EQUIPMENT INSTALLATION MANUAL

For the

FreeFlight Systems

XPLORER ADS-B Receiver (P/N 87099-XX)

Document No: 87214 Revision A

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History of Revisions

Dates of Original and Change pages are:		
Revision ..... A …………… December 3. 2012		
Page Description	**Page no.**	**Date**

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SECTION I   GENERAL INFORMATION

1.1 INTRODUCTION

This document contains the system installation guidance for the FreeFlight Systems (FFS) XPLORER Automatic Dependent Surveillance – Broadcast (ADS-B) Receiver, part number 87099-xx hereafter referred to as XPLORER. XPLORER provides a robust yet low-cost solution for ADS-B In applications.

1.2 SYSTEM DESCRIPTION

1.2.1 General Description

XPLORER receives ADS-B messages from the national ADS-B ground station network and aircraft equipped with ADS-B Out Universal Access Transceiver (UAT) devices. The system forms the appropriate ADS-B reports from the received data and delivers these reports to compatible displays. The reports provided to the displays are in standard ADS-B data protocol.

Compatible displays can include both portable devices such as the iPad or "hard mounted", uncertified displays having a standard RS-232 communications port. If using a portable display, a compatible application, or "app", must be used in conjunction with the display device. If using an iPad, several apps are currently available including FreeFlight Systems' "ADS-B View" application which can be downloaded through Apple's iTunes service.

Connection between compatible displays and XPLORER is accomplished via a WiFi connection (for portable displays) or through an RS-232 connection (for "hard mounted" displays).

The reports that are available to be displayed include the full range of Flight Information Service - Broadcast (FIS-B) data including graphical NEXRAD images and text reports such as METARS and PIREPS. Traffic Information Service - Broadcast (TIS-B) data including location, altitude, and type of aircraft surrounding the ownship position is also available to suitably equipped aircraft. Please note that the display of TIS-B information requires the use of a certified ADS-B Out capability, making the ownship aircraft a verified client in the national air space system. System configuration actions required to provide this capability are described later in this manual (see Section III 2).

1.2.2 XPLORER CONFIGURATIONS

XPLORER is available in several configurations depending on the needs of the user. These configurations are shown in the table below.

Part Number	Display Interface	Internal GPS	RS-232 Maintenance Interface
87099-00	WiFi	No	No
87099-01	RS-232	No	Yes
87099-11	RS-232	Yes	Yes

1.2.3 Example Configurations

Figures 1, 2, and 3 show block diagrams of typical XPLORER installations and correspond to the configurations shown in the preceding table.

Figure 1 shows a BlueTooth GPS receiver connected to a portable display (e.g. iPad) and providing that GPS information to XPLORER. Figure 2 shows XPLORER connected to an uncertified cockpit display using RS-232. Figure 3 shows XPLORER with the external GPS option connected to an uncertified cockpit display using RS-232.
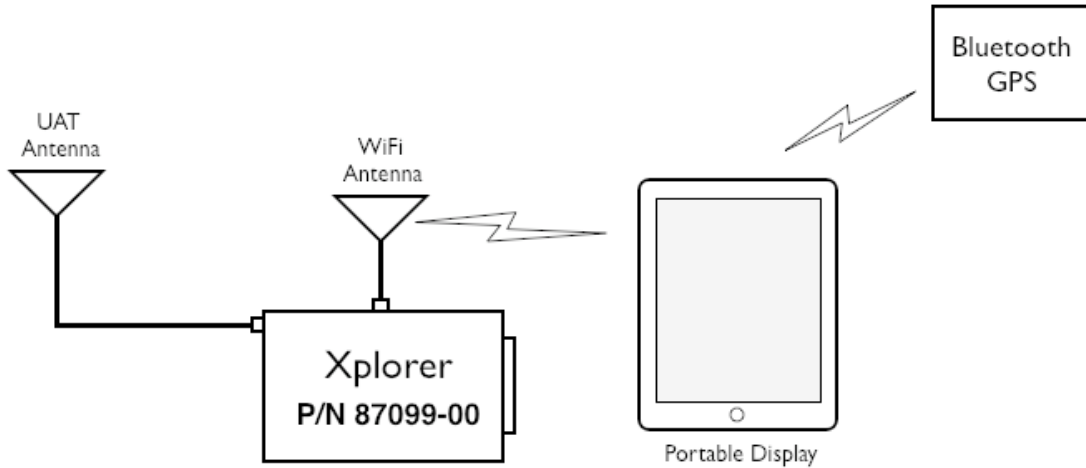
Figure 1: Typical XPLORER Installation with Display-connected GPS
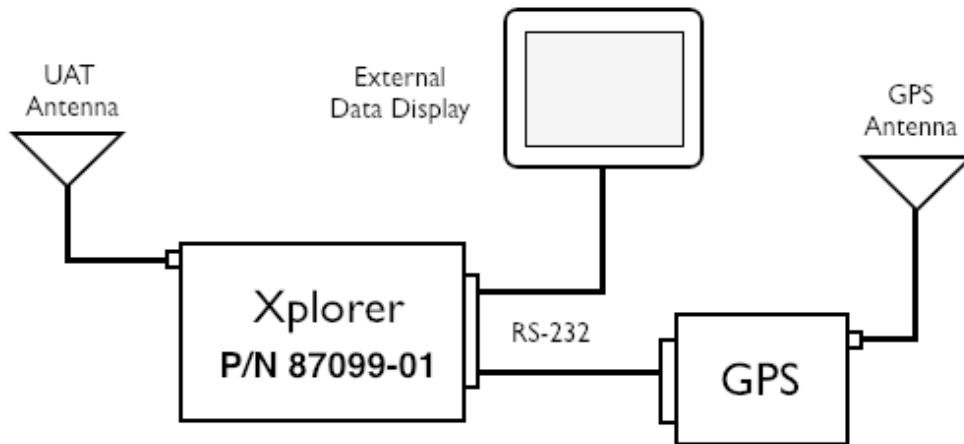
Figure 2: XPLORER with RS232-connected Uncertified Cockpit Display

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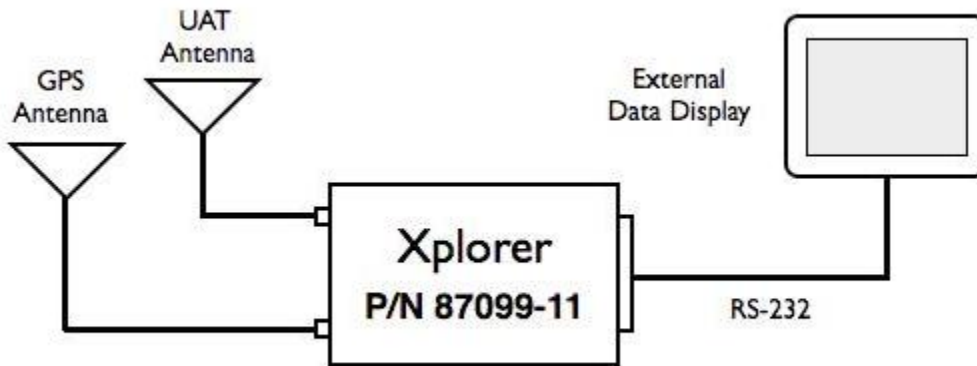
Figure 3: XPLORER with Uncertified Display and Internal GPS Unit

1.2.4 GPS Usage

XPLORER uses the Global Position System (GPS) for correlating the ownship position with the graphical weather and traffic information. Several options exist for using GPS with XPLORER. These options, along with the priority given to each should multiple GPS sources be available, are shown in the following table.

