D2000 (P/N 100340)

IRIDIUM SATELLITE PACKET DATA TERMINAL

Installation Guide

Document Part # 100341

Revision A

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INTRODUCTION

Application

This guide is applicable to the following components:

Part Number	Component Description
100340AD	D2000AD Packet Data Terminal (aviation firmware)
100340MD	D2000MD Packet Data Terminal (land/mobile firmware)
100297	D2000 Power Cigarette Lighter Adapter
100298	D2000 Power Supply Adapter (110/220V sources)
AT1621-62W-TNCF-SMAF-000-03-26-NM	Iridium/GPS Combined Antenna (aviation)
AT1621-62W-SMAF-SMAF-000-03-26-NM	Iridium/GPS Combined Antenna (land/mobile)
AT1621-162W-SMAF-SMAF-000-03-26-NM	Iridium/GPS Combined Antenna (marine)
Notes	

Overview

The information contained in this manual describes the features, functions, technical characteristics, components, installation considerations and setup procedures for Blue Sky Network's D2000 IRIDIUM SATELLITE PACKET DATA TERMINAL.

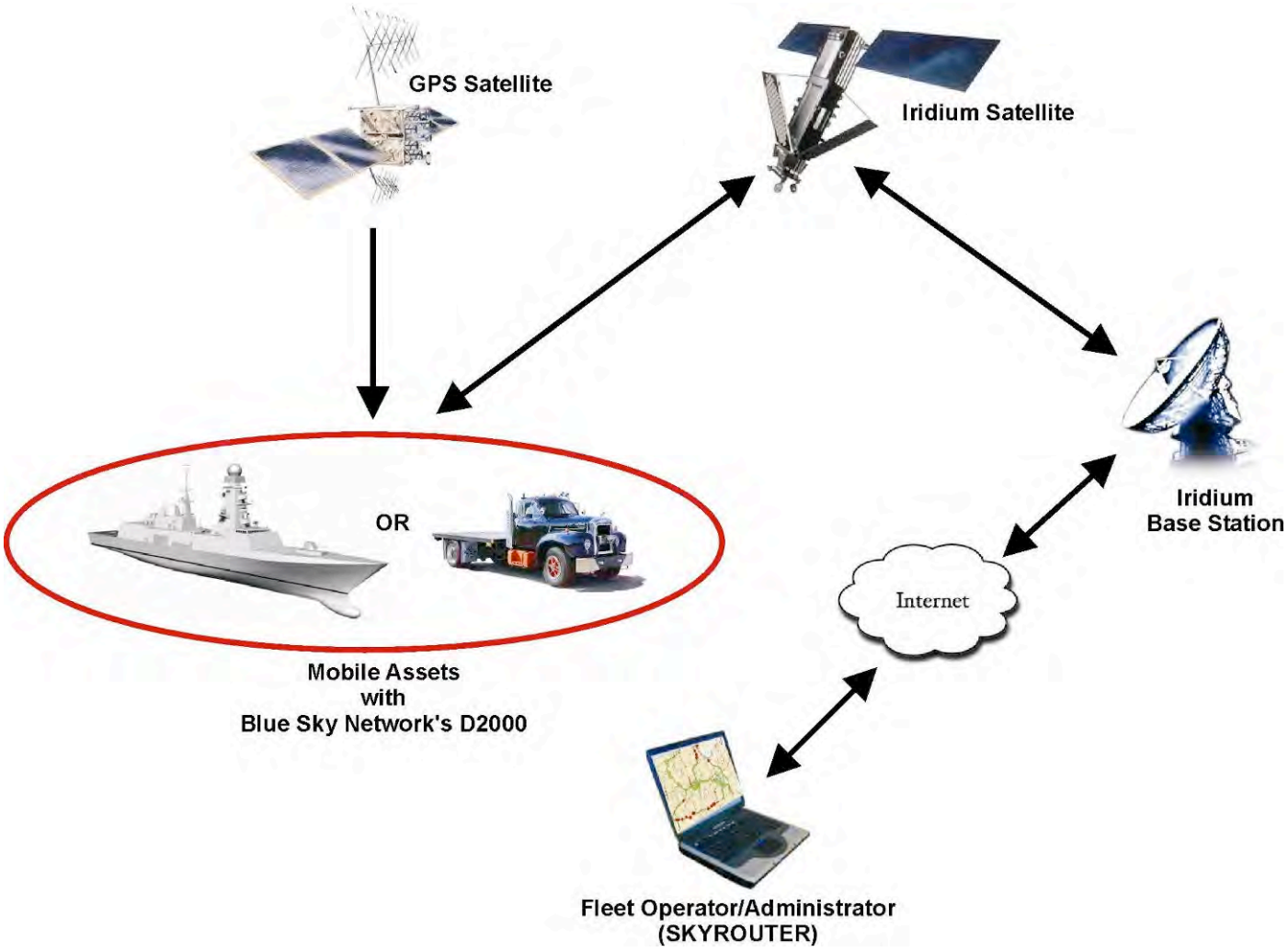
Information, drawings and wiring diagrams contained in this manual are intended as a reference for engineering planning only. Drawings and wiring diagrams contained herein do not represent any specific vehicle or vessel installation. It is the installer's responsibility to create installation drawings specific to the asset.

SYSTEM DESCRIPTION & OPERATION

D2000 Network Description

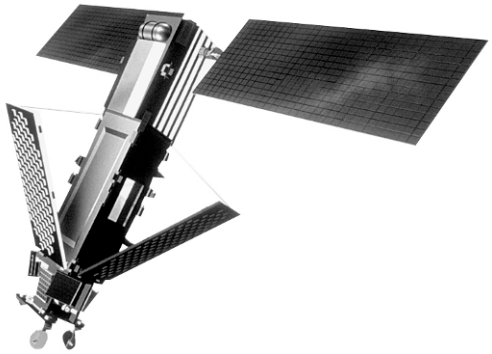
The Blue Sky Network's D2000 is an Iridium Satellite Packet Data Terminal. Roughly the size of a car stereo, it can easily be installed on a marine vessel, land vehicle, or aircraft for instant global tracking and 2-way data communications.

All data services are managed by the customer through our web-based SkyRouter portal. SkyRouter offers global asset tracking, account management features, such as user authorization, asset settings, messaging and billing information. Access to SkyRouter is highly secure and password protected.



