# OSAT-100
# AIRBORNE POSITION/ DATA COMMUNICATOR

(P/N 001109-1)

## Installation and Operating Instructions

Til Document No.
01RE283
Rev. A
Issue - 4

August 28 2001

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## REVISIONS

| REV | PAGE | DESCRIPTION | DATE | APPROVED |
|---|---|---|---|---|
| A | | Initial Public Release | Aug 28, 2001 | RKD |
| A, iss-1 | para. 1.3<br>para. 1.4<br>para. 1.5<br>para. 2.1<br><br>para. 3.5<br>Figure 3.3<br><br>3-7 | Add more details<br>Add specifics regarding user software<br>Insert ENHANCED SOFTWARE section<br>Change details regarding Palm Pilot operation<br>Add Comant VHF/GPS antenna<br>Correct pinout error at Palm Pilot connector<br>- para 3.7.10 to 3.7.13: Correct errors regarding pin numbers to match Palm Pilot connector in Figure 3.3 | Oct 11, 2001 | RKD |
| A, iss-2 | para. 1.4<br><br>para. 3.2<br><br>Figure 3.3<br><br>ii | Change reference from “SkyExpress” to “FlightWatch”<br>Change reference from “SkyExpress” to “FlightWatch”<br>Improve alignment of labels at SYSTEM connector<br>Create REVISION HISTORY page | Mar 11, 2002 | RKD |
| A, iss-3 | para 3.4<br><br>Figure 3-3 | Change serial 6-pin connector to female<br>Update figure 3-3 (C.R. 02123) | May 10,2002 | RKD |
| A, iss-4 | para 3.5<br>para 1.4,<br>2.1, 3.2 | update Antenna Installation info<br>delete reference to “included CD” | Nov 19, 2002 | RKD |

CAUTION

This unit contains static sensitive devices. Wear a grounded wrist strap at a static-safe service bench when handling printed circuit boards.

Warning:

Changes or modifications not expressly approved by Technisonic Industries could void the user's authority to operate the equipment.

WARRANTY INFORMATION

Technisonic Industries warrants this product to be free of defects in materials and workmanship, and that the product meets or exceeds approved factory acceptance test requirements. Technisonic reserves the right to replace or repair any warranted product at its sole discretion during the warranty period.

Technisonic shall not be in any case be liable for any special incidental, consequential, indirect or punitive damages resulting from the product's failure to operate.

The Model OSAT-100 Airborne Data/Position Communicator is under warranty for one year from date of purchase. Failed units caused by defective parts, or workmanship should be returned to:

Technisonic Industries Limited

240 Traders Blvd.,
Mississauga,
Ontario L4Z 1W7

Tel: (905) 890-2113
Fax: (905) 890-5338

Dallas Avionics Inc./Radio Masters Inc.

2525 Santa Anna
Dallas,
Texas 75228

Tel: (214) 327-8283

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# GENERAL DESCRIPTION

## 1.1 INTRODUCTION

This publication provides installation and operating information for the OSAT-100 Position/Data Communicator, p/n 001109-1 manufactured by Technisonic Industries Limited. The OSAT-100 will provide position reporting and messaging with global coverage in near real time. ORBCOMM satellite system subscription and operating charges are billed through SkyTrac Systems Ltd., which is Technisonic's OSAT project partner and the system software developer.

## 1.2 DESCRIPTION

The OSAT-100 contains a GPS (Global Positioning System) receiver, a VHF transceiver specifically designed to communicate with the ORBCOMM satellite system, a battery which enables communications with the satellite system after airframe shutdown and a battery charging system. The OSAT-100 is compliant with RCTA DO-160C environmental category: [A2D2]-XX(BSP)XXXXXXABBXXXZ(XXXX)XX and carries an airworthiness approval.

## 1.3 PURPOSE OF EQUIPMENT

The OSAT-100 is the primary hardware component of a system designed to provide automatic message reporting, 2 way messaging and other data transfers between an aircraft and any point in the world having Internet access, via the ORBCOMM Low Earth Orbit (LEO) satellite system.

Present position and text messages from the aircraft can be displayed on any computer with Internet access and SkyTrac software. Position reporting intervals are user defined. Basic software (included with the OSAT-100) position reports including latitude, longitude, GPS time, relative position (to a known way point), ground speed, altitude and heading are presented in tabular format. Start-up and shut-down times are also reported.