GPS Source		Priority
Internal GPS [1]	FFS 1201 (GPS-FFS Protocol)	1 (Highest)
	Other External RS-232 GPS Receiver (NMEA Protocol)	
Bluetooth GPS paired with portable display running compatible app (e.g. iPad running ADS-B View)		2
Automatic [2]		3

1) When using an XPLORER with internal GPS, do not connect external GPS.

2) Automatic determination of GPS is possible for those aircraft installations that include a certified UAT (978 MHz) ADS-B Out transmitter. In this case, the receiver monitors the ownship ADS-B Out transmissions and reads the ownship GPS information from those transmissions. This requires the aircraft ICAO code to be entered into the XPLORER system. This can be accomplished through the use of the Maintenance Interface described later in this manual.

1.3 XPLORER INSTALLATION OVERVIEW

Figure 4: XPLORER Receiver with WiFi Option

1.3.1 Connectors

Connectors present on XPLORER are shown in the following table.

Configuration		Connectors			
		Signal / Power (DB-15)	UAT Antenna (SMA)	GPS Antenna (SMA)	WiFi Antenna (SMA)
PN 87099-00	WiFi	✓	✓		✓
PN 87099-01	RS-232	✓	✓		
PN 87099-11	RS-232 with Internal GPS	✓	✓	✓	

1.3.2 Status Lights

Three system status LEDs and three Wi-Fi status LEDs are present on the front face of the XPLORER.   These indicators are described below:
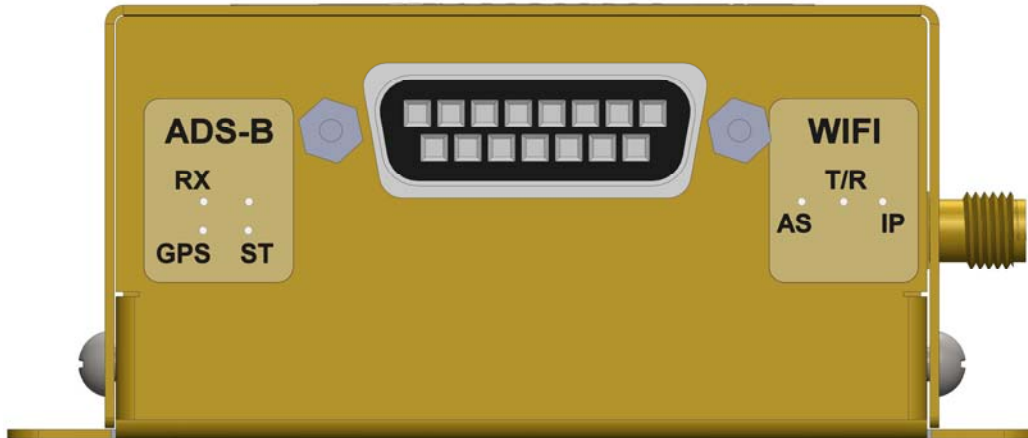
Figure 5: XPLORER Front Face

A. Status LEDs

Three status LEDs (RX, GPS, ST) indicate the operational status of the XPLORER.

B. Wi-Fi Status LEDs

Three status LEDs (AS, T/R, IP) indicate the operational status of the XPLORER WiFi Interface.

1.4 UAT ANTENNA REQUIREMENTS

The XPLORER requires a TSO-C66, C74, C112, or C154 UHF antenna. Ensure that the antenna is a 50Ω antenna with a VSWR < 1.7:1 at 978 MHz. The Comant CI-101 and RA Miller AV-22 stick-and-ball antennas and the Comant CI-105 blade antenna are examples that meet these requirements. The installation kits available from FreeFlight Systems contain suitable stick-and-ball UAT antennas.

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1.5 Technical Characteristics

XPLORER Receiver (P/N 87099-XX)		
TSO COMPLIANCE		Uncertified
FCC IDENTIFICATION (WI-FI UNIT)		T9JRN171-1
PHYSICAL DIMENSIONS		
Height		1.4 in (35.61 mm)
Width		3.3 in (83.82 mm)
Depth		4.69 in (119.14 mm)
WEIGHT		4.5 oz (127.5 gm)
OPERATING TEMPERATURE		-40°C to +70°C
STORAGE TEMPERATURE		-55°C to +85°C
ALTITUDE		50,000 feet
POWER REQUIREMENTS		10 – 37 Volts DC, Typical 0.1 A @ 28 VDC
RECEIVER FREQUENCY		978 MHz
RECEIVER SENSITIVITY		<-93 dBm at the antenna
Avionics Interfaces: TYPE	I/O	Description
GPS	Input/ Output	External or internal GPS
Pulse Per Second (PPS)	Input / Output	PPS time mark from external or internal GPS
Display	Output	WiFi or RS-232

1.6 PARTS AND EQUIPMENT

1.6.1 XPLORER Receiver Items

XPLORER part numbers are listed below:

Part Number	Description
87099-00	XPLORER with WIFI
87099-01	XPLORER with RS-232
87099-11	XPLORER with RS-232 and Internal GPS

1.6.2 Installation Kits

The items included in the XPLORER Installation Kit for XPLORER versions without GPS (XPLORER 87099-00 & 87099-01) are listed below:

XPLORER Installation Kit 87231-00		
P/N	Qty	Description
87093	1	Connector DSUB 15 Crimp Female
87229	1	Backshell DSUB 15
84194	17	Socket, Crimp, Female DSUB
85937	1	Ball and Stick Type UAT Antenna
87027	1	Connector SMA Straight Plug Male RG-142 Crimp
86966	1	RG-142 BNC Male Crimp Connector

The items included in the XPLORER Installation Kit for XPLORER with GPS (XPLORER 87099-11) are listed below:

XPLORER Installation Kit 87231-10		
P/N	Qty	Description
87093	1	Connector DSUB 15 Crimp Female
87229	1	Backshell DSUB 15
84194	17	Socket, Crimp, Female DSUB
85937	1	Ball and Stick Type UAT Antenna
87027	2	Conn SMA Straight Plug Male RG-142 Crimp
86966	1	RG-142 BNC Male Crimp Connector
81194	1	Antenna GPS, Active, 40dB-, 1575.42 MHz
84104	1	Plug, Dual Crimp, TNC, Sealed, RG-142

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1.7 MATERIALS REQUIRED BUT NOT SUPPLIED

1.7.1 Required

The following items are required for proper installation but not supplied:

- For WiFi version of XPLORER (PN 87099-00), a portable display with compatible application (e.g. iPad with the ADS-B View app)

- For RS-232 version of XPLORER (PN 87099-01 or -11), a Maintenance Interface Adapter Assembly, diagrams for which are provided in Section VII.

