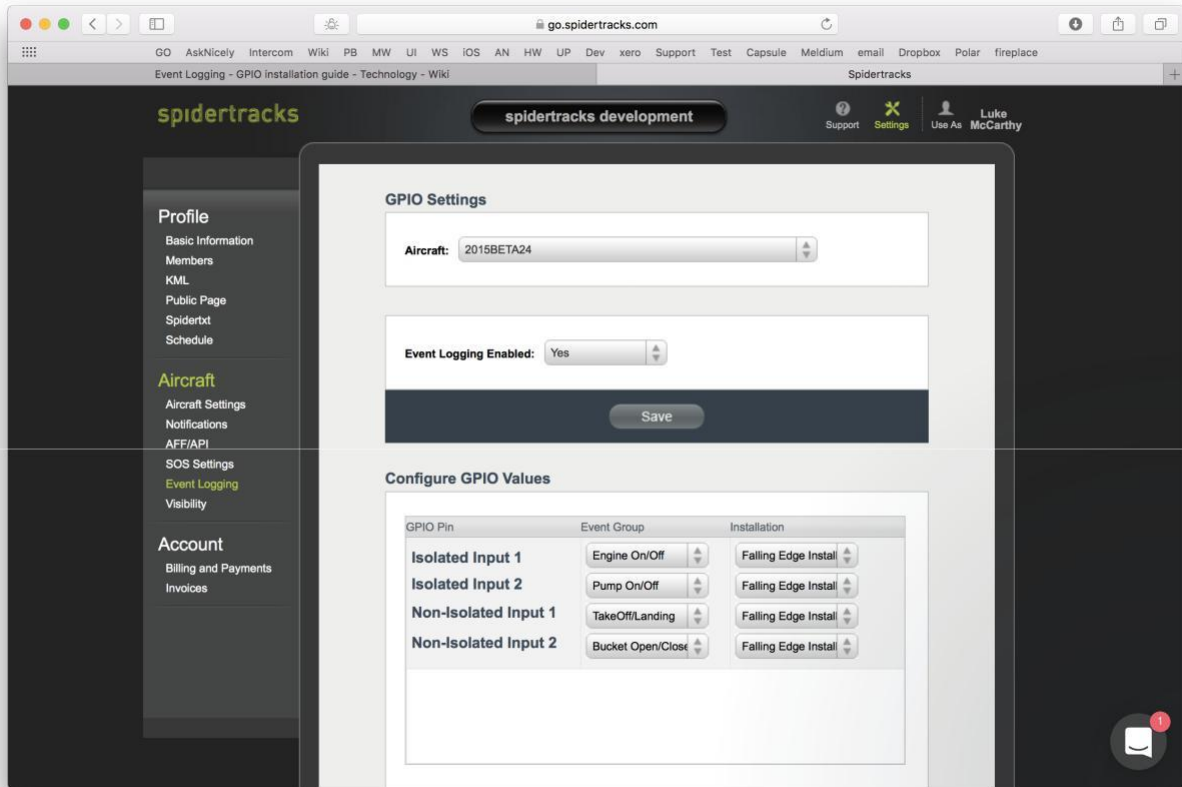


Figure 4. Event Logging and GPIO setup on go.spidertracks.com

Under GPIO Settings select an aircraft to configure. Note, the aircraft must have a Spider 7 with GPIO assigned to it. If this is not already configured it can be done from the Aircraft Settings page.

Select Event Logging Enabled to yes and save to turn the GPIO on. Once saved you will be able to select the Event Groups and whether it is rising edge or falling edge triggered. You don't need to configure all four pins. The following event groups are currently available:

- Engine On / Off
- Take Off / Landing
- Pump On / Off
- Tank Open / Close



- Bucket Open / Close

In order to use Take Off and Landing event messages you must also configure and install the Spider for Engine On and Off events.

Once you save the configuration a message will be sent to the Spider to update the firmware. The Spider must connect to the Iridium Satellite Network in order to receive this update. We recommend 10 minutes of connection in order to process all updates.

If you require a different event description to the ones listed above, please contact support@spidertracks.com.