Iridium Satellite Network

The Iridium Satellite System is the only current provider of truly global, mobile satellite voice and data solutions with complete coverage of the Earth including oceans, airways and Polar regions. Through a constellation of 66 low-earth orbiting (LEO) satellites operated by Boeing, Iridium delivers essential communications services to and from remote areas where terrestrial communications are not available. The service is perfectly suited for the transportation industry as well as industrial applications such as heavy construction, defense/military, emergency services, maritime, mining, forestry, oil and gas.



Satellites	66 (plus 6 in-orbit backup satellites)
Orbital Planes	6
Orbit Altitude	485 miles (780 kilometers)
Inclination of Orbital Plane	86.4 degrees
Orbital Period	100 minutes, 28 seconds
Satellite Weight	1,500 pounds (689 kilograms)
Spot Beams	48 per satellite (30 miles in diameter per beam)

GPS Satellite Navigation System

The Global Positioning System (GPS) is a worldwide radio-navigation system formed from a constellation of satellites and their ground stations.

GPS uses these "man-made stars" as reference points to calculate positions accurate to a matter of meters.

GPS satellite signals are processed in a GPS receiver, enabling the receiver to compute position, velocity and time. GPS receivers have been miniaturized to just a few integrated circuits, and are becoming very economical, which makes the technology accessible to virtually everyone.

While there are thousands of civil users of the GPS system world-wide, the system was designed for the U. S. military. GPS is funded and operated by the U. S. Department of Defense (DOD).

D2000 OVERVIEW

Specifications

Height	3.0 inches (7.62 cm)
Width	6.5 inches (16.51 cm)
Depth	7.5 inches (19.05 cm)
Weight	2.2 pounds (1Kg)
Power Requirements Nominal Current	10VDC - 33VDC 0.5A Continuous, 1.5A Peak (12V, battery charging)
Operating Temperature Range	-20 degrees C to + 60 degrees C
Altitude	Up to 50,000 feet
Iridium SBD Frequency	L-Band
GPS Frequency	L-Band

Laptop/PDA I/O	Ethernet Port
Sensor Data I/O	1 Serial Port (RS-232)
Antenna Connectors:	
Aviation:	TNC jack for Iridium, SMA jack for GPS
Land:	SMA jack for Iridium, SMA jack for GPS
Marine:	SMA jack for Iridium, SMA jack for GPS
Vibration and Humidity Tests	SAE 1455

Features

Worldwide - The D2000 is a truly global satellite communication solution. Using the Iridium Satellite Network, Blue Sky has exploited an efficient and cost effective communication delivery system.

GPS - The D2000 has an integrated 12 channel GPS receiver. Users can define position reporting intervals and other operating parameters either locally, or remotely through the SkyRouter portal.

Asset Tracking - Directly from our web-portal, SkyRouter (www.blueskynetwork.com), users can view the location of one or a fleet of mobile assets. Tracking data can also be utilized by third party tracking solutions.

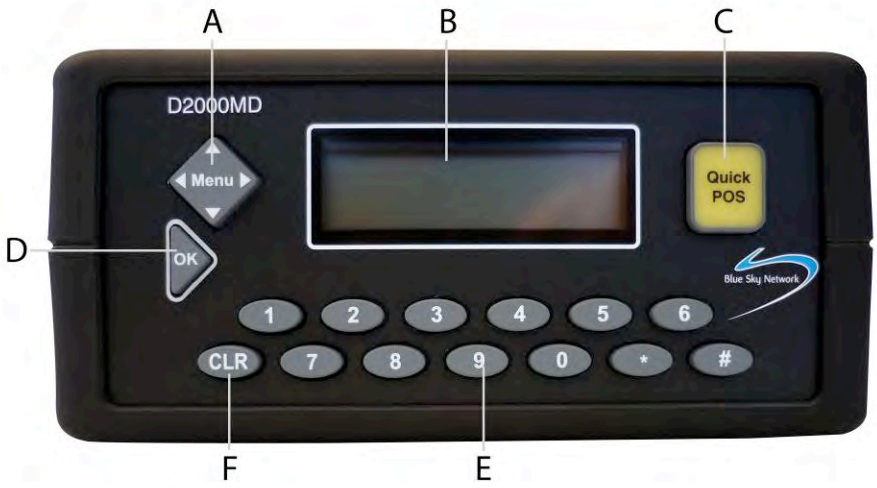
Portability - The D2000 may be used as a portable unit.

Antenna Configurations:

The D2000 100340AD version (for aviation) utilizes a TNC jack for the Iridium antenna and an SMA jack for an amplified GPS antenna for enhanced signal levels in challenging RF environments.

The D2000 100340MD version (for land/marine) utilizes a SMA jack for the Iridium antenna and an SMA jack for an amplified GPS antenna for enhanced signal levels in challenging RF environments.