- Wire and shielded wire (24 AWG)

- 2 Amp Circuit Breaker

- Ground terminals

1.7.2 Optional

For WiFi version of XPLORER (PN 87099-00), a Bluetooth-compatible GPS paired to a portable display along with a compatible display application (e.g. iPad with the ADS-B View app)

SECTION II   INSTALLATION

2.1 GENERAL

This section provides general information for installing the XPLORER into an aircraft. This section contains mounting dimensions, pin outs, and interface details pertaining to installation. Adherence to these installation procedures and information will assure satisfactory system performance.

2.2 UNPACKING AND INSPECTING EQUIPMENT

Exercise care when unpacking each item. Visually inspect each item for evidence of damage incurred during shipment. If a damage claim must be filed, save the shipping container to substantiate the claim. When all equipment and the installation kit have been inspected, save the packing material and container in case the unit is to be stored or reshipped. See Section I for equipment and optional parts supplied.

2.3 EQUIPMENT MOUNTING

2.3.1 XPLORER Mounting

If connecting to the display via WiFi, XPLORER should be mounted as close as possible to the display (ideally in the main cabin) to maximize data transfer capability.

The following installation procedure should be followed, remembering to allow adequate space for installation of cables and connectors.

- Select a position in the aircraft that is not close to any high external heat source. (Note: XPLORER is not a significant heat source itself).

- Avoid sharp cable bends and placing cables too near to aircraft control cables.

- Secure XPLORER on a flat surface according to the XPLORER mounting requirements illustrated in Section V.

2.4 COOLING REQUIREMENTS

XPLORER does not require forced air cooling. While the unit does not require forced air cooling, the combined heat load of surrounding avionics may significantly degrade the system's reliability if provisions for cooling are not incorporated in the initial installation. Failure to provide adequate cooling may lead to increased avionics maintenance costs and may void the FreeFlight Systems Warranty.

2.5 XPLORER ELECTRICAL CONNECTIONS

2.5.1 XPLORER INTERFACE – PINOUT

J6 - Power and I/O Connector (DB-15)				
PIN	SIGNAL	Electrical	I/O	Description
1	PPS IO -	RS-422	I/O	Internal/External GPS Pulse Per Second Out/In
2	Reserved	N/A	-	N/A
3	232 RxD2	RS-232	I	Serial Port 2 RS-232 Data In
4	Reserved	N/A	-	N/A
5	232 TxD1	RS-232	O	Serial Port 1 RS-232 GPS Data Out
6	232 TxD5	RS-232	O	Serial Port 5 RS-232 Data Out (Maintenance Port)
7	GND	Ground	Gnd	Aircraft Power Return
8	Vin	10-37 VDC	Pwr	Aircraft Power Input
9	PPS IO +	RS-422	I/O	Internal/External GPS Pulse Per Second Out/In
10	Reserved	N/A	-	N/A
11	232 TxD2	RS-232	O	Serial Port 2 RS-232 Data Out
12	232 RxD1	RS-232	I	Serial Port 1 RS-232 GPS Data In
13	232 RxD5	RS-232	I	Serial Port 5 RS-232 Data In (Maintenance Port)
14	Reserved	N/A	-	N/A
15	GND	Ground	Gnd	Aircraft Power Return

2.6 XPLORER INTERFACE DETAILS

2.6.1 Power Input

Aircraft power is provided to the XPLORER through the J6 Power and I/O connector. The power supply input can be 10 – 37Volts DC. Use a 2 Amp circuit breaker for power supply protection. Power input resides on the following pins:

POWER INPUT				
PIN	SIGNAL	ELECTRICAL	I/O	DESCRIPTION
J6-8	Vin	10-37 VDC	Pwr	Aircraft Power Input
J6-7	RTRN	Ground	Gnd	Aircraft Power Return
J6-15	RTRN	Ground	Gnd	Aircraft Power Return

2.6.2 Serial Interfaces (RS-232 Version Only)

There are a total of three physical serial interfaces available on the RS-232 version of XPLORER. The pin outs of these three interfaces can be found in the following table:

RS-232 SERIAL PORTS				
Port	PIN	SIGNAL	I/O	DESCRIPTION
1	J6-12	232 RxD1	I	Serial Port 1 Data In
	J6-5	232 TxD1	O	Serial Port 1 Data Out
2	J6-3	232 RxD2	I	Serial Port 2 Data In
	J6-11	232 TxD2	O	Serial Port 2 Data Out
5	J6-13	232 RxD5	I	Serial Port 5 Data In
	J6-6	232 TxD5	O	Serial Port 5 Data Out

Of these three physical interfaces, two are available for connecting to two different functional interfaces:

Functional Interface	Serial Interface	Comment
GPS Input / Out	Serial Port 1	FreeFlight TSIP protocol GPS or NMEA compatible GPS
Display	Serial Port 2	TIS-B / FIS-B

The remaining serial interface, Serial Port 5, is the ASCII Maintenance interface terminal connection and is not reconfigurable. (Serial Ports 3 and 4 are reserved for internal system usage and are not accessible.)

For the serial version of the XPLORER (PN 87099-01 or -11), these interfaces can be configured by using the ASCII Maintenance Interface to enter Configuration Mode of the XPLORER. This is described in more detail later in this Installation Manual.

2.6.3 Time Mark Input (PPS)

The Time Mark Input is an RS-422 differential pair for the one pulse-per-second (PPS) input from a GPS like the FFS 1201. The Time Mark input pin connections are as follows:

Time Mark Input			
PIN	SIGNAL	I/O	DESCRIPTION
J6-9	PPS IO +	I/O	Internal/External GPS Pulse Per Second Out/In +
J6-1	PPS IO -	I/O	Internal/External GPS Pulse Per Second Out/In -

Note: The Time Mark input must be synchronized to UTC.

2.6.4 Maintenance Interface (RS-232 Version Only)

The Maintenance Interface is available in the serial-only version of XPLORER (PN 87099-01 or -11). This interface is used to communicate between XPLORER and a Personal Computer (PC) using the Port 5 RS-232 interface. The Maintenance Interface can be used to configure the system, provide additional status information, and update system software. An RS-232 to USB adapter assembly will be required and is described in Section VII.

2.6.5 Status LEDs

Seven external LEDs on the front of the enclosure indicate system status to the installer. The LED locations and functions are shown on the systems' label attached to the unit. The following

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table describes the LED states that can be observed on the WiFi version of XPLORER. Only ST, GPS and RX LEDs are available on the RS-232 XPLORER.

STATUS TYPE	NAME	"ON" COLOR	STATE	DESCRIPTION
System Status	ST	RED	ON	UAT failure. Troubleshoot system.
			OFF	UAT is operating normally.
GPS Status	GPS	GREEN	FLASHING	GPS is acquiring satellites and determining position.
			ON	GPS has acquired satellites and is operating normally.
			OFF	No GPS data (This LED will remain OFF if no GPS is attached)
Receive	RX	GREEN	BLINK ON	Blinks ON when ADS-B data is received
			OFF	No UAT receptions
Wi-Fi Network Association	AS	RED	BLINK FAST	Not Associated with a Network
			BLINK SLOW	Associated with a Network / No Access
			OFF	Associated with a Network / Access
Wi-Fi Data Transmit	T/R	AMBER	BLINK ON	Blinks ON when Wi-Fi Data is transmitted or received
			OFF	No Wi-Fi data transmissions
Wi-Fi Device Connectivity	IP	GREEN	BLINK FAST	IP Address associated
			BLINK SLOW	IP Address OK
			ON	Connected to an IP Address

2.7 UAT ANTENNA INSTALLATION

The UAT antenna should be installed according to the manufacturer's instructions.