1.6.4. Testing

To check the information you are receiving is correct, go to the History page within your account. Select the checkbox beside the 'test flight' and click on the download button in the top bar. The event description will show within the CSV file. The event is not currently displayed on the maps within the Flying or History pages.

For further assistance please contact support@spidertracks.com.



2. Initialisation

Figure 3 provides a visual reference for content discussed within Sections 2 and 3 of this document.



Figure 5: Spider 7 Keypad I/O

2.1. Start Up

When the Spider is first powered the LEDs will cycle through a start-up sequence (that indicates firmware version) and should then display a solid Power LED indicator only.

2.2. GPS Signal

In order to acquire a GPS lock, the aircraft will need to be outside and in full view of the sky (refer to 1.1) with the power on. Once a GPS lock is attained the Signal LED indicator (bottom right) will turn orange. A GPS lock should be acquired within 60 seconds in the general case.

2.3. Iridium Connectivity

Once a GPS lock has been attained the Spider will immediately attempt to send the first position report to the Iridium satellites. Once a connection has been made with the Iridium network, the Signal LED indicator will turn from orange to green and should remain green throughout the duration of the flight.

Under normal operating conditions the time taken from startup through GPS lock and connection with the Iridium network should be less than 2 minutes.



3. Operation

Tracking, communication and other flight data transmitted via the Spider can be viewed on the Spidertracks website and mobile application, however, this will first need to be configured at app.spidertracks.io. For setting up your account, please refer to the [User Guide for the Spidertracks website](#).

Reporting parameters are configured within the website and not on the Spider itself. When such parameters are initialised, or changed, the Spidertracks system queues a configuration message for delivery to the Spider. This sits on the gateway until the next subsequent 'session' that the Spider establishes, at which point the message is delivered and the Spider's operating system is updated accordingly. Configuration updates can be made in real time while the aircraft is in flight.

When powered and in full view of the sky, the Spider will begin to send position reports consistent with how it has been configured without any interaction required by the pilot. The purpose of the keypad is to provide visual indication on the state of the Spider as well as additional functionality, but is not required for the Spider to report aircraft position.

3.1. System Attributes

There are many features of the Spidertracks system that are delivered through software services and are not specific to any of the Spider product variants. The full range of these are beyond the scope of this document, however, the following two sub-sections summarise cornerstone attributes and provides context for Spider functions discussed in this section.

3.1.1. Tracking Modes

Spidertracks provides both *passive* and *active* tracking capabilities (referred to as *normal* and *watch* modes respectively).

Under normal tracking conditions, the Spider will report positional information and flight events in real time, however, if the aircraft were to encounter an emergency situation in flight, ground personnel would not be alerted to this unless there was a conscious SOS button pressed by the crew.

In watch mode, the Spidertracks system is actively monitoring the status of the flight. If communication with the aircraft is lost for a period of ten minutes, a tier one alert will be pushed through to the emergency management framework.

Watch mode can be activated either manually or automatically (by speed trigger). In either case, the watch button must be pressed to disable the watch system - there is no auto-off.



3.1.2. Emergency Management Framework

The Spidertracks system comes with a two tiered emergency management framework, which are aligned with the ICAO definitions of *uncertainty* and *alert*. Recipients of these alert notifications are fully customisable within the Organisational Settings of the website.

3.2. Watch Button

The Watch button has two purposes:

1. To manually activate/deactivate the watch system at any stage of flight when operating in normal reporting mode; or,
2. To turn the Watch system off when operating under automated watch mode. Note that the aircraft must be below the configured speed threshold in order to disable the watch system when operating in automated watch mode.

The watch button will toggle on/off - do not press and hold the button. When disabling the system the LED indicator will begin to flash once toggled. The Spider has now sent a watch-off message. Until the message has been sent successfully, the LED will continue to flash. It is normal operation for this to take up to 60 seconds. While this is in process the aircraft must remain in full view of the sky. If the Spider is powered off before transmitting the watch-off message, a tier one alert will be raised.