Front Panel



A. 4-Way Menu Navigation Button

B. LCD Display Screen

C. Quick Position / Mayday Alert Button

D. OK (Enter) Button

E. Numerical Pad

F. Clear Button

Back Panel

100340- Combined Antenna Configuration

A. Antenna Connector (TNC)

B. Antenna Connector (SMA)

C. Circular Power Connector

D. Power Switch

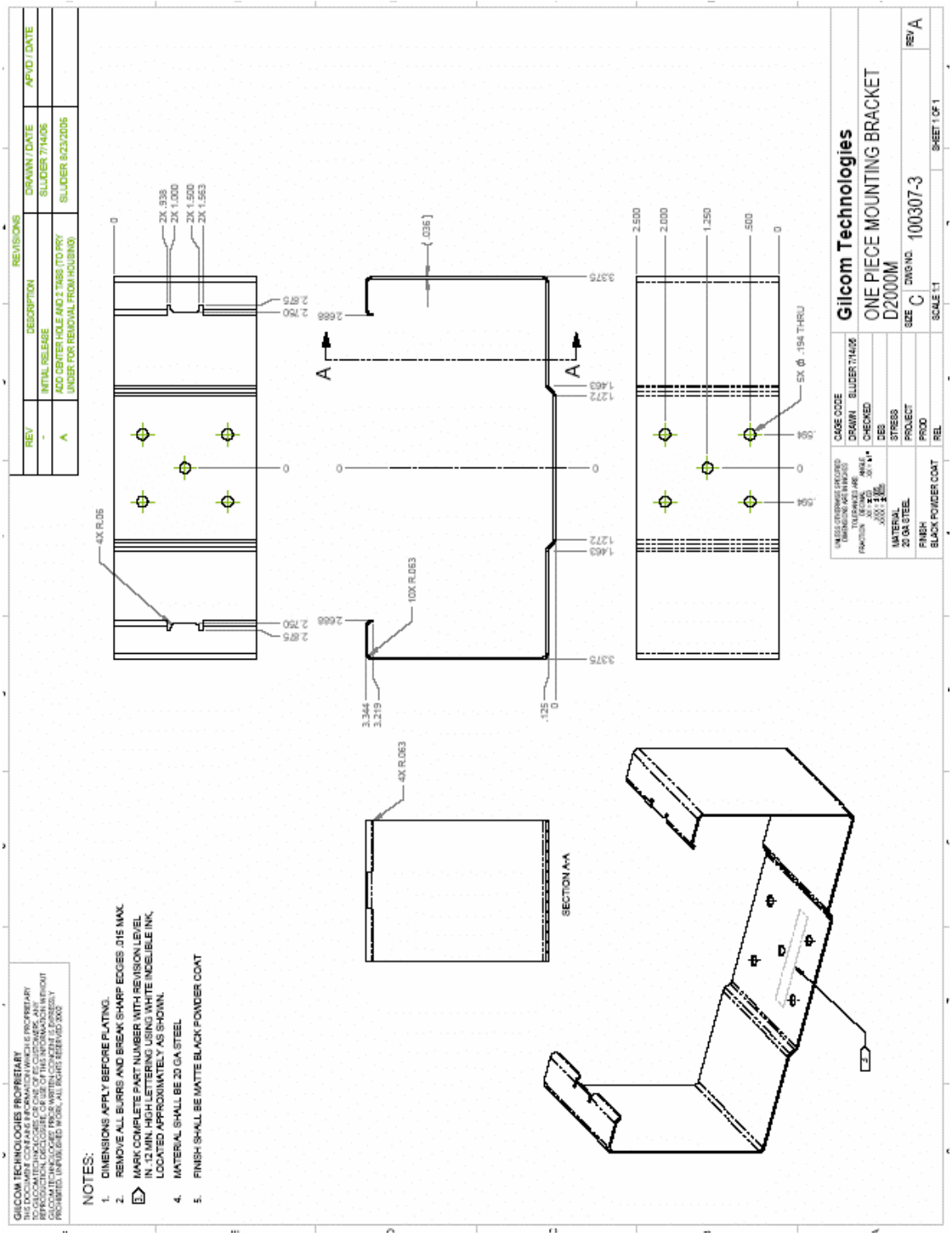
E. Serial Port

F. Maintenance Port (for firmware upgrade)

G. Ethernet Port

Installation

The location of the D2000 is at the discretion of the user, but consideration should be given to space, environmental conditions and distance from the antenna. The Optional U-Shaped Mounting Bracket (p/n 100307-3, below) can be provided with the unit and should assist the installer with placing the unit in a dashboard, ceiling or other available space (please call Blue Sky Network for ordering information). The D2000 has a pair of notches in each side (top and bottom) of the unit, allowing a solid link of the Mounting Bracket on the D2000.



The Mounting Bracket can be assembled directly into any surface with the appropriate mounting holes, or can be used with the optional suction mount, as shown below. Using the suction mount option with the D2000 allows for higher mechanical flexibility and better visualization of the front panel.

1. D2000 Unit

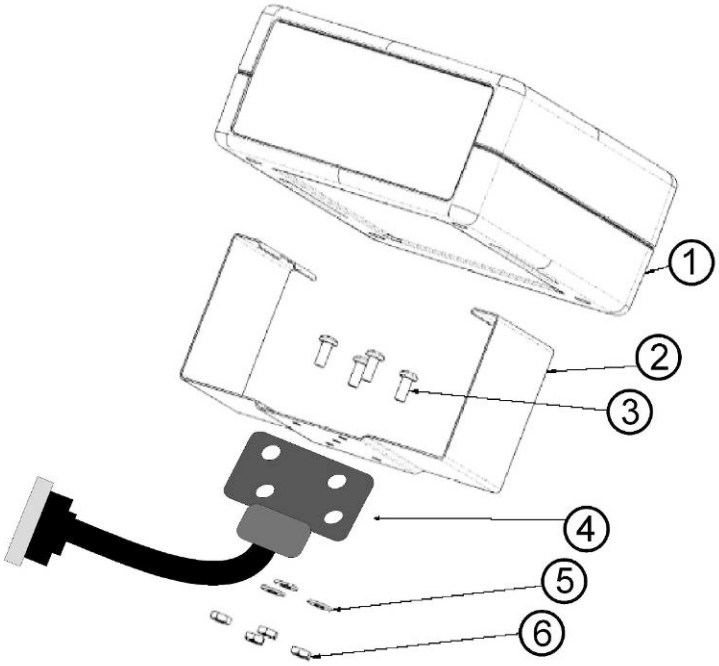
2. Mounting Bracket (p/n 100307-3).

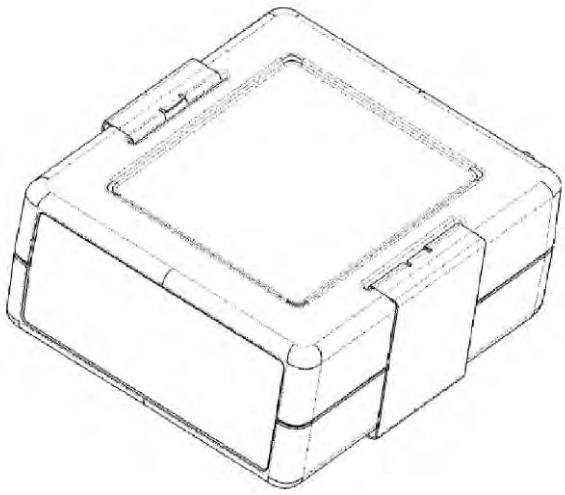
3. Screws (10-32 x .5LG SS Pan Head)