Operationally, the OSAT system can augment regulatory flight following for commercial operators and provide vital positional data and messaging services to those operators conducting flight activities in remote areas.

## 1.4 SYSTEM REQUIREMENTS

The OSAT system requires 2 airframe mounted antennas (a standard aviation GPS antenna and a standard airborne VHF/FM antenna or a combined GPS/VHF-FM antenna) to enable the determination of its present position and communication with the LEO satellite system.

Messages currently must be accessed by and sent from the aircraft utilizing a PDA with Palm OS 3.5 and SkyTrac software. A Windows based PC with a dedicated e-mail address is required at the base. Please consult the SkyTrax (PDA software) and the FlightWatch (PC base software) users' manual for more detailed information.

## 1.5 ENHANCED SOFTWARE

Enhanced flight management software including a client server based mapping application and additional airframe reporting functionality is available directly from SkyTrac Systems Limited.

## 1.6 CUSTOM SOFTWARE AVAILABILITY

SkyTrac Systems also designs custom applications to maximize operational efficiencies for the commercial aviation sector. Custom software enables the user to monitor and transmit additional airframe parameters and/or flight data to provide:

- aircraft data for technical records
- pilot and engineer time and hours for payroll
- flight times and expenses for accounting
- arrival and departure times for customer services
- arrival and departure times for internal auditing purposes
- other operation specific parameters

Please contact SkyTrac Systems directly to discuss your specific requirements.

**SkyTrac Systems Ltd.**
**201 – 3590 Airport Road,**
**Penticton, B.C. V2A 6J7**
**Ph: 250 492-5363**
**Fax: 250 487-7607**
**www.skytrac.ca**

## 1.7 SPECIFICATIONS

### GPS RECEIVER

| | |
|---|---|
| Receive frequency | 1575.42 MHz |
| Receiving Method | 8 Channel Parallel Receiver (It is possible to receive signals from 8 satellites simultaneously. Measurement is accomplished by using a combination of the four best-situated satellites). |
| Receiver sensitivity | -130 dBm |
| Acquisition time | 2 minutes after powered on (Using almanac data, no obstacles over 10 deg of elevation). |
| Position accuracy | 15 m (49.2 feet) 2 DRMS (GDOP < 6) |

### GPS ANTENNA (Requirements)

| | |
|---|---|
| Voltage | +4.25 to +5.25 VDC |
| Current | Less than 30 mA |
| Gain (preferred range) | 28 to 37 dB |
| Noise Figure | less than 2.7 dB |

### DATA TRANSCEIVER

| | | |
|---|---|---|
| Operating modes | Sleep: | Waiting for internal timer or external activation |
| | Receive: | Receiving downlink signal |
| | Transmit: | Transmitting uplink signal Interfaces |
| | Transmit: | Uplink transmission |
| | Serial: | RS-232. |
| | I/O: | 2 input and 2 output pins (TTL level) |
| | | 2 input pins, analog. |
| Power requirement | 12 - 24 VDC | |
| Operating frequency and data rate | Up-link (transmit): | 148 to 150 MHz at 2400 bps |
| | Down-link (receive): | 137 to 138 MHz at 4800 bps |

GENERAL SPECIFICATIONS

| | |
|---|---|
| Dimensions | 5.0″ Wide X 2.9″ High X 10.5″ Deep |
| Operating temperature | -55 deg C to +70 deg C |
| Weight | 4.0 Lbs. |
| Power requirement | 18 - 30 VDC or 12 – 24 VDC (selectable by internal jumper) |
| Current drain | Receive - 250 mA<br>Transmit - 1.5 A max (in 100 ms bursts). |

## 1.8 ENVIRONMENTAL TEST SUMMARY

The following table summarizes DO-160C Environmental Testing for the Technisonic OSAT-100 Airborne Position/Data Communicator.

| Conditions | Section | Description of Conducted Tests |
|---|---|---|
| Temperature and Altitude | 4 | Equipment tested to categories A2 and D2. |
| Vibration | 8 | Equipment is tested with shock mounts to categories B, S and P. |
| Magnetic Effect | 15 | Equipment is class A. |
| Power Input | 16 | Equipment tested to category B. |
| Voltage Spike | 17 | Equipment tested to category B. |
| RF Emission | 21 | Equipment tested to category Z. |