3.3. Radius Button

Radius is a dynamic exclusion zone of a preconfigured size within the Organisational Settings of the website. When the Radius button is toggled on, position reporting is suspended while the aircraft operates within the bounds of that geo-fenced area. Tracking will resume on exiting the radius area or toggling off the Radius button. For information on configuring Radius please refer to [User guide and videos for the spidertracks website.](#)

3.4. Mark Button

Up to four pre-programmed macro messages can be delivered by way of toggling the Mark button the corresponding number of times, i.e. a single toggle will trigger Mark 1 message to be sent, toggling twice will trigger Mark 2 message to be sent. Each message is geo-stamped and includes all other parameters of a standard position report.

Configuration of macro messages, recipients and delivery mechanism are configured within the Organisational Settings of the website.



3.5. SOS Function

A tier-one alert can be initiated immediately by pressing the Radius and the Mark buttons together. When the SOS function has been toggled all LEDs across the top of the keypad will flash simultaneously and the Spider will default to a rapid reporting state (8-10 second intervals in the general case).

NB: The SOS state can not be disabled any other way than to power-cycle the Spider.

3.6. Adjusting the LED Brightness

You can adjust the LED brightness on the keypad by pressing and holding the Mark button. The LED will cycle through the levels of brightness. Release the Mark button when your desired brightness is reached.

3.7. Spidertxt 2.0

The Spider 7 is equipped with Low Energy Bluetooth (BLE) technology and is compatible with Spidertxt 2.0. This enables two-way freeform messaging to/from the cockpit using a mobile device connected to the Spider.

For more information on Spidertxt 2.0 please contact Spidertracks support.



4. Troubleshooting

4.1. Discontinuous Tracks

Intermittent power supply issues are often the cause of this and are easily recognisable by:

- Multiple short tracks which constitute what should have been a single track between point A and B
- An excessive number of 0 minute tracks
- Missing tracks (last track terminates at point C, next track originates at point D)
- Last point in track is at a high altitude and/or airspeed
- In the case where a Spider is operating in watch mode, an undesirable outcome of erratic power cycling may be a tier one alert being fired

Generic Causality:

- Spider is powered by auxiliary power outlet (cigarette lighter) which is subject to interruption from bumps, knocks, and vibration
- Spider is powered by a battery pack which is unable to deliver enough current, and/ or is running flat

4.2. Lost GPS

If the GPS signal is lost both the Satellite and GPS LED on the Spider will turn off. On the keypad, the Signal LED will turn off. It is not uncommon to drop a GPS lock but occurrences should be infrequent and not last for periods of more than a few seconds.

4.3. Lost Iridium Connectivity

If the Spider can not connect to an Iridium Satellite for a short period of time there will be a transmission delay from real-time. If the delay exceeds 120 seconds, the Satellite LED on the Spider 7 will turn off, but the GPS LED will stay on to indicate that the unit still has a GPS lock. The Signal LED on the keypad will turn orange.

The Spider uses temporary memory to store a maximum of 10 points, therefore even if the Spider is struggling to send position points, it can still add points to the queue as long as there is a GPS lock. Once the Satellite connection is re-established, the Satellite LED on the Spider will turn back on and the Signal LED on the keypad will turn green.



Appendix

(A) Spider 7 Minor Modification Summary Report

(A)1. Description

The subject modification consists of the installation of a Spider 7 real-time aircraft tracking device.

(A)2. Modification Approval Basis

Spidertracks recommends classifying the subject modification as a minor modification. This recommendation is based on the evaluations of the modification against: (1) Transport Canada Civil Aviation Standard 571 Appendix A, Criteria for the Classification of Modifications and Repairs; and (2) Federal Aviation Administration FAR Part 43 Appendix A. Therefore, acceptable data will be employed to support the installation of the Spider 7. Compliance is at owner's discretion.

(A)3. Configuration Control Data

Chapter	Version	Date
Spider 7 Instruction Manual	3.0.0	24/01/2017

(A)4. Post Installation Testing

Complete post installation in accordance with the following guidelines:

Title	Version	Date
Appendix (B): Spider 7 Structure Test Procedure	IR	17/11/2015
Appendix (C) : Spider 7 Electromagnetic Compatibility Test Procedure	IR	17/11/2015

(A)5. Operation and Limitations

Refer to Spider Tracks Limited, Spider 7 Instruction Manual for operational instructions. Basic flight manual limitations remain applicable.