4. Suction Mount (three variations). Item sold separately by Blue Sky Network, please call for details.

5. Lock washers

6. Hex Nuts (10-32)





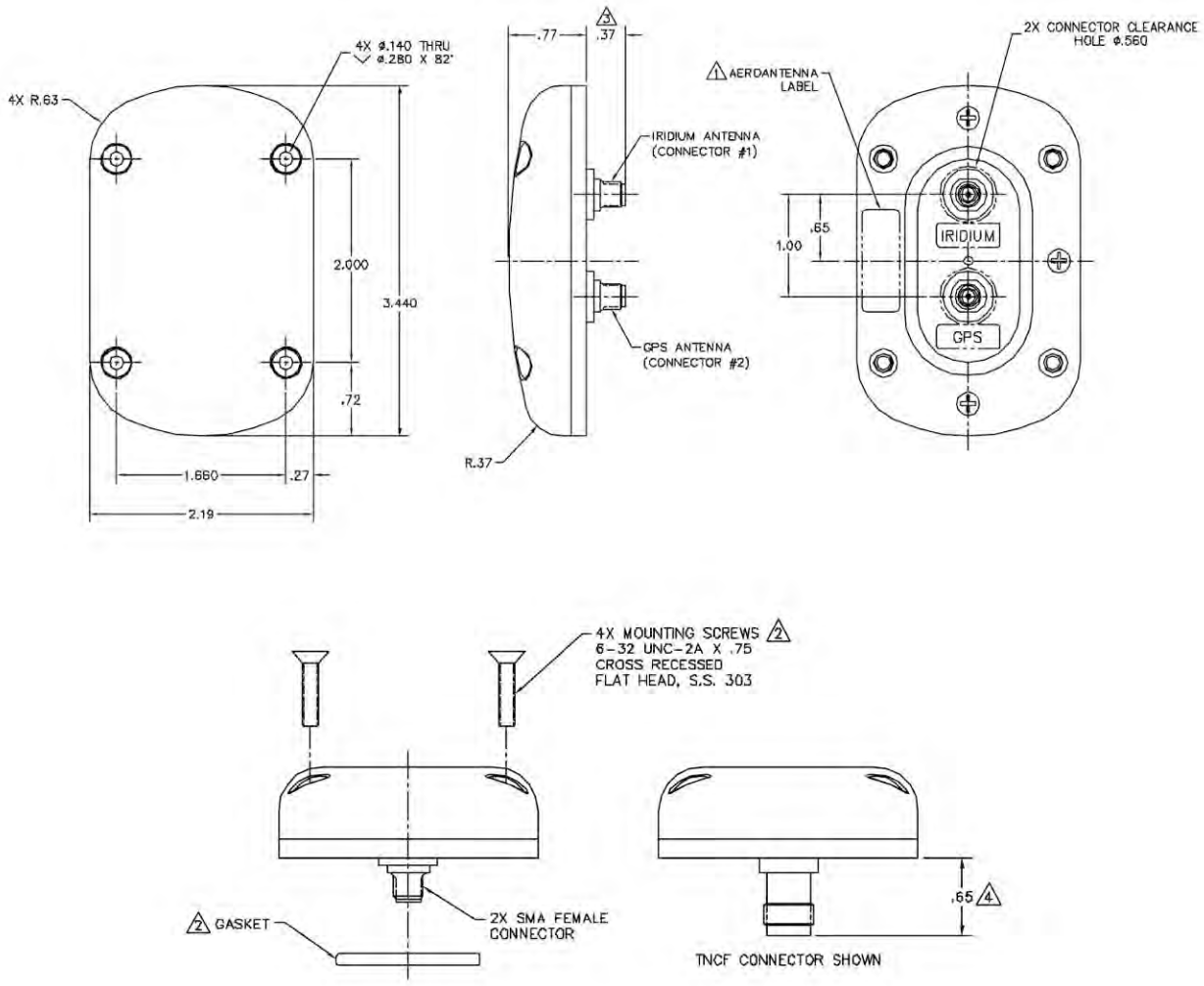
Top View (bracket holding into two notches)

"Goose Neck" Suction Mount

Antennas

The D2000 antenna configuration uses a combined Iridium/GPS antenna. The Iridium RF and the GPS RF signals are routed through separate coaxes. Several suitable antennas for this configuration are illustrated below.

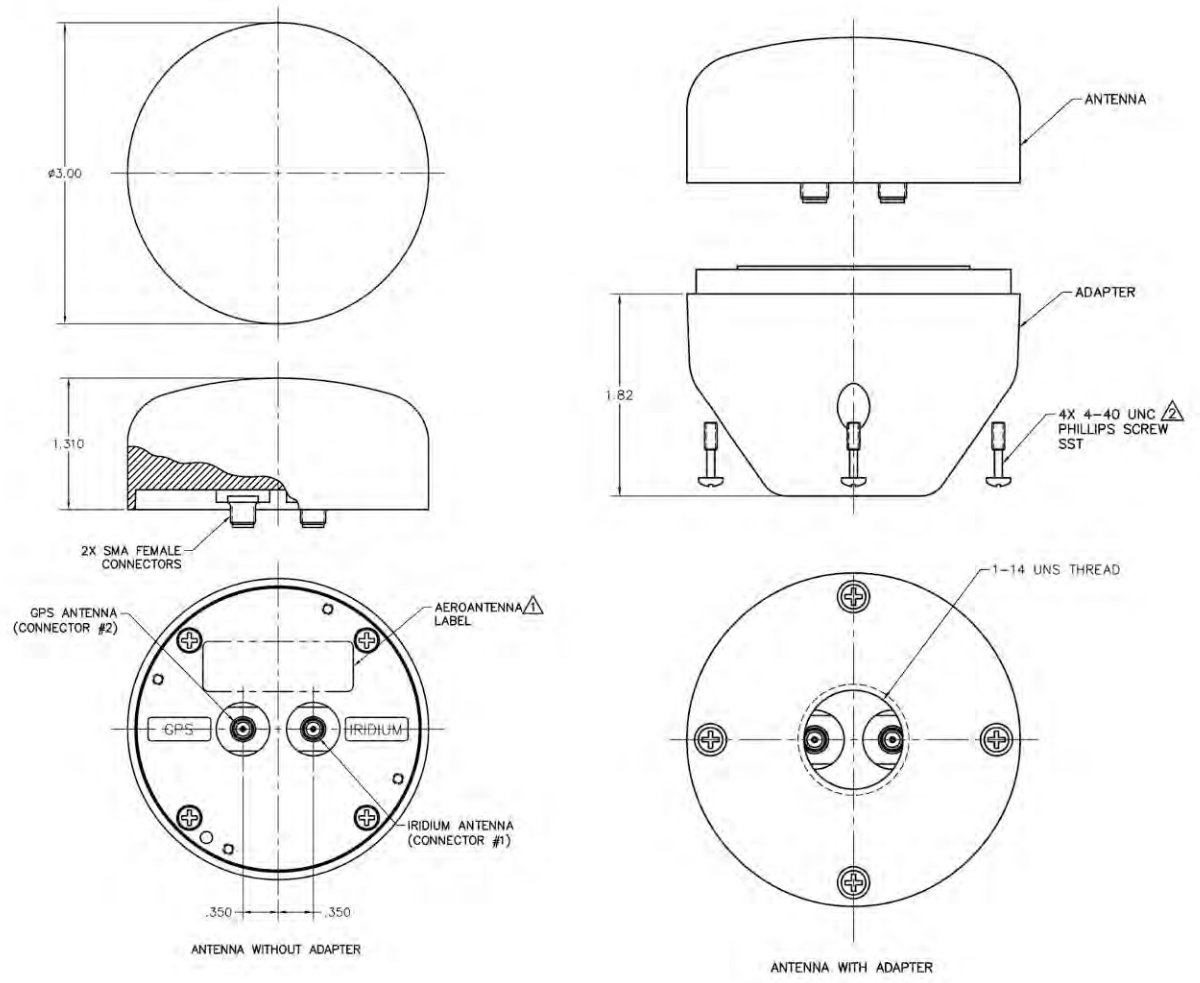
Aviation Antenna (AT1621-62W-SMAF-SMAF-000-03-26-NM):