SECTION 2

# OPERATING INSTRUCTIONS

## 2.1 OPERATING INSTRUCTIONS

There are no specific instructions for operation of the OSAT-100 in the airframe once it has been correctly installed and activated by SkyTrac Systems. The position reporting function of the OSAT-100 is transparent to the aircraft operator. The position reporting intervals can be set using a PDA (using Palm OS 3.5 and SkyTrac software). Text messages may be accessed or sent (i.e. to/from aircraft) also using the PDA. The SkyTrac PDA software for the Palm OS 3.5 is called "SkyTrax" and can be obtained from SkyTrac Systems.

The Palm Pilot PDA should be securely mounted in the airframe prior to operation. The device must be interconnected with the DATA connector on the OSAT-100 as per SECTION 3 of this document. Typically, the required signals from the OSAT-100's DATA connector are brought to a bulkhead connector somewhere in the air frame.

The Palm Pilot PDA must not be operated during takeoff and landing of the aircraft.

## 2.2 ACTIVATION

To establish your communications contract and activate your OSAT-100 unit(s) please contact customer service at:

SkyTrac Systems Ltd.
201 – 3590 Airport Road,
Penticton, B.C. V2A 6J7
Ph: 250 492-5363
Fax: 250 487-7607
www.skytrac.ca

Please check the SkyTrac web site to confirm that your software is the latest version. Please allow 2 business days to activate your units on the ORBCOMM satellite network.

# SECTION 3

# INSTALLATION INSTRUCTIONS

## 3.1 GENERAL

This section contains information and instructions for the installation of the OSAT-100 Airborne Position/Data Communicator.

## 3.2 EQUIPMENT PACKING LOG

Unpack the equipment and check for any damage that may have occurred during transit. Save the original shipping container for returns due to damage or warranty claims. Check that each item on the packing slip has been shipped in the container. Verify and record the Serial Number of the OSAT-100 and the Version number of the SkyPan software from their respective labels. This information is required when contacting SkyTrac Systems to enter into a subscriber agreement for the provision of satellite communications services.

The following software required for basic operation is available from SkyTrac Systems: SkyUtilities, FlightWatch, SkyTrax PDA, SkyTrax PC (when available) and User Manuals for the software. Various geographic databases are also available from the same source. At least one of these databases are required for proper operation. Updated software may be available at www.skytrac.ca.

## 3.3 OSAT-100 INSTALLATION

The OSAT-100 is designed to be secured to an airframe surface by its vibration shock mounting points utilizing the six supplied vibration isolators, and should be installed in conjunction with an IN-OSAT installation kit (P/N 019190-1). See Figure 3-1 for an outline drawing of the unit with dimensions to facilitate the installation. Refer to Figure 3-3 for additional installation instructions.

## 3.4 INSTALLATION KIT - CONTENTS

The OSAT-100 Installation Kit, P/N 019190-1 consists of One of each of the following:

1. SYSTEM, Power/Airframe 10-pin connector (female), P/N KPSE06F12-10S (crimp style)
2. DATA, Serial 6-pin connector (female), P/N KPSE06F10-6S (crimp style)
3. VHF antenna, BNC mating connector, P/N 31-320
4. GPS antenna, TNC mating connector, P/N 122108

## 3.5 ANTENNA INSTALLATION

The OSAT-100 requires two antennas for proper operation. The first is an airborne GPS antenna that uses 5 volt bias voltage. The Comant P/N CI-405-7 or a suitable equivalent may be used. The second antenna should be an airborne VHF/FM quarter wave (0 dB gain) type such as the Comant P/N CI-177 or equivalent. The Comant, combination VHF/GPS antenna (P/N CI-2480-1) customized specifically for use with the OSAT-100 is also available.

The OSAT-100 utilizes a BNC connector for the VHF antenna and a TNC connector for the GPS antenna. It is recommended that antennas with the same type of connectors be used to maintain commonality and prevent reverse connection to the OSAT-100. Antennas should be installed to the airframe in accordance with manufacturers recommendations. Refer to Figure 3-3 for additional installation instructions.