(A)6.Weight and Balance

Update aircraft weight and balance report as required:

Description	Weight [kg]	Arm [mm]	Moment [kg-mm]
Installation, Spider 7	0.165		

(A)7.Electrical Load

Installation of the Spider 7 introduces a maximum continuous draw of 1.0A at 12VDC.

Update the aircraft electrical load analysis report as required.

(A)8.Continuing Airworthiness

Maintenance of the modification is in accordance with the applicable OEM maintenance manual. Instructions for Continued Airworthiness (ICA) are not required.



(B) Spider 7 Structure Test Procedure

(B)1. Test Definition

The purpose of these test procedures is to demonstrate structural integrity for the installation of the Spider 7.

(B)2. Special Tools and Equipment

A calibrated digital or analogue fish hook type scale (e.g. Transducer Techniques HFG-110) is required to conduct the structural testing.

(B)3. Test Conditions

The Spider 7 must be installed prior to starting the structural testing. Allow for adequate time for the adhesive to fully bond to the installation location.

(B)4. Applied Loads

Conservative ultimate load factors for structural testing purposes are provided for FAR 23 (normal, acrobatic and utility category airplanes) and FAR 27 (normal rotorcraft) installations. For additional information, refer to the acceptable data source, FAA AC43.13-2B, Chapter 1, Paragraphs 103 through 105.

Load Case	Ultimate Load Factor	Weight of Spider 7	Minimum Applied Load [Load Factor x Weight]
Forward	18.0g	0.165 kg	2.970 kg
Downward	20.0g	0.165 kg	3.300 kg
Upward	5.7g	0.165 kg	0.941 kg
Side	8.0g	0.165 kg	1.320 kg

Table 3: Minimum Applied Loads.

(B)5. Test Procedure

The following procedures detail the methodology for the structural test.

1. Record the serial number of the Spider 7 being used in the test and complete the test record information.



2. Apply the minimum loads listed in Chapter 3.4 to the centre of the Spider 7 in accordance with AC 43.13-2B, Para 105. Record the actual applied loads:

Forward	
Downward	
Upward	
Side	

(B)6.Pass/Fail Criteria

When no damage or permanent deformation occurs after 7 seconds of applied static load in all directions, the Spider 7 installation is acceptable. Should permanent deformation occur after 3 seconds, reinforcements are required (e.g. doubler installation) to the affected structure and repeat test.

(B)7.Test Record

Date of Test	
Spider 7 S/N	
Location of Test	
A/C Registration	

LAME conducting
testing:

Print Name

Signature

License No.



(C)Spider 7 Electromagnetic Compatibility Test Procedure

(C)1. Test Definition

The purpose of these test procedures is to demonstrate Electromagnetic Compatibility (EMC) between the aircraft's electrical or electronic systems, and the Spider 7 being tested. This test procedure is an aircraft-level test, to determine if there is any electromagnetic or radio frequency interference (EMI/RFI) to the various critical aircraft systems, radios and installed equipment.

(C)2. Special Tools and Equipment

The following equipment may be required depending on aircraft installed equipment and availability of navigation aids and ATC radar in the area where testing is conducted.

- a. NAV/COM Ramp Tester (e.g. NAV-402AP, IFR-4000);
- b. Transponder/DME Ramp Tester (e.g. ATC-600A, ATC-601, IFR-6000);
- c. TCAS Ramp Tester (e.g. TCAS-201, IFR-6000);
- d. Headsets; and
- e. Other equipment as required to exercise all modes of operation for systems under test.

(C)3. Test Conditions

All aircraft systems under test must be functional prior to starting the EMC test. Any reduced functionality of the system(s) should be noted. All testing shall be conducted in day VFR conditions with a clear view of the sky to ensure that a GPS fix can be obtained for starting the Iridium transmission.

For the test, the following conditions are required:

- a. All engines running with all generators online (for part of the test);
- b. All electrical busses powered; and
- c. All avionics/electrical systems and installed equipment powered and active.