Selecting appropriate UAT antenna locations is critical to the proper performance of the XPLORER. The following considerations should be taken into account when selecting the Antenna location.

- The antennas should be well removed from any projections, the engine(s) and propeller(s). It should also be well removed from landing gear doors, access doors or others openings which will break the ground plane for the antenna.

- The antenna should be mounted on the bottom or top surface of the aircraft and in a vertical position when the aircraft is in level flight.

- Avoid mounting the antenna within 3 feet of the ADF sense antenna or any COMM antenna, and 6 feet from transponder, DME and UAT transmit antennas.

- Where practical, plan the antenna location to keep the cable lengths as short as possible and avoid sharp bends in the cable to minimize VSWR.

- Electrical connection to the antenna should be protected to avoid loss of efficiency as a result of the presence of liquids or moisture. All antenna feeders should be installed in such a way that a minimum of RF energy is radiated inside the aircraft.

2.7.1 UAT Antenna Ground Plane

When a conventional aircraft monopole antenna is used it relies on a ground plane for correct operation. For ideal performance the ground plane should be very large compared to the wavelength of the transmission, which is ~12in. In a metal skinned aircraft this is usually easy to accomplish, but is more difficult in a composite or fabric skinned aircraft. In these cases a metallic ground plane should be fabricated and fitted under the antenna.

The ground plane must be al least 30.5 in on each side.

The thickness of the material used to construct the ground plane is not critical, providing it is sufficiently conductive. A variety of proprietary mesh and grid solutions are available.

2.7.2 UAT Antenna Cable

The XPLORER installation cable length and associated loss should be minimized to obtain maximum receiver sensitivity performance. The loss should be limited to 4dB or less.

Allowing 0.25dB loss for the connector at each end of the antenna cable assembly leaves an allowance of 3.5 dB loss for the cable itself.

An acceptable cable has:

- A maximum of 3.5dB loss for the run length of the cable

- A characteristic impedance of 50 Ohms

- Double braid screens or foil-and-braid screen

Once the cable run length is determined, a cable type with the proper attenuation (loss) per foot that meets the above requirements can be chosen. Longer runs require lower loss cable. Consider moving the XPLORER closer to the antenna to minimize the losses in the antenna cable subject to the limits identified above.

The following table is a guide to the minimum and maximum usable lengths of some common cable types. Actual cable loss varies between manufacturers and the table is based on typical data. Use the table as a guide only and refer to the manufacturer's data sheet for the specific cable chosen to calculate maximum length.

CABLE	ATTENUATION (dB/100 ft @ 1 GHz)	MAX LENGTH (ft)
RG-174	27.1	12.9
RG-316	25.8	13.6
RG-400	14.5	24.1
RG-142	12.8	27.3
RG-393	7.5	46.7

When routing the cable, ensure the following:

- Route the cable away from sources of heat.

- Route the cable away from potential interference sources such as ignition wiring, 400Hz generators, fluorescent lighting, and electric motors.

- Allow a minimum separation of 12 inches (300mm) from an ADF antenna cable.

- Keep the cable run as short as possible.

- Avoid routing the cable around tight bends.

- Avoid kinking the cable even temporarily during installation.

- Secure the cable so that it cannot interfere with other systems.

2.8 EQUIPMENT LIMITATIONS

The XPLORER is an uncertified (non-TSO) ADS-B receiver and cannot be used for flight-critical operations. It is for reference only.

The internal GPS of XPLORER (if so equipped) is an uncertified (non-TSO) GPS receiver and cannot be used for flight-critical operations. It is for reference only.

The antenna installation must comply with the specifications in Section 2.7.

SECTION III   CONFIGURATION AND CHECKOUT

3.1 GENERAL

This section contains installation configuration, checkout, and basic operating procedures.

3.2 ENABLING TRAFFIC OUTPUT (TIS-B)

XPLORER is capable a providing both FIS-B and TIS-B (traffic) data to a display. FIS-B data is provided by default. However, due to the manner by which the TIS-B data is managed by the ADS-B ground infrastructure, it is necessary that the aircraft receiving and displaying the TIS-B data demonstrate that it is a current and valid client in the air space system. This is accomplished by having a certified ADS-B Out system operating on the ownship.

As delivered, XPLORER has TIS-B data transmission to the display turned off. To turn on TIS-B data transmission, XPLORER must be "TIS-B activated". The first step in activating an XPLORER for TIS-B data transmission is to obtain a key from FreeFlight Systems which is specific to the XPLORER serial number. Please go to **www.freeflightsystems.com/xplorer** or contact FreeFlight Systems at the telephone number located on the last page of this manual for additional information on obtaining the key.

The method used for entering the key is dependent upon which version of XPLORER is being activated, either WiFi or RS-232.

For the WiFi version of XPLORER, activating TIS-B is accomplished by entering the key using a compatible application. Please reference the Xplorer support page at **www.freeflightsystems.com/xplorer** for additional information and the download link for the key installation software.

For the RS-232 version of XPLORER, the key is entered by using the Maintenance Interface. Please reference Section 3.4 below for information on how to set the key.

3.3 PRELIMINARY CHECKOUT

Before the unit is installed and tested, verify that all cables are properly secured. With the XPLORER removed, turn on the power and verify the following:

1. Verify that aircraft DC bus voltage is present on pin 8 of P6

2. Verify that ground is present on pin 7 of P6.

3. Verify that the UAT antenna coax center conductors are not shorted to its shield or aircraft ground.

When the above conditions are verified, turn off the master power. Properly attach the external connectors to the XPLORER. During initialization the XPLORER unit performs a comprehensive diagnostics test on several internal functions such as power, memory, serial interfaces, and GPS. A failure of a system component will be annunciated by the XPLORER System Status LED.

3.4 SETUP AND CONFIGURATION (RS-232 VERSION ONLY)

In order to setup the XPLORER (PN 87099-01 or -11) for an external serial-connected uncertified display, the maintenance port (serial port 5) must be connected to a computer running a terminal interface program such as "Tera Term". Please reference Section VII for a description of the interface adapter to be used to access the Maintenance Interface.