Aviation Antenna Specifications

Frequency:	1621 ±5 MHz 1575 ±5 MHz	
Polarization:	Right Hand Circular	
Axial Ratio:	3 dB Max	
Iridium Radiation Coverage		
Elevation Angle:	0°<Θ<10°	Gain: -2.5 dBic min
	10°<Θ<90°	Gain: 0 dBic min
GPS Radiation Coverage		
Elevation Angle:	0°<Θ<10°	Gain: -7.5 dBic min
	10°<Θ<20°	Gain: -5.5 dBic min
	20°<Θ<30°	Gain: -3.5 dBic min
	Θ>30°	Gain: -2.5 dBic min
Amplifier		
Gain:	Iridium: Passive GPS L1: 26 dB (35mA)	
Voltage:	Iridium: Passive GPS L1: 3 VDC	
Noise Figure:	2.5 dB Max	
Impedance:	50 Ohms	
VSWR:	≤2.0:1	
Power Handling:	10 Watts	
Connectors:	SMA / TNC	
Weight:	4.50 oz	
Altitude:	55,000’	
Operating Temp:	-55°C to +85°C	
Designed to:	DO-160E	
ENV CAT:	F2-ABB[S(CLMY)U(FF1)]XSFDFSZXXXXPX[A3][2A]CX	
TSO:	C-144	

Marine Antenna (AT1621-162W-SMAF-SMAF-000-03-26-NM):

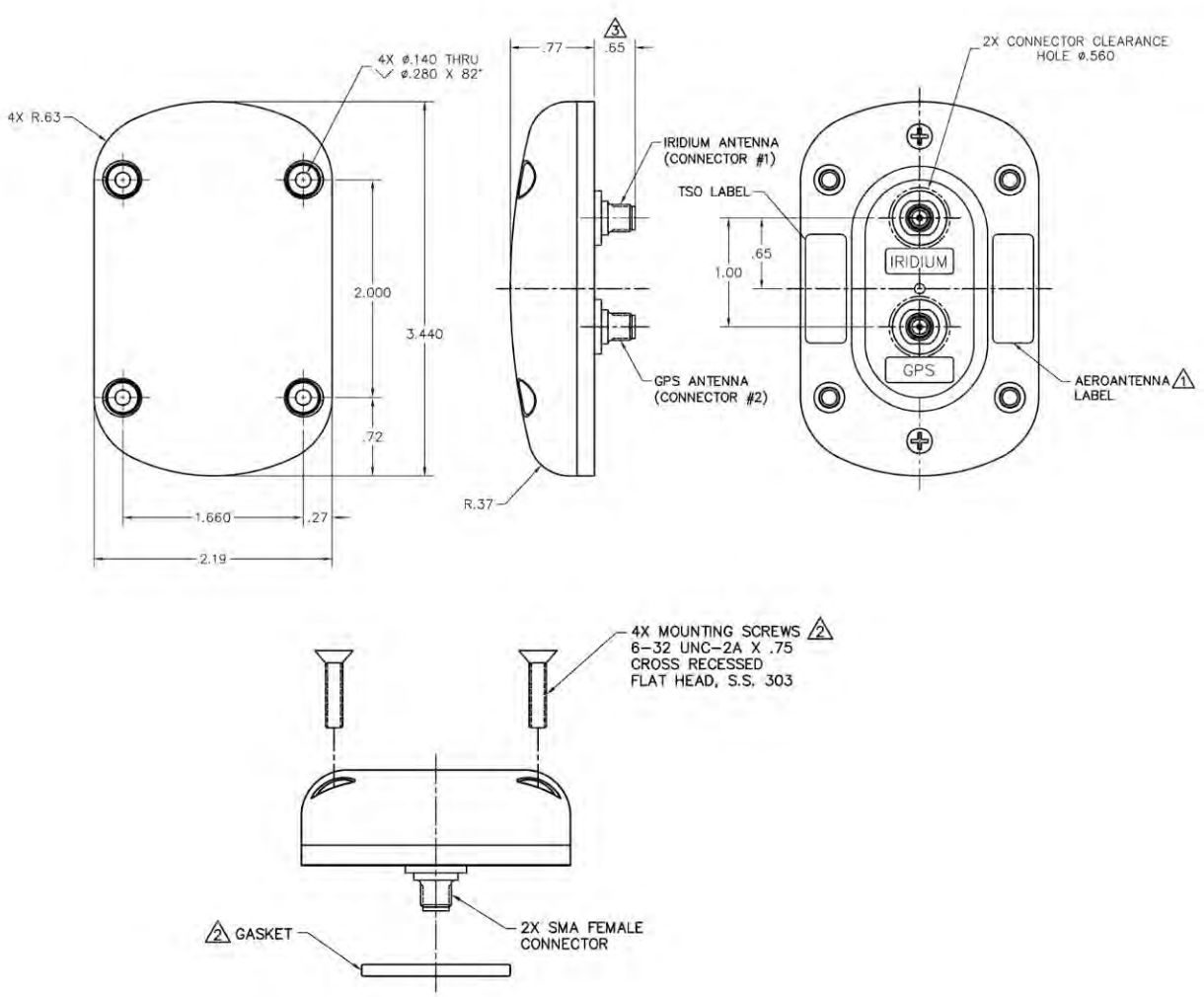


The marine antenna utilizes a robust molded radome that provides protection against severe weather normally encountered in marine environments. Included with the antenna is marine mount adapter, allowing for simple installation on standard marine antenna poles.