The VHF antenna should be electrically bonded to the metal surface of the airframe by preferably all 4 mounting screws, or by using the bottom surface of the antenna base. Improper bonding will tend to reduce the effectiveness of the antenna and may also increase the VSWR. An abnormally high VSWR could have the undesired effect of reducing transmit power. If the VHF antenna is mounted on a non-metallic surface, then the counterpoise (or ground plane) for the antenna does not exist. In this case the antenna may not work at its best efficiency. A counterpoise can be created for this situation on the inner surface of the airframe. The typical doubler plate used to reinforce the mounting point for an antenna tends to be too small to act as an effective ground plane. Three or four electrical conductors, approximately 20 inches long, connected to the mounting screws of the antenna base and radiating outwards would be an effective counterpoise. These “radials” do not have to be straight; they can be bent or follow the contours of the inner airframe surface and avoid other obstacles. Whatever material that is used for the radials (wire braid, stranded wire, metallic adhesive tape, etc) must be attached to the airframe in such a way that it will not be prone to vibration induced mechanical failure.

VHF antenna placement on the airframe can sometimes be critical for proper operation of the OSAT-100 system. It must have as unobstructed a view of the sky as possible in the limited space available on an aircraft. On fixed wing aircraft performance may be degraded if the VHF antenna is mounted very close to the vertical stabilizer, particularly if the antenna is offset from the centerline of the fuselage. The vertical stabilizer in this case would tend to shield the antenna from satellites in that direction.

Rotor wing aircraft by their nature will shield both antennas to varying degrees. The shielding effect of the main rotor can be reduced by mounting the VHF antenna as far away from it as is practical. Antenna placement near the front of the airframe, especially if it is very close to, or over the canopy can also have undesired side effects. Interference from some instrument panel displays have been responsible for desensitizing the OSAT-100 VHF receiver. The OSAT-100 VHF antenna could also be mounted aft of the main rotor as far back as is allowable. This tends to give greater separation from the main rotor in most applications, and prevents the possibility of interference from cockpit displays. The main problem for this location is the proximity to the hot turbine engine exhaust. Any VHF antenna mounted in this location must be heat resistant. The Comant CI-292-4 VHF/FM stainless steel whip antenna is generally suitable for this location.

## 3.6 INSTALLATION - PIN LOCATIONS AND CONNECTIONS

The pin identification letters and locations for the 10-pin SYSTEM and 6-pin DATA connectors located on the front of the OSAT-100 are provided in Figure 3-2 and Tables 3-1 and 3-2.