The serial port settings for the terminal program are:

- BAUD Rate 115200

- Parity – None

- Data bits - 8

- Stop - 1

- Flow Control – None

The terminal setup should be set to:

- Local Echo – checked

Once connected to the Maintenance Interface and connected to the appropriate detected COM number type the <Enter> key. The following prompt should be displayed:

```
XPLORER-RX>
```

3.4.1 Maintenance Commands

The available commands are summarized in the table below:

Command	Description
bit	Display built-in test status
comm	Display communication ports' status - continuous
cnfg	Display configuration data
help or ?	Display command help
info	Display info – S/N, operation hours, versions, etc.
Reset	Reset and restart the unit
rx status	Display receiver status info – continuous
set <item> <value>	Set a configuration item's value
stop	Stop continuous data outputs

3.4.1.1 "help or ?" Command

This command displays a list of available commands as shown below:

```
AVAILABLE COMMADS.....
bit                     Display POST and PBIT status
comm                    Display communication ports' status
cnfg                    Display all configuration data
help or ?               This help
info                    Display SN, operation hours, versions, etc.
Reset                   Reset the UAT
rx status               Display receiver status info
set <item> <opt>        Set configuration <item> to <opt>
    <item> ------------ ?, addr, call sign, serial in, serial out
    <opt> ------------- <item> options, enter '?' for usage
```

3.4.1.2 "bit" Command

This command displays built-in-test information about the health of the XPLORER. Example output is displayed below:

```
Temperature= 38.63 °C
External Power= 12.48 V
Internal Power= 4.95 V
IC Power= 3.30 V

POST ==> PASS
 RAM Verify....... P   SDRAM Verify..... P   Temp Sensor ..... P
 UART1 Loopback... P   UART2 Loopback... P

PBIT ==> PASS
 Valid Address.... F   Temperature...... P   Input DC Power... P
 GPS Data Good.... F   GPS PPS Good..... F   GPS Comm Good.... F
```

3.4.1.3 "comm" Command

This command continually displays serial port communication status information: enabled/disabled status and receive and transmit byte count and errors. The data is updated once per second. Example output is displayed below:

```
Serial Comm:
Port   Status    Baud(Set/Act)    Rx Bytes   Tx Bytes   RxErr   Tx Err
-----------------------------------------------------------------------
 1     DISABLED  115200/116071          2          2       0        0
 2     DISABLED  115200/116071          2          2       0        0
 5     ENABLED   115200/115205         62      15220       0        0
```

Type the "**stop**" command to stop updating and return to the prompt.

3.4.1.4 "cnfg" Command

This command displays configurable information such as the serial port settings (protocol and baud rate), the ICAO address, and the VFR Call Sign. Example output is displayed below:

```
ICAO Address.............. 0
 VFR Call Sign.............
 Serial In 1............... NOT USED, 9600
 Serial In 2............... NOT USED, 9600
 Serial Out 1.............. NOT USED, 9600
 Serial Out 2.............. NOT USED, 9600
```

3.4.1.5 "info" Command

This command displays information such as Serial Number, operation time and hardware and software version information about the XPLORER. Example output is displayed below:

```
Xplorer-RX, External GPS, Serial, FIS
    Serial Number........ xxxxxxxx
    Operation Time....... 204.2 hrs
    HW Version........... 6.0
    SW Version........... 1.1
    SW Checksum.......... 0x17D7
    FPGA Version......... 1.0
    FPGA Build ID........ 0x9A226D97
```

3.4.1.6 "Reset" Command

This command causes the XPLORER to reboot and restart.

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3.4.1.7 "rx status" Command

This command displays detailed status and other information about the ADS-B data being received by the XPLORER. Example output is displayed below:

```
.UTC Sec:            5128
 Rx Loop Count: 438379898
 Rx Word Count:    158208

 Msgs Rxd:    Total    LstSec  RSErr:1     2     3     4     5     6    >6    Ovr
 ------------------------------------------------------------------------------
    Uplink      291         4     136       9     0     1     0     0     0     0
    Basic      2496         1       0       0     1     0     0     0     0     0
    Long       2442         0       0       0     0     0     0     1     1     0

 Traffic Targets:     1
   #    Addr Typ CallSign      Latitude    Longitude    Alt   Spd AG    Msgs  SSI TO
 ------------------------------------------------------------------------------
 OWN  11111 ABi            0.00000°N   0.00000°E  -1000     0  G       0    0  0s
   1 FAA123 ABi ABCD1234  32.91796°N  96.98608°E    300     4  A    4937  -42 19s
   2
   3
   4
   5
   6
   7
   8
   9
  10


 Ground Stations:     2
   #     Latitude    Longitude Site Slot    Msgs SSI TO
 ------------------------------------------------------------------------------
   1   32.91137°N  97.05956°W    3   29    2557 -79 19s
   2   32.56099°N  96.97190°W   12   25    7665 -92 19s
   3   32.91169°N  97.01575°W    2   29      46 -77 11s
   4
   5
   6
   7
   8
   9
  10
```

The output displayed contains an initial section with general count information (current UTC second, receiver loop count, and receiver word count). These counts will increment at varying rates when the receiver is operating correctly.

The next rx status output section displays general message count information for ground Uplink, basic, and long message types. The displayed counts include total messages received (Total), messages received in the last second (LstSec) and messages with various counts of corrected Reed-Solomon errors (RSErr:x).

The third rx status section displays detailed traffic information. This information includes total number of traffic targets being tracked and then detailed information about the ownship data being received and the 10 closest traffic targets. The detailed traffic information includes address (Addr), address type (Typ), call sign, Latitude, Longitude, altitude in feet (Alt), speed in knots (Spd), air ground status (AG), message count (msgs), signal strength indication in dbm (SSI), and traffic time out in seconds (TO).

Note that traffic targets will time out being tracked if no ADS-B message is received from the target for more than twenty seconds.

The fourth rx status section displays detailed ground station information. This information includes total number of ground stations being received and detailed information about the 10 closest ground stations. The detailed ground station information includes Latitude, Longitude, Site ID, time slot of last transmission, message count (Msgs), signal strength indication in dbm (SSI), and ground station time out in seconds (TO). Note that ground stations will time out being tracked if no ADS-B uplink message is received from the ground station for more than twenty seconds.

Type the "**stop**" command to stop updating rx status and return to the prompt.

3.4.1.8 "set" Command

This command is used to modify configuration settings such as ICAO address, call sign, and serial port function. Help on this command is displayed by entering "**set ?**". Example "**set ?**" output is displayed below

```
USAGE: set <item>

<item>       Configuration item to set. Item options:
 ?                            This help
 addr <hex>                   ICAO address (8 hex characters)
 call sign <chars>            VFR default call sign (8 characters)
 serial in <port> <func> <baud>   Serial in port protocol and baud rate
 serial out <port> <func> <baud>  Serial out port protocol and baud rate
```

3.4.1.8.1 "set addr" Command

This command is used to set the ICAO address of the aircraft. For example, to set the ICAO address to AAA123, enter "**set addr AAA123**". The ICAO address must be entered as a hex value. *The XPLORER requires the ICAO to be set and for there to be an active, certified ADS-B Out UAT device on-board in order to process TIS-B data.* If the XPLORER receives UAT ADS-B messages from the set ICAO address it will output TIS-B information on the serial port.

3.4.1.8.2 "set call sign" Command

This command sets the call sign of the aircraft. For example, to set the call sign to ABCD1234, enter "**set call sign ABCD1234**". The call sign is only set for informational purposes.

3.4.1.8.3 "set serial in" Command

This command sets the Serial Port Input configuration options. Help on this command is displayed by entering "**set serial in ?**". Example "**set serial in ?**" output is displayed below:

```
USAGE: set serial in <port> <func> <baud>
  <port>     Serial port number:  1, 2,

  <func>     Interface function/protocol:
             Port 1:
                 UNUSED, GPS-FFS, GPS-NEMA, Internal-GPS,
             Port 2:
```

```
   <baud>     4800, 9600, 19200, 38400, 57600, 115200, 230400,
```

Note that only serial port 1 accepts serial port input configuration settings.