Marine Antenna Specifications

Iridium element:	1621 MHz +/- 5MHz
VSWR:	<2:1
Polarization:	Right Hand Circular Polarization (RHCP)
Element type:	Passive patch
Impedance:	50 ohms
Power Handling:	10 watts
Element gain:	0 dBic min @ Zenith
RF connector:	SMA jack
GPS element:	1575 MHz +/- 5MHz
VSWR:	<2:1
Polarization:	Right Hand Circular Polarization (RHCP)
Element type:	Passive patch
Impedance:	50 ohms
Power Handling:	10 watts
Element gain:	-2.5 dBic min @ Zenith
Amplifier gain:	+26 dB
Amplifier power requirements:	+3VDC at 35mA typical
RF connector:	SMA jack

Land Antenna (AT1621-262W-SMAF-SMAF-000-03-26-NM):



Land Antenna Specifications

Frequency:	1621 ±5 MHz 1575 ±5 MHz	
Polarization:	Right Hand Circular	
Axial Ratio:	3 dB Max	
Iridium Radiation Coverage		
Elevation Angle:	0°<Θ<10°	Gain: -2.5 dBic min
	10°<Θ<90°	Gain: 0 dBic min
GPS Radiation Coverage		
Elevation Angle:	0°<Θ<10°	Gain: -7.5 dBic min
	10°<Θ<20°	Gain: -5.5 dBic min
	20°<Θ<30°	Gain: -3.5 dBic min
	Ø>30°	Gain: -2.5 dBic min
Amplifier		
Gain:	Iridium: Passive GPS L1: 26 dB (35mA)	
Voltage:	Iridium: Passive GPS L1: 3 VDC	
Noise Figure:	2.5 dB Max	
Impedance:	50 Ohms	
VSWR:	≤2.0:1	
Power Handling:	10 Watts	
Connectors:	SMA / TNC	
Weight:	4.50 oz	
Operating Temp:	-55°C to +85°C	

Antenna & Antenna Cable Installation

For optimum performance, the antenna must be installed on the upper surface of the vehicle body, with an unrestricted view of the sky down to eight degrees above the horizon.

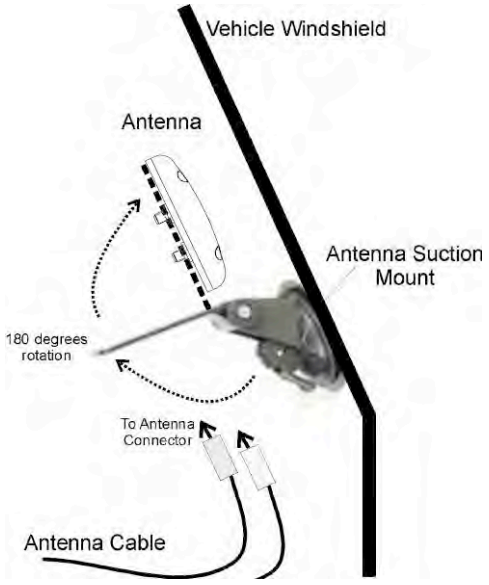
Transmission from the antenna may be affected by, and can affect the operation of other systems and it is the installer's responsibility to evaluate the location for any possible RF interference. In particular, the Iridium frequency is near the allocated GPS and Inmarsat band. The antenna should be at least 35 inches (or 1 meter) from any L-band antennas, particularly another GPS antenna.

Strict maximum attenuation requirements for the coax cable and connectors that link the Antenna to the D2000 Unit must be observed. The Iridium signal loss budget, including the antenna cable and all connectors from the antenna to the D2000 Unit is < 1.5dB @1621MHz. The BSN Installation Kits include low loss coax antenna cables sized to meet this requirement.

Antenna Cable Routing Considerations

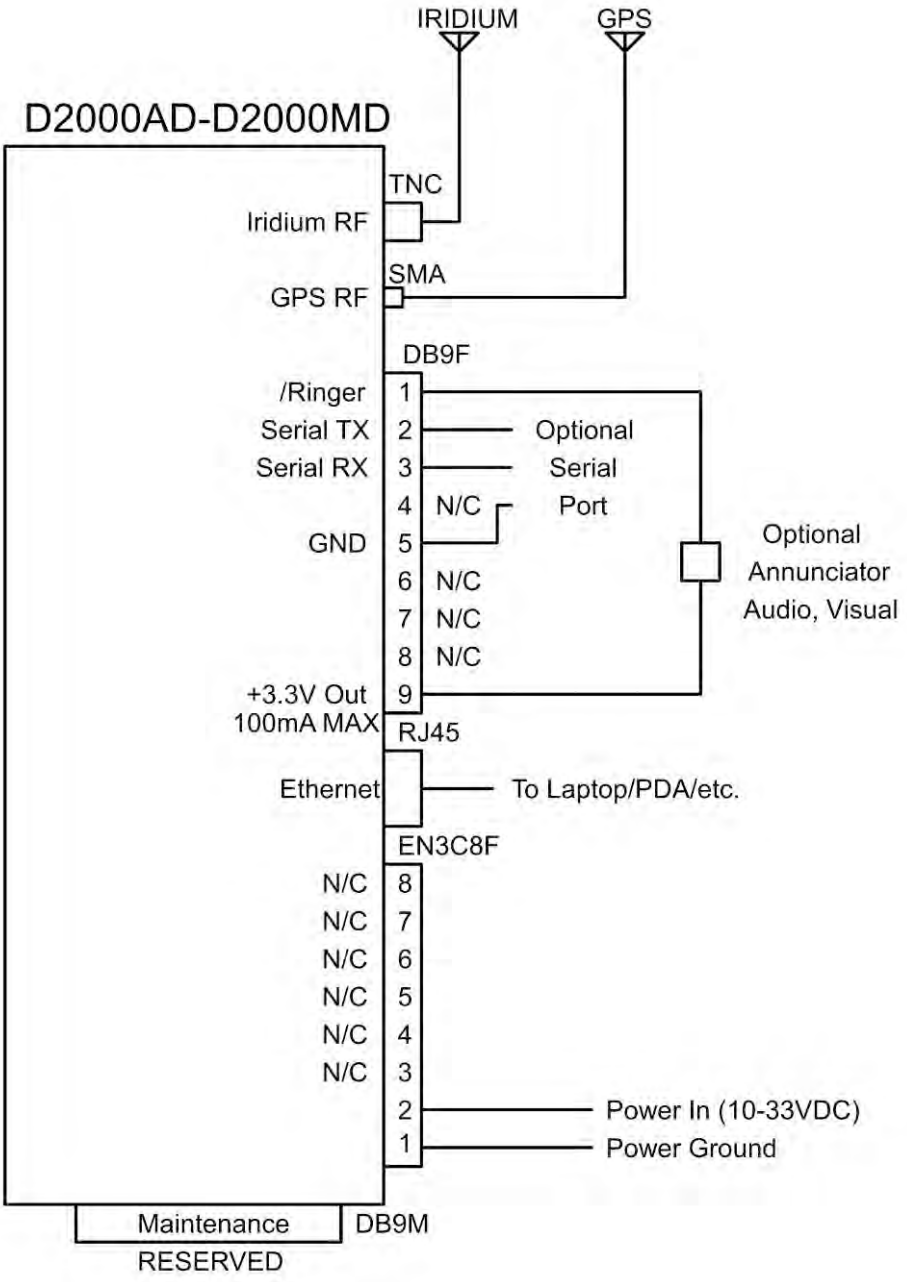
- The length and routing of cables must be carefully planned before starting the installation.
- Avoid sharp bends in the cable. Exceeding the maximum bend radius of the antenna coax cable may result in permanent degradation of the cable signal.
- In order to ensure optimum performance, the D2000 and associated wiring should be kept away from high noise sources and not routed with cables from high power sources.