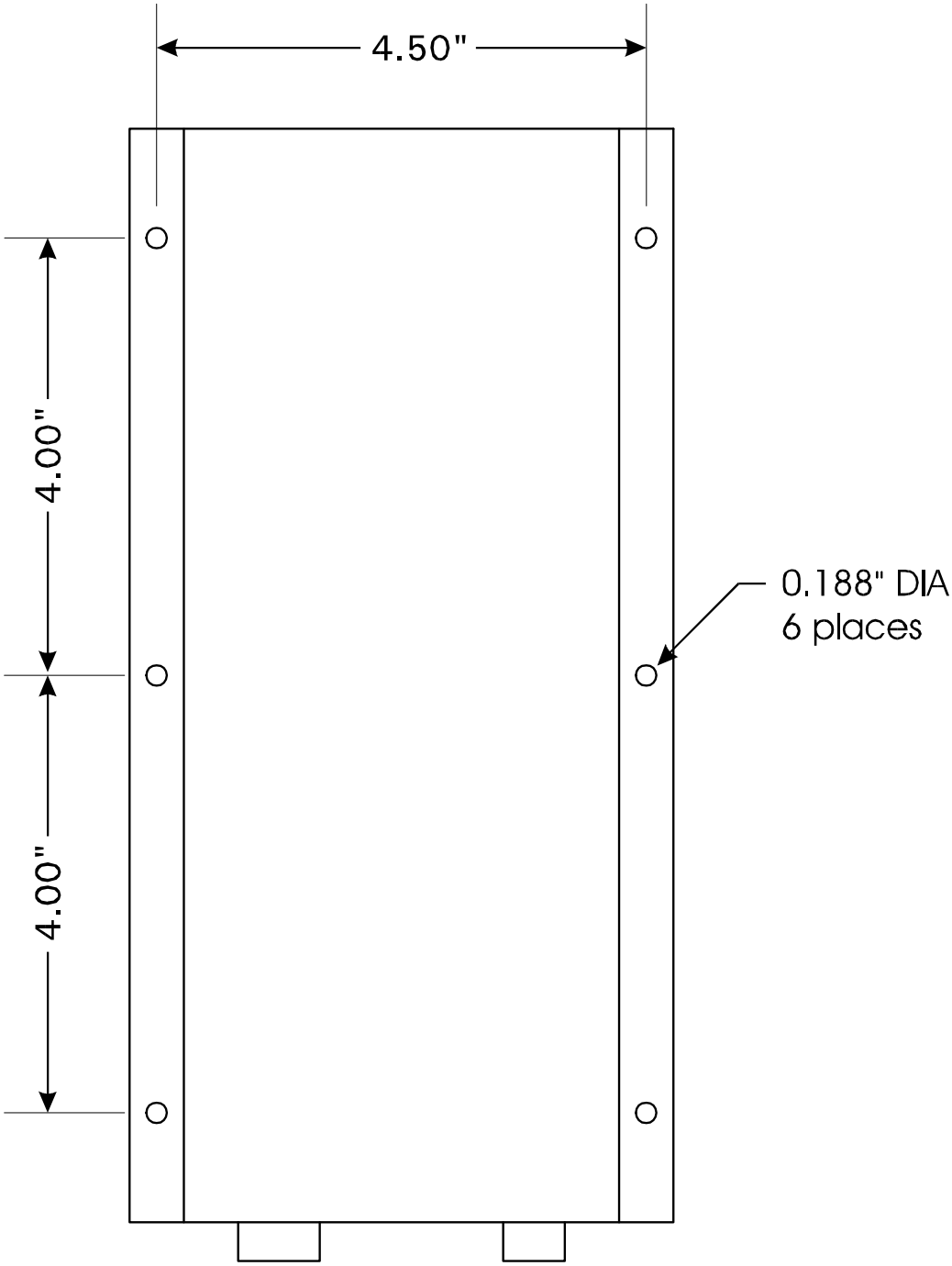



FIGURE 3-1 OSAT-100 Top View - Securing Points

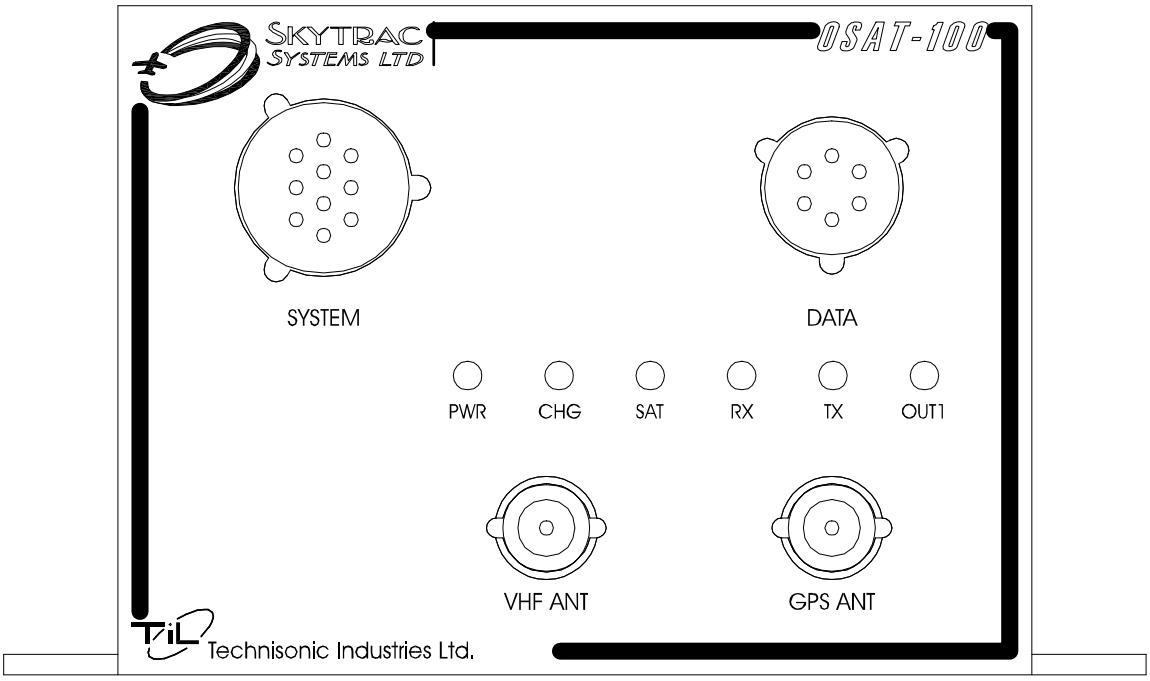


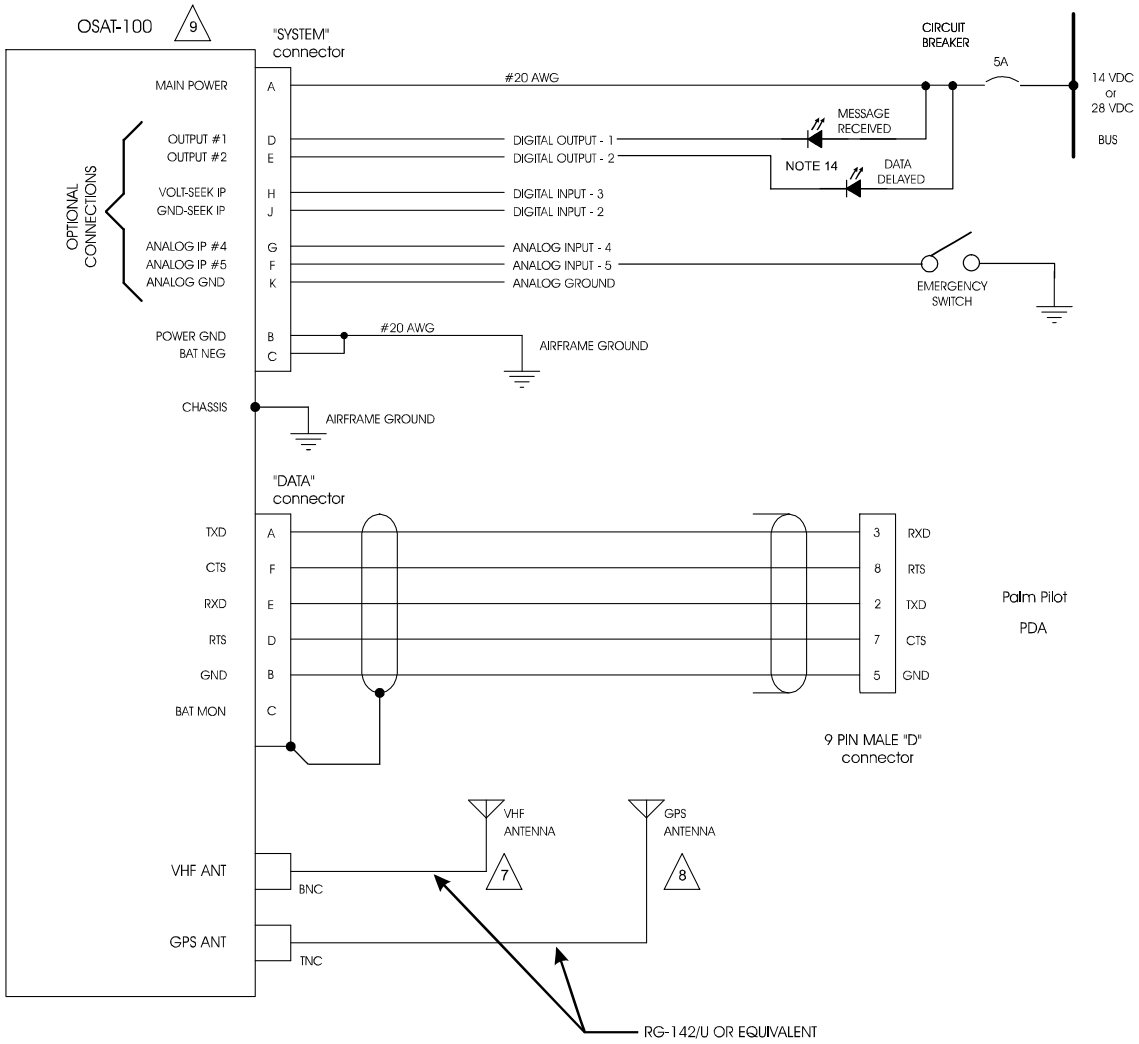

FIGURE 3-2 OSAT-100 Front Panel View

| 10 Pin SYSTEM Connector | |
|---|---|
| Pin # | Description |
| A | +28 Vdc or +14 Vdc Main Power In |
| B | Ground (Power) |
| C | Battery – |
| D | Output #1 |
| E | Output #2 |
| F | Analog IP #5 |
| G | Analog IP #4 |
| H | Voltage seeking IP |
| J | Ground seeking IP |
| K | Analog Ground |

TABLE 3-1

| 6 Pin DATA Connector | |
|---|---|
| Pin # | Description |
| A | TXD |
| F | CTS |
| E | RXD |
| D | RTS |
| C | Battery Monitor |
| B | Ground |

TABLE 3-2




NOTES:

1) ALL WIRE IAW MIL-W-22759 UNLESS OTHERWISE SPECIFIED.
2) ALL CABLE IAW MIL-C-27500 UNLESS OTHERWISE SPECIFIED.