(C)4. Test Procedure

The following procedures detail the methodology for the EMC test.

1. Identify all aircraft systems under testing from the test matrix table and strike out those that are not applicable to the respective aircraft used in the test.
2. Record the serial number of the Spider 7 being used in the test and complete the test record information.
3. Power up the Spider 7. The left LED on the keypad of the Spider will glow green and the right LED will turn amber when it has a GPS fix.
4. Achieve a Bluetooth connection with the Spider 7 and an appropriate device (e.g. Apple iPhone).
5. Operate each aircraft system under test in all the modes of operation, while monitoring the system for interference. If there is no interference observed, insert a check mark in the “passed” column. If interference is observed, describe the interference in the respective observation column and contact Spider Tracks Limited for further assistance.
6. Multiple systems may be monitored in tandem to expedite the test whenever possible.
7. Systems should be tested on the ground unless the aircraft system/equipment can only be tested in flight.
8. If there are avionics/electrical systems on the aircraft that are not listed, add them at the end of the table.
9. Ensure there is no interference to aircraft systems from the use of the Spider 7.
10. When test is complete, note any comments or differences in the test procedures “Comments” section remembering to sign and date the appropriate areas at the end of this document.

(C)5. Pass/Fail Criteria

EMC testing is subjective in nature since an interference can be deemed acceptable or unacceptable. If an interference is observed, the decision of acceptability should be determined by the person who will be making a compliance finding against the applicable airworthiness standards. In general, the systems under test shall have no unintentional changes in operating mode, unexpected responses, intermittent behaviours, or unacceptable noise.





(C)6. Test Record

Date of Test	
Spider 7 S/N	
Location of Test	
A/C Registration	

Aircraft System Under Test	Test Instructions	Passed	Observations
VHF 1	Open squelch. Tune to 118, 120, 124, 128, 132, 136MHz. Listen for noise . Verify transmit and reception.	<input type="checkbox"/>	
VHF 2	Open squelch. Tune to 118, 120, 124, 128, 132, 136MHz. Listen for noise . Verify transmit and reception.	<input type="checkbox"/>	
VHF 3	Open squelch. Tune to 118, 120, 124, 128, 132, 136MHz. Listen for noise . Verify transmit and reception.	<input type="checkbox"/>	
HF 1	Tune to 3, 6, 9, 15, 21, 27MHz. Listen for noise. Verify transmit and reception in both AM and SBB modes for each channel.	<input type="checkbox"/>	
VHF/FM 1	Tune to test frequency. Verify transmit and reception.	<input type="checkbox"/>	
VHF/FM 2	Tune to test frequency. Verify transmit and reception.	<input type="checkbox"/>	
UHF 1	Tune to test frequency. Verify transmit and reception.	<input type="checkbox"/>	
VOR 1	Tune in to local stations and/or use ramp tester. Verify VOR bearing display and station audio ident.	<input type="checkbox"/>	
VOR 2	Tune in to local stations and/or use ramp tester. Verify VOR bearing display and station audio ident.	<input type="checkbox"/>	
SATCOM	Verify operation in all modes.	<input type="checkbox"/>	



Aircraft System Under Test	Test Instructions	Passed	Observations
ILS 1	Tune in to local stations and/or use ramp tester. Verify GS / LOC display and station audio ident.	<input type="checkbox"/>	
ILS 2	Tune in to local stations and/or use ramp tester. Verify GS / LOC display and station audio ident.	<input type="checkbox"/>	
DME 1	Tune in to local stations and/or use ramp tester. Verify correct DME and station audio ident.	<input type="checkbox"/>	
DME 2	Tune in to local stations and/or use ramp tester. Verify correct DME and station audio ident.	<input type="checkbox"/>	
ADF 1	Tune in to local stations and/or use ramp tester. Verify correct indication and station audio ident.	<input type="checkbox"/>	
GPS 1	Display GPS satellite data. Verify signal quality and number of satellites tracking. Verify GPS position is reasonable.	<input type="checkbox"/>	
GPS 2	Display GPS satellite data. Verify signal quality and number of satellites tracking. Verify GPS position is reasonable.	<input type="checkbox"/>	
GPS 3	Display GPS satellite data. Verify signal quality and number of satellites tracking. Verify GPS position is reasonable.	<input type="checkbox"/>	
RAD ALT 1	Verify RAD ALT displays zero feet on ground.	<input type="checkbox"/>	
RAD ALT 2	Verify RAD ALT displays zero feet on ground.	<input type="checkbox"/>	
ELT	Monitor ELT for inadvertent trigger.	<input type="checkbox"/>	
WX RADAR	Operate weather radar in all available modes. And verify no erroneous indications.	<input type="checkbox"/>	
CLOCKS	Verify no erroneous indications.	<input type="checkbox"/>	
STBY INST	Verify no erroneous indications.	<input type="checkbox"/>	
STBY COMPASS	Monitor for erratic indications.	<input type="checkbox"/>	