For example, to set serial port 1 to FFS GPS input at 19200 BAUD, enter "**set serial in 1 GPS-FFS 19200**". Below is an example of the output displayed after entering this command:

```
 Serial In 1.............. GPS-FFS, 19200
```

3.4.1.8.4 *"set serial out" Command*

This command sets the Serial Port Output configuration options. Help on this command is displayed by entering "**set serial out ?**". Example "**set serial out ?**" output is displayed below:

```
USAGE: set serial out <port> <func> <baud>

  <port>     Serial port number:  1, 2,

  <func>     Interface function/protocol:
             Port 1:
             Port 2:
                UNUSED, Traffic-Alert, Pass-Thru,

  <baud>     4800, 9600, 19200, 38400, 57600, 115200, 230400,
```

Note that only serial port 2 accepts serial port output configuration settings.

For example, to set serial port 2 to Pass Thru output at 115200 BAUD, enter "**set serial out 2 Pass-Thru 115200**". Below is an example of the output displayed after entering this command:

```
 Serial Out 2.............. Pass Thru, 115200
```

SECTION IV   TROUBLESHOOTING

This section provides information for troubleshooting problems that occur after XPLORER installation. This section contains information on how to use the XPLORER LEDs to troubleshoot installation problems. Refer to SECTION III for configuration of the system.

4.1 XPLORER LED TROUBLSHOOTING PROCEDURE

A quick reference troubleshooting guide using the XPLORER LEDs follows:
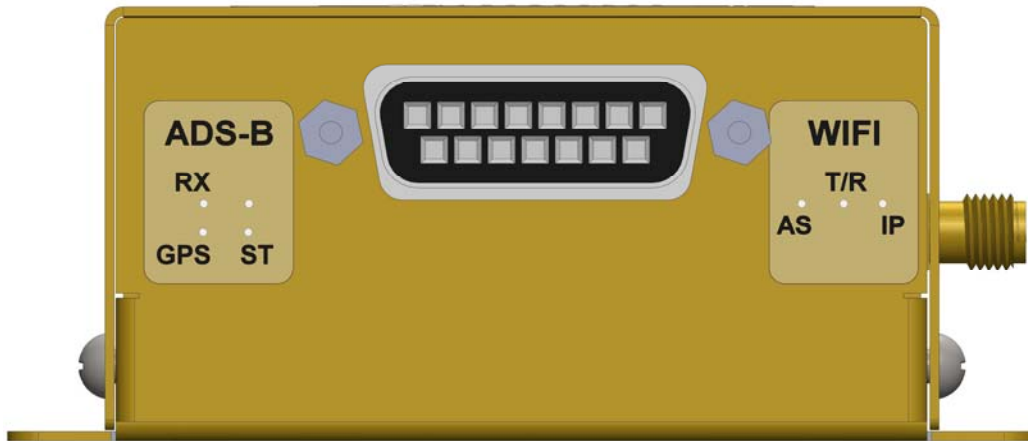
PROBLEM	POTENTIAL CAUSE	TROUBLESHOOTING
No LED Activity	No power	Verify power is turned on Check power connections to unit.
RX LED not active	Not receiving ADS-B messages	If in an area able to receive ADS-B messages: Check antenna connections
ST LED is on	A fault with the unit	Cycle Power
GPS LED is flashing slowly	GPS is acquiring satellites	Check GPS for problems
GPS LED is off	GPS information is not received	For systems configured with GPS, check GPS connection/configuration. Check GPS for fault.

Please reference Section 2.6.2 for additional information on LED indications.