3) COAXIAL CABLE IAW MIL-C-17 UNLESS OTHERWISE SPECIFIED. DO NOT USE COAX WITH PVC INSULATION.
4) FABRICATION & INSTALLATION OF WIRING HARNESS IAW AC 43.13-1B CHAPTER 11.
5) GROUNDING AND BONDING IAW AC 43.13-1B CHAPTER 11, SECTION 15.
6) ALL SINGLE WIRE TO BE #22 AWG MINIMUM AND ALL SHIELDED WIRE TO BE #24 AWG MINIMUM UNLESS OTHERWISE SPECIFIED.

△7 INSTALLATION OF ANTENNA IAW AC 43.13-1B CHAPTER 4 SECTION 4, CHAPTERS 6 & 7, AND AC 43.13-2A CHAPTER 3. IF POSSIBLE, THE ANTENNA SHOULD BE LOCATED A MINIMUM OF 12 FT FROM AIRCRAFT NAVIGATION RECEIVER ANTENNAS AND A MINIMUM OF 4 FEET FROM AIRCRAFT COMMUNICATIONS AND ELT ANTENNAS. BE CAREFUL NOT TO CHOOSE SEPARATIONS THAT CLOSELY APPROXIMATE 1/4 OR 1/2 OR WHOLE NUMBER MULTIPLES OF THE NAVIGATION OR COMMUNICATIONS WAVELENGTH.