Aircraft System Under Test	Test Instructions	Passed	Observations
HSI/DG 1	Monitor for erratic indications.	<input type="checkbox"/>	
HSI/DG 2	Monitor for erratic indications.	<input type="checkbox"/>	
AHRS 1	Monitor for erratic attitude and heading indications.	<input type="checkbox"/>	
AHRS 2	Monitor for erratic attitude and heading indications.	<input type="checkbox"/>	
CVR	Run self-test if available. Verify no flags or lights appear.	<input type="checkbox"/>	
FDR	Run self-test if available. Verify no flags or lights appear.	<input type="checkbox"/>	
COCKPIT LIGHTS	Verify normal operation.	<input type="checkbox"/>	
EXTERNAL LIGHTS	Verify normal operation.	<input type="checkbox"/>	
HTAWS	Monitor for erroneous indications. Perform self-test if available.	<input type="checkbox"/>	
TCAS	Monitor for erroneous indications. Perform self-test if available.	<input type="checkbox"/>	
MFD	Monitor for erroneous indications. Perform self-test if available.	<input type="checkbox"/>	
TRANSPONDER	Use ramp tester or check in flight to establish Mode C interrogations.	<input type="checkbox"/>	
CAUTION PANEL	Monitor for erroneous indications.	<input type="checkbox"/>	
CIRCUIT BREAKERS	Monitor for erroneous indications.	<input type="checkbox"/>	
SPAS	Perform system test and monitor for erroneous indications.	<input type="checkbox"/>	
AFCS / SCAS / CSAS	Perform system test and monitor for erroneous indications.	<input type="checkbox"/>	
FLIGHT DIRECTOR 1	Engage flight director in all modes of operation.	<input type="checkbox"/>	
FLIGHT DIRECTOR 2	Engage flight director in all modes of operation.	<input type="checkbox"/>	
ADC 1	Perform a system function test. Verify correct display of airspeed, altitude, TAT, TAS.	<input type="checkbox"/>	



Aircraft System Under Test	Test Instructions	Passed	Observations
ADC 2	Perform a system function test. Verify correct display of airspeed, altitude, TAT, TAS.	<input type="checkbox"/>	
HEATER / ECS	Operate in all modes.	<input type="checkbox"/>	
FUEL QUANTITY	Monitor for erroneous or erratic indications.	<input type="checkbox"/>	
FUEL SYSTEM	Monitor for erroneous or erratic indications.	<input type="checkbox"/>	
HYDRAULIC SYS	Cycle hydraulic pumps. Monitor for erroneous or erratic indications.	<input type="checkbox"/>	
FUEL CONTROL	Cycle system to manual and back to auto. Monitor for erroneous or erratic indications.	<input type="checkbox"/>	
FIRE DETECTION SYSTEM(S)	Monitor for erroneous or erratic indications.	<input type="checkbox"/>	
ENGINE INDICATING	Run engines. Verify proper functioning. Monitor for erroneous or erratic indications. Transfer electrical busses to all engine driven generator(s).	<input type="checkbox"/>	
AC/DC ELECTRICAL SYSTEMS	Configure the electrical systems in different modes. Verify no interference when switching loads from one bus to another.	<input type="checkbox"/>	
MAST MOMENT INDICATOR	Monitor for erroneous or erratic indications.	<input type="checkbox"/>	
FADEC / DECU	Run engines in all modes. Monitor for erroneous or erratic indications.	<input type="checkbox"/>	
VEMD	Run engines in all modes. Monitor for erroneous or erratic indications.	<input type="checkbox"/>	
PITOT STATIC HEAT	Confirm correct operation.	<input type="checkbox"/>	
EMERGENCY LIGHTS	Monitor for inadvertent activation.	<input type="checkbox"/>	
PARTICLE SEPERATOR	Monitor for erroneous indications.	<input type="checkbox"/>	