Other options for installing the antenna are available. One method is to have it in a portable mode inside the vehicle. The diagram below shows an example of how Antenna Suction Mounting hardware (sold by Blue Sky Network) can be used to place the antenna from the inside of the vehicle's windshield.



Land antenna setup w/ suction mount

D2000 Wiring Diagram



The D2000 requires power and antenna to operate, but there are additional wiring options to enhance the D2000 usability. For instance, the user might opt to install a visual or audio alert device in order to signal the operator that a message has arrived from the dispatch center.

Please note: The DB9F port has limited capability. 3rd party devices such as sensors need additional software to function. BSN is not responsible for developing software for such devices.

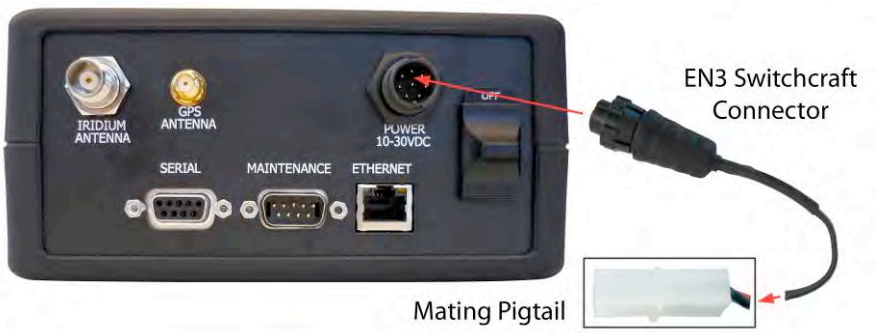
Power Input and Accessories

The D2000 power interface supports wide voltage input in the range of 10V to 33V DC. The following power is the most commonly used:

- 24 VDC nominal, typically less than 0.2A while operating, 0.4A when transmitting.
- 12 VDC nominal, typically less than 0.4A while operating, 0.8A when transmitting.

Power Connections

The D2000 (P/N100340xx) uses a weatherproof 8-Pin EN3 Switchcraft connector for power input. A mating pigtail (shown below) is included with the D2000 to facilitate installation of the newer D2000 in areas formerly occupied by the old D2000 (100300xx) configuration, and to easily connect to the Cigarette Lighter Adapter Wall Power Adapter, or External Battery (shown below).



If the user does not wish to build a fixed power harness to the D2000, power may also be provided by a Cigarette Lighter Adapter (p/n 100297), Wall Power Adapter (p/n 100298) or External Battery (RB-HC10R2T-MT5000)- all sold by Blue Sky Network.

D2000 Cigarette Lighter Adapter (100297)

D2000 Wall Power Adapter (100298)

D2000 External Battery (RB-HC10R2T-MT5000)

POWER OPTIONS

Alternatives for Powering the D2000

a. Cigarette Lighter Adapter ("Quick Installation")

This is the quickest way of getting your D2000 up and running – just plug in the D2000 power interface to your vehicle's cigarette lighter by using Blue Sky Network's special adapter (p/n 100297 – Figure 1). Please note that we strongly recommend that your vehicle's cigarette lighter provides a Switched (and not Constant) power source. This will prevent the D2000 from draining the main battery while the vehicle is turned off.

Figure 1

b. Wall Power Adapter

Another quick and simple way of getting your D2000 up and running is the Wall Power Adapter (p/n 100298 – Figure 2)- for use in vehicles with access to AC power (such as marine vessels), simply plug the Wall Power Adapter into the AC socket, and the mating pigtail to the power connector for the D2000.

Figure 2

c. External Battery

If absolute portability is needed, an external battery (p/n RB-HC10R2T-MT5000, Figure 3) can be supplied. External batteries are generally supplied in a Blue Sky Network "Flyaway" kit (p/n GFKD2, Figure 5), in which the D2000 kit is enclosed within a pelican case- although they can be ordered as a stand-alone item if desired. A "Compact Smart Charger" (p/n CHUN-123-AS), Figure 4) is supplied within the Flyaway kit for the best possible charging functionality. (See the "D2000 Flyaway Kit Quick Guide" and "External Battery Care Guide" for more information)

Figure 3
D2000 External Battery
(RB-HC10R2T-MT5000)

Figure 4
D2000 Compact Smart Charger
(CHUN-123-AS)

Figure 5
D2000 Flyaway Kit
(GFKD2)

POWER-UP TEST

After the D2000 is installed or simply placed inside the vehicle with Power and Antenna connections properly secured (see picture below), a Power-Up Test (PUT) is strongly recommended. **BEFORE YOU START**, please make sure the unit has been activated and is registered in your SkyRouter user account.

Please follow the three steps below to ensure the unit is working correctly after installation:

1. Turn on the power switch on the back of the unit.

After turning the unit on, the D2000 shows a “Blue Sky Network” initialization text for about 30 seconds before stabilizing at the Main Menu screen, where it shows the Iridium (“I”) and GPS (“G”) signal strengths.