△8 INSTALLATION OF ANTENNA IAW AC 43.13-1B CHAPTER 4 SECTION 4, CHAPTERS 6 & 7, AND AC 43.13-2A CHAPTER 3. IF POSSIBLE, THE ANTENNA SHOULD BE LOCATED A MINIMUM OF 4 FEET FROM AIRCRAFT COMMUNICATIONS AND ELT ANTENNAS.

△9 INSTALLATION OF OSAT-100 COMMUNICATOR IAW AC 43.13-8 CHAPTER 4 SECTION 4 AND AC 43.13-2A, CHAPTER 2

10) TEST THE SYSTEM IN ACCORDANCE WITH THE POST-INSTALLATION TEST PROCEDURE IN THE INSTALLATION AND OPERATING INSTRUCTIONS MANUAL.
11) REFER TO THE AIRCRAFT STRUCTURAL REPAIR MANUAL AND THE MAINTENANCE MANUAL FOR INSTRUCTIONS AND INFORMATION PERTINENT TO THIS INSTALLATION.
12) WIRING TO FOLLOW EXISTING WIRING BUNDLES WHERE POSSIBLE.
13) WIRING TO BE ROUTED MAINTAINING A SEPARATION OF 2 INCHES MINIMUM FROM EXISTING WIRE BUNDLES, EXCEPT WHERE NOT POSSIBLE OVER SHORT DISTANCES.
14) AVIONICS LIGHTS (INCANDESCENT OR LED AND SERIES RESISTOR) TO BE SELECTED TO SUIT INSTALLATION (100mA MAX.)