Aircraft System Under Test	Test Instructions	Passed	Observations
CYCLIC TRIM	Verify for normal operation and monitor for inadvertent activation.	<input type="checkbox"/>	
ENGINE TRIM	Verify for normal operation and monitor for inadvertent activation.	<input type="checkbox"/>	
CARGO HOOK	Verify for normal operation and monitor for inadvertent activation.	<input type="checkbox"/>	
LONG LINE RELEASE	Verify for normal operation and monitor for inadvertent activation.	<input type="checkbox"/>	
		<input type="checkbox"/>	
		<input type="checkbox"/>	
		<input type="checkbox"/>	

Comments:

Indicate any deviations from the test procedure, or observations regarding the test results:

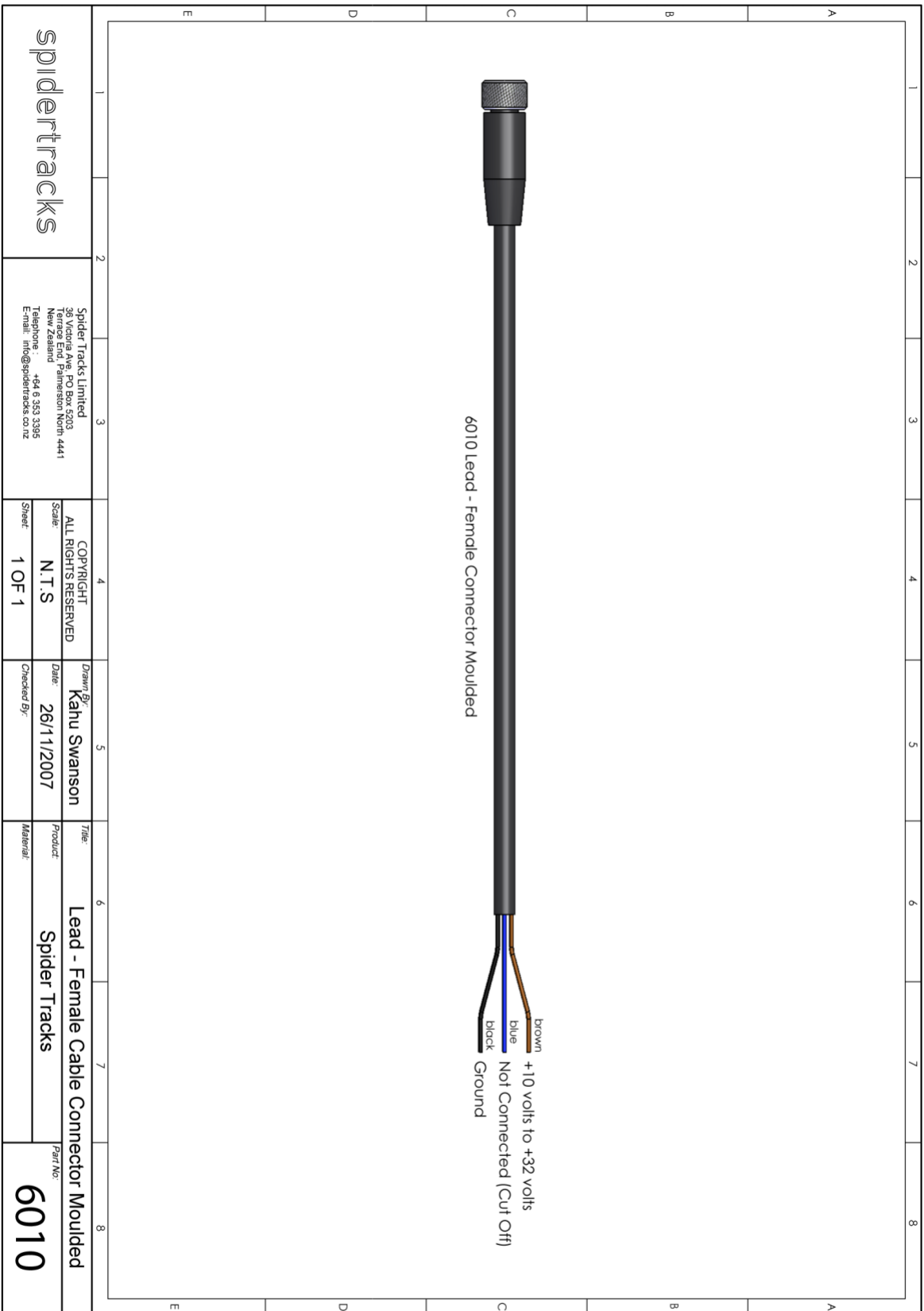
LAME conducting testing:

PRINT NAME_____
SIGNATURE_____
LICENSE
NO

Pilot conducting testing:

PRINT NAME_____
SIGNATURE_____
LICENSE
NO

(D)Wiring Diagram - Power Lead



(E) Datasheet for Iridium/GPS S67-1575-109

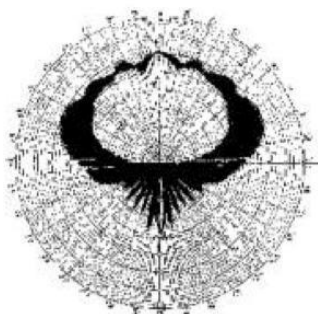
IRIDIUM / GPS S67-1575-109



DESCRIPTION

S67-1575-109: Low profile Iridium/GPS antenna provides continuous coverage from 1565MHz to 1626.5 MHz for excellent Iridium operation as well as GPS L1 applications. Mechanical configuration is a spherical-radius molded radome which provides enhanced protection against rain, ice, and lightning strikes. Qualified for high-speed military aircraft as well as ARINC applications.

DESIGNED TO: DO-160, MIL-C-5541,
MIL-E-5400, MIL-STD-810, TSO-C129



RADIATION PATTERN

SPECIFICATIONS

**IRIDIUM/GPS
S67-1575-109**

ELECTRICAL

- Frequency
 - GPS 1575 +/-10MHz
 - Iridium 1616 -1626.5 MHz
- VSWR 1.5:1
- Polarization RHCP
- Impedance 50 ohms
- Power Handling 60 watts CW
- Gain +3 dBic @ Zenith
- Lightning Protection .. DC grounded

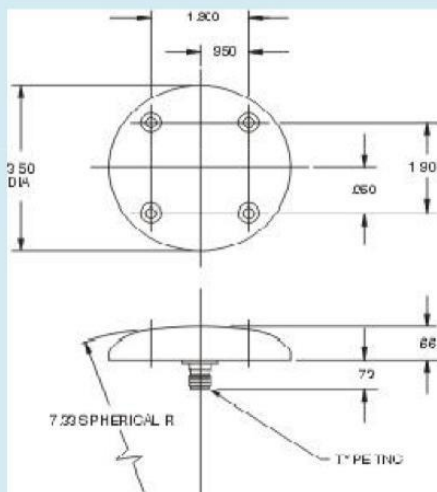
MECHANICAL

- Weight 6 oz.
- Height66 in.
- Diameter 3.5 in.
- Material 6061-T6 aluminum / thermoset plastic
- Finish Skydrol resistant enamel
- Connector TNC Female

ENVIRONMENTAL

- Temperature -55°C (-67°F) to +85°C (+185°F)

OUTLINE DRAWING



(F) RTCA DO-160 Test Reports

Links to download:

- [DO-160F Sections 15 and 21](#): Magnetic Effect & RF Emissions
- [DO-160G Sections 7 and 8](#): Shock and Vibration
- [DO-160G Section 17](#): Voltage Spike
- [DO-160G Section 26](#): Flammability