SECTION V   INSTALLATION DRAWINGS

5.1 XPLORER RECEIVER DIMENSIONS
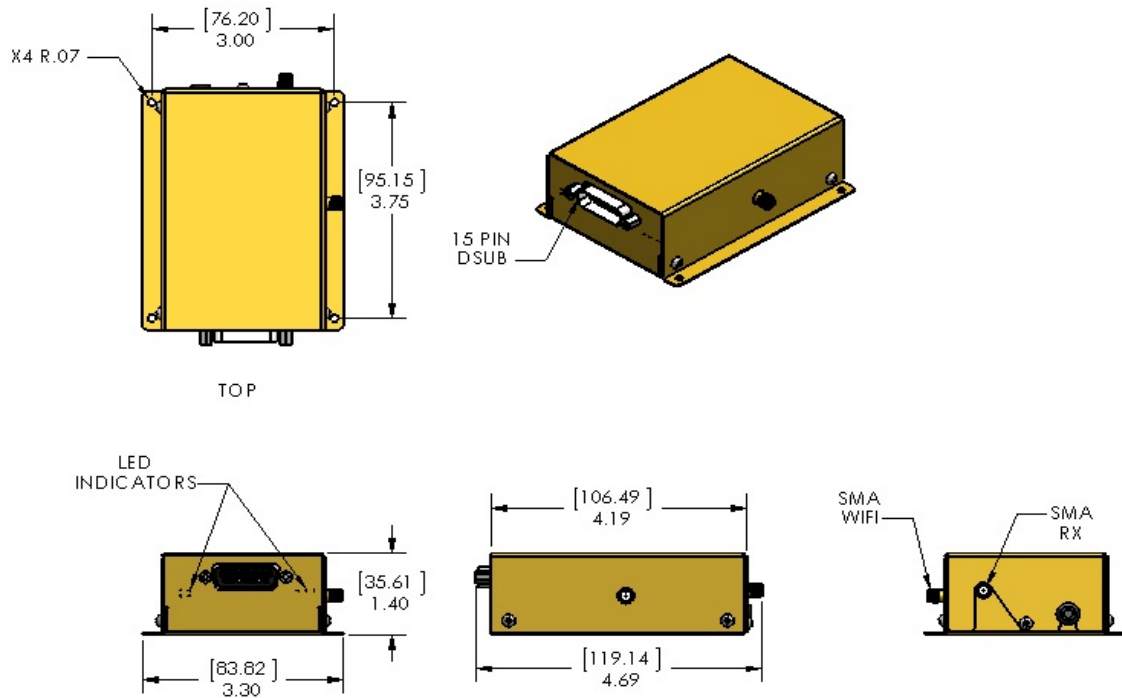
All dimensions in inches [millimeters]

Figure 6: XPLORER Dimensions

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SECTION VI   TYPICAL INTERCONNECT DIAGRAMS

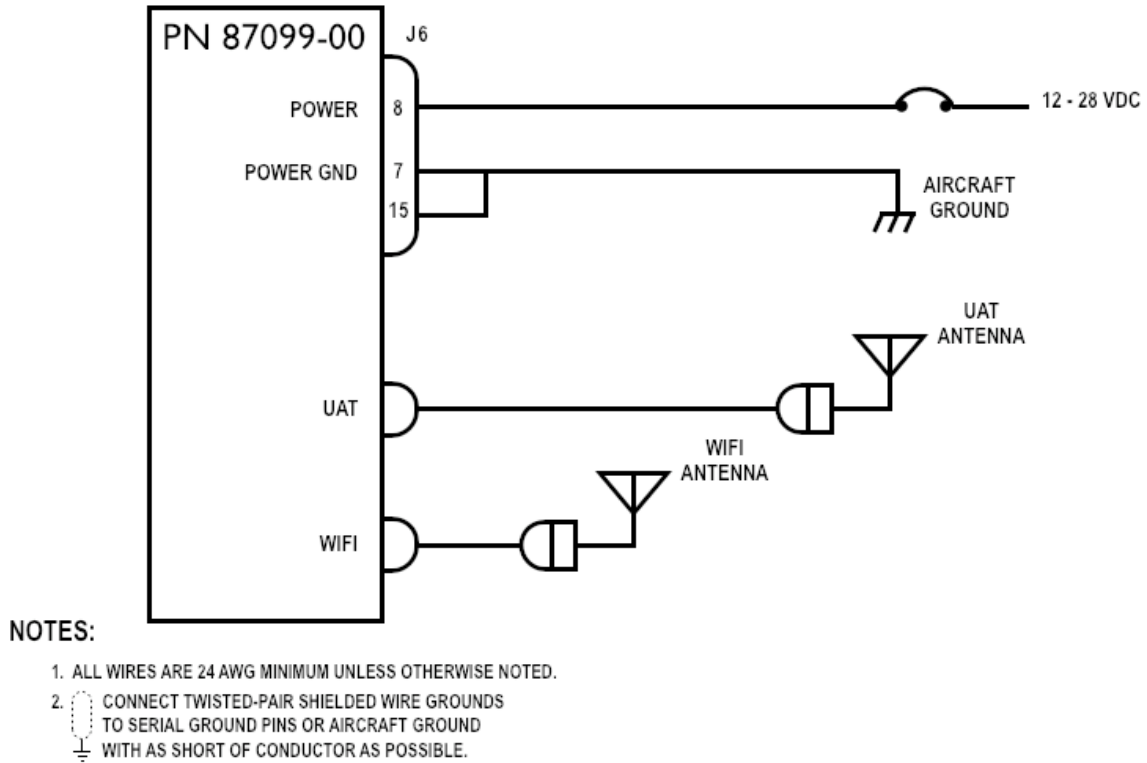## 6.1 XPLORER INTERCONNECT WITH WI-FI ONLY

Figure 7: XPLORER Interconnection Diagram – WiFi

## 6.2 XPLORER INTERCONNECT WITH RS-232 AND EXTERNAL GPS

Figure 8: XPLORER Interconnect Diagram - RS-232 with External GPS

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6.2.1   XPLORER INTERCONNECT WITH RS-232 AND INTERNAL GPS
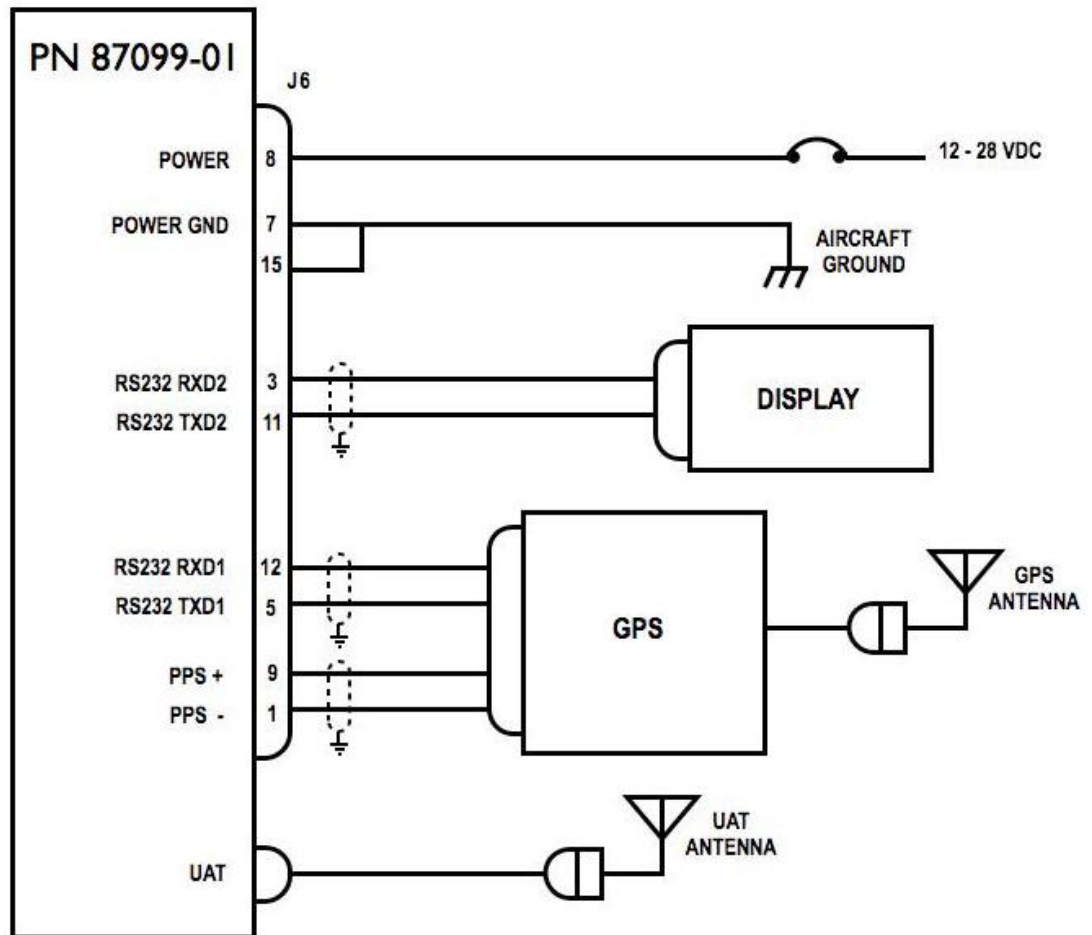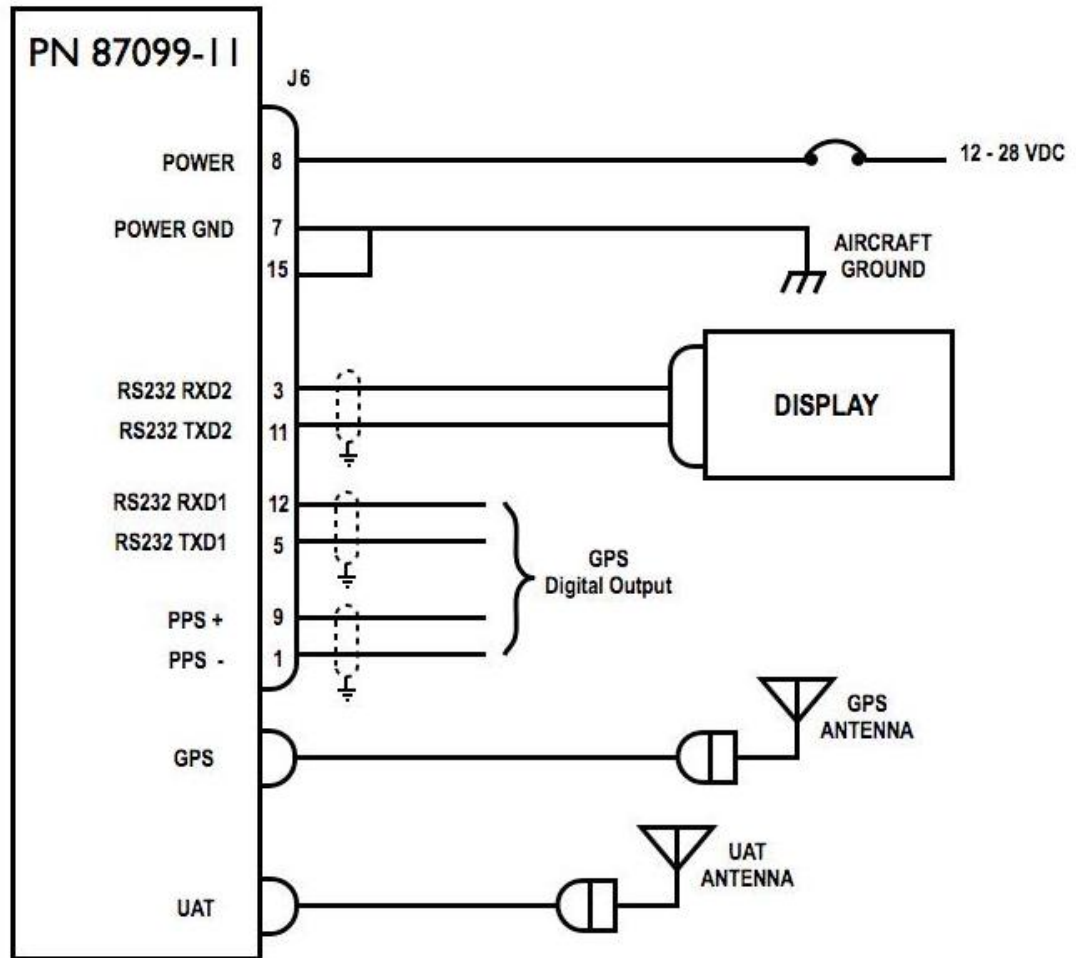
NOTES:

1. ALL WIRES ARE 24 AWG MINIMUM UNLESS OTHERWISE NOTED.
2. CONNECT TWISTED-PAIR SHIELDED WIRE GROUNDS TO SERIAL GROUND PINS OR AIRCRAFT GROUND WITH AS SHORT OF CONDUCTOR AS POSSIBLE.

Figure 9: XPLORER Interconnect Diagram - RS-232 with Internal GPS

SECTION VII XPLORER (RS-232 VERSION ONLY) MAINTENANCE ADAPTER

An adapter harness is required in order to connect the RS-232 version of XPLORER ((PN 87099-01 or -11) to a Personal Computer (PC) for the purpose of configuring the system with a terminal program such as Terra Term. Interconnect diagrams of the adapter harness are shown below.
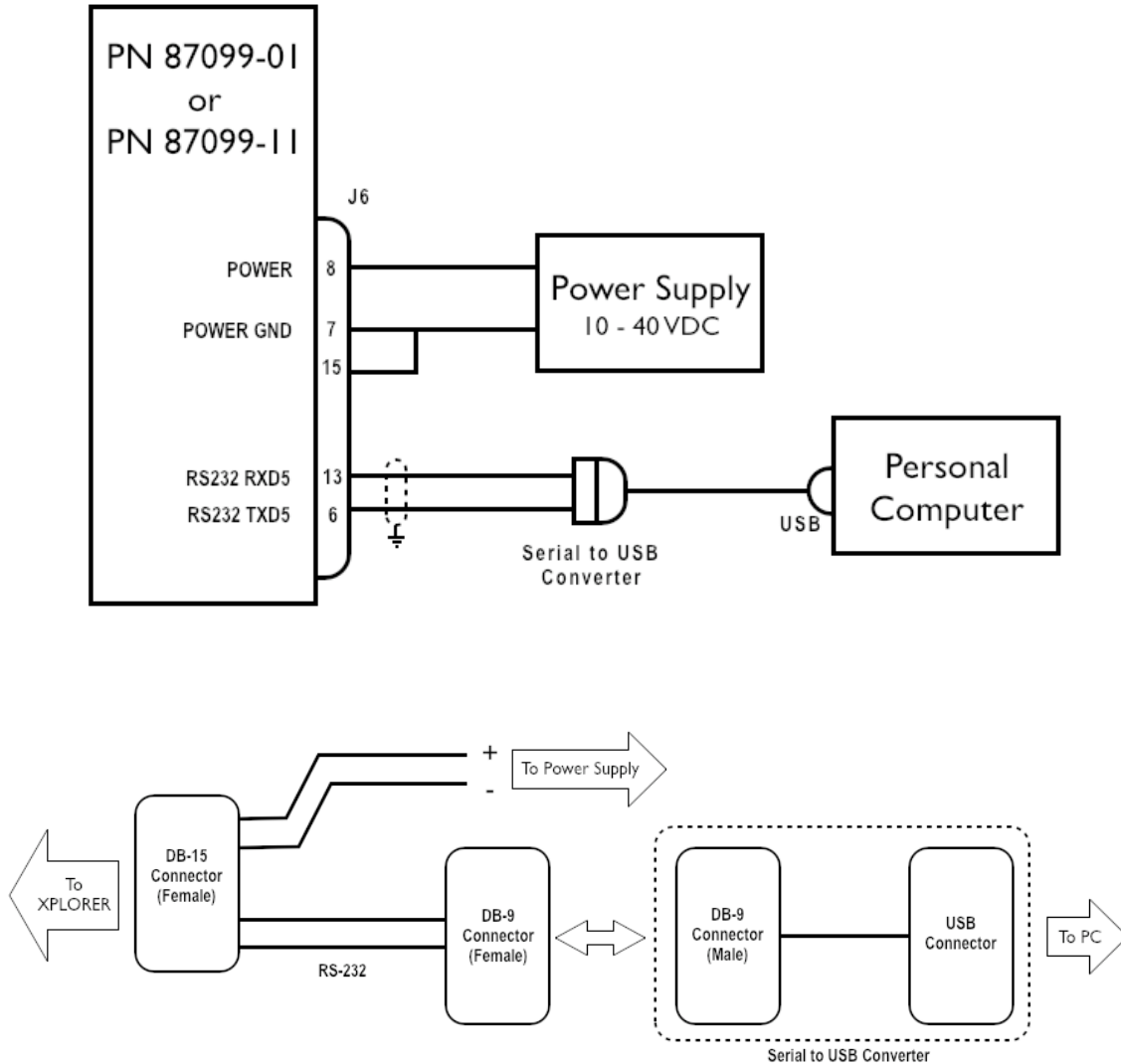

Figure 10: XPLORER Maintenance Interface Cabling

SECTION VIII   WARNING DISCLAIMER

A) When installing the XPLORER in an aircraft, ensure the unit is securely installed and does not interfere with aircraft operating controls or obstructs the pilot's view.

B) The XPLORER must only be used as a navigational aid and should not be used for any precise measurements or calculation information.

C) The XPLORER provides weather information that can be used as an aid for situational awareness only. Weather information provided must be use for advisory use only and should not be used for flight safety critical information and operation. The user is advised to exercise caution and let common sense prevail when confronted with sever weather conditions.

D) The XPLORER provides traffic information that must be used for navigational aid only. Pilots must rely on Air Traffic Control (ATC) guidance or visual rules for maneuvering their aircraft in traffic.

SECTION IX   LIMITED WARRANTY

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