2. Check the satellite signal strength.

The D2000 “Menu” screen has the “I” and “G” (“i” and “g” for lesser signal strengths) lines to indicate Iridium and GPS signal strength, which can vary between 0 and 5 (it usually takes about 1 to 2 minutes to acquire all the satellite signal information). In a perfect scenario both connections would show 5 bars, but because each vehicle has its own configuration and antennas can be mounted in different ways, it is more common to achieve 3-5 bars (which is still good), unless the antenna has a perfect view of the sky (signal = 5) or completely obstructed by buildings (signal = 0), for example.

3. Confirm that the unit is sending reports

Once the D2000 unit is ON and signal strength is acceptable, the unit should start reporting after a minute or two. One way of confirming that the reports were sent is by accessing this information through Main Menu (>Status>Reports Sent). Bear in mind that even if the D2000 verifies that reports have been sent, this does not necessarily mean the reports reached the SkyRouter servers. To make sure that the reports have been received you should log into your account on SkyRouter.

If you are having problems with any of the steps above, make sure the power connection is reliable and the Antenna has a clear view of the sky. If problems persist, please contact our Technical Support at: support@blueskynetwork.com.

SERVICE ACTIVATION

The D2000 IRIDIUM SATELLITE PACKET DATA TERMINAL has no licensing requirements. Service Activation consists of the following steps:

1. Log onto the Blue Sky Network web site and review the Service Plan options available.

www.blueskynetwork.com

Phone: +1-858-551-3894
Fax: +1-858-225-0794

5333 Mission Center Rd. Suite 220
San Diego, CA 92108

2. Obtain and complete the Service Agreement form and choose a service plan to fit your needs. This information on the form is used to set up your account and complete the product activation. Once the information is completed and the payment options approved, the product activation can normally be completed in about an hour.
3. If you have questions, please do not hesitate to contact us by phone or email (support@blueskynetwork.com).

PRODUCT WARRANTY

PLEASE READ -- THIS DOCUMENT CONTAINS IMPORTANT NOTICES, WARRANTY INFORMATION AND LIMITATIONS ON YOUR RIGHTS

USE AND INSTALLATION

The D2000 is intended to be used and installed on vehicles or vessels. This Product should be installed by a professional and is intended to be handled and used solely in accordance to the most recent specifications and instruction guides distributed by Blue Sky Network, LLC ("Blue Sky"). NO SUBSTITUTION ALLOWED FROM RECOMMENDATIONS WITHOUT *Blue Sky Network LLC* PERMISSION, TO MAINTAIN EQUIPMENT WARRANTY.

FUNCTIONALITY

The functionality of this Product will, in significant part, depend on the service provider and the communications network used in conjunction with this Product. To the extent Blue Sky is also your service provider for this Product, then this Product is also subject to the terms and conditions of your service contract.

LIMITED WARRANTY

This Product consists of one basic component: D2000 Modem Unit (part #100340).

Blue Sky is the original equipment manufacturer for the modem unit. Blue Sky warrants that the Warranted Components shall be free from defects in materials for a period of six (6) months and workmanship for a period of twelve (12) months from the date this Product is delivered to the first end-user purchaser ("Purchaser") or the date this Product is first placed into satellite subscriber service, whichever occurs earlier. This warranty is not assignable or transferable by the Purchaser.

Blue Sky, at its option, shall at no charge to Purchaser either repair or replace Warranted Components that do not conform to this warranty, provided that the Warranted Components are returned in accordance with the instructions set out below and within the warranty period. These remedies are Purchaser's exclusive remedies under this warranty. Repair may include the replacement of parts with functionally equivalent reconditioned or new parts. Warranted Components that have been repaired or replaced are warranted for the balance of the original warranty period. All Warranted Components for which replacements have been provided shall become Blue Sky's property.

Blue Sky does not manufacture the antenna and therefore Blue Sky is not providing any warranty concerning this component. To the extent the manufacturer warrants the antenna and such warranty may be assigned and passed through to Purchaser, such warranty shall be assigned by Blue Sky and passed through to the Purchaser. The Purchaser must deal directly with, and Blue Sky accepts no responsibility regarding the actions of, the manufacturer of the antenna.

Blue Sky does not warrant any installation, maintenance, or service of this Product or any component thereof not performed by Blue Sky, which shall also charge handling fees for special repair cases where user mishandling of the Product applies.

Blue Sky is not responsible in any way for any damage to ancillary equipment or software which is attached to or used in connection with this Product, or for operation of this Product with any ancillary equipment or software, and all such equipment and software are expressly excluded from this warranty. Furthermore, Blue Sky is not responsible for any damage to this Product resulting from the use of ancillary equipment not furnished by Blue Sky for use with this Product.

BLUE SKY ASSUMES NO RESPONSIBILITY FOR PAYMENT OF ANY REPAIR SERVICES PERFORMED BY THIRD PARTIES INCLUDING REMOVAL OF THE UNIT FROM THE AIRCRAFT, INSPECTION, PACKAGING, HANDLING, OR INSTALLATION UNLESS SUCH SERVICES ARE AUTHORIZED IN ADVANCE AND IN WRITING BY BLUE SKY.

HOW TO GET WARRANTY SERVICE

Warranty service is available by contacting Blue Sky at the following telephone number (during business hours) or email address or by returning the Warranted Components to Blue Sky at the following address:

Blue Sky Network, LLC.
5333 Mission Center Rd. Suite 220
San Diego, CA 92108
Phone: +1-858 551-3894
E-mail: sales@blueskynetwork.com

Purchasers are advised to contact Blue Sky at the above telephone number or email address for a consultation prior to returning Warranted Components. All Product shipped to Blue Sky must be shipped with freight, duties, and insurance prepaid. Purchaser must include with the Product a bill of sale (or other comparable proof of purchase), the Purchaser's name, address and telephone number, the tail number and serial number of the aircraft on which the Product was installed and a detailed description of the problem. Warranted Components that are repaired or replaced under this limited warranty shall be shipped to Purchaser at the Purchaser's expense for the freight and insurance and at Purchaser's expense for any applicable duties or other expenses of shipment.

Blue Sky reserves the right to make changes, upgrades, and improvements to this product without incurring any obligation to install such changes, upgrades, and improvements in previously manufactured products.

ANY SERVICE WORK PERFORMED BY A PARTY OTHER THAN BLUE SKY OR BY A PARTY NOT OTHERWISE AUTHORIZED BY BLUE SKY SHALL IMMEDIATELY VOID THIS LIMITED WARRANTY.

Please contact Blue Sky if you have any questions regarding Blue Sky's limited warranty.

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