FIGURE 3-3 Wiring connections for the OSAT-100.

## 3.7 WIRING INSTRUCTIONS

Figure 3-3 shows all required connections and recommended wire sizes for the OSAT-100. Wire utilized for connection to the 10-pin Main SYSTEM connector should be 20 or 22AWG.

Wiring for the 6-pin DATA connector should consist of an appropriate length of shielded multi-conductor cable.

### 3.7.1 Main Power +28VDC (SYSTEM connector)

The main power +28VDC (±15%) is connected to pin A via a 5 amp circuit breaker (KLIXON P/N 7274-11-5 or equivalent circuit breaker or fuse). The OSAT-100 is factory set for operation with a +28VDC supply. (J10 set with center to pin 3, heater jumpers on J8 installed, and on J9 not installed). See Figure 3-4 for jumper locations.

If +14VDC power is to be utilized, set jumpers J10 and J9 located on the main PC board to the appropriate positions to allow operation at this voltage. Jumper J10 with center to pin 1 and the two jumpers should be removed from jumper position J8 and placed on J9.

### 3.7.2 Power Ground (SYSTEM connector)

Ground connection for the OSAT-100 is on pin B.

### 3.7.3 Battery – (SYSTEM connector)

Connect pin C to ground to enable the OSAT-100 internal battery.

### 3.7.4 Output #1 (SYSTEM connector)

Digital Output #1 from the OSAT-100 is provided on pin D. This is an open-collector transistor output that is to be pulled high externally. It is capable of sinking 0.5 amperes.

### 3.7.5 Output #2 (SYSTEM connector)

Digital Output #2 from the OSAT-100 is provided on pin E. This is an open-collector transistor output that is to be pulled high externally. It is capable of sinking 0.5 amperes.

### 3.7.6 Analog Input #5 (SYSTEM connector)

An analog voltage level between 0 and +10 volts applied to pin F will be converted to a digital value between 0 and 255.

### 3.7.7 Analog Input #4 (SYSTEM connector)

An analog voltage level between 0 and +10 volts applied to pin G will be converted to a digital value between 0 and 255.

### 3.7.8 Voltage Seeking Input (SYSTEM connector)

A positive voltage between +5 and +28 volts applied to pin H will be converted to a digital logic low.

### 3.7.9 Ground Seeking Input (SYSTEM connector)

A ground applied to pin J will be converted to a digital logic low.

3.7.10 TXD (DATA connector)

Pin A should be connected to pin 3 of the 9-pin D mating connector to a PDA, or pin 2 for a laptop PC.

3.7.11 CTS (DATA connector)

Pin F should be connected to pin 8 of the 9-pin D mating connector to a PDA, or pin 7 for a laptop PC.

3.7.12 RXD (DATA connector)

Pin E should be connected to pin 2 of the 9-pin D mating connector to a PDA, or pin 3 for a laptop PC.

3.7.13 RTS (DATA connector)

Pin D should be connected to pin 7 of the 9-pin D mating connector to a PDA or pin 8 of a laptop PC.

3.7.14 Battery Monitor (DATA connector)

For OSAT-100 servicing purposes, the internal battery voltage can be measured on pin C.

3.7.15 Ground (DATA connector)

Pin B should be connected to pin 5 of the 9-pin D mating connector to a PDA or laptop PC.

## 3.8 INITIAL TEST AFTER INSTALLATION

Make certain that the serial cable is connected to the serial data port.

3.8.1 Turn the aircraft power on. The green "PWR" LED, and the yellow "CHG" will come on.

3.8.2 With the VHF antenna connected, the green "SAT" LED will turn on whenever a usable Orbcomm satellite is within view. The aircraft must be outside of any shielded environment such as a hanger. Depending on the prevailing satellite constellation and geographic test location, the "SAT" LED should turn green intermittently within the first 10 minutes after power up.

3.8.3 If all of the above indications are met, connect a PDA device using Palm OS 3.5 and loaded with the appropriate SkyTrac software, to the serial port. Refer to the applicable software manual for indications of proper functionality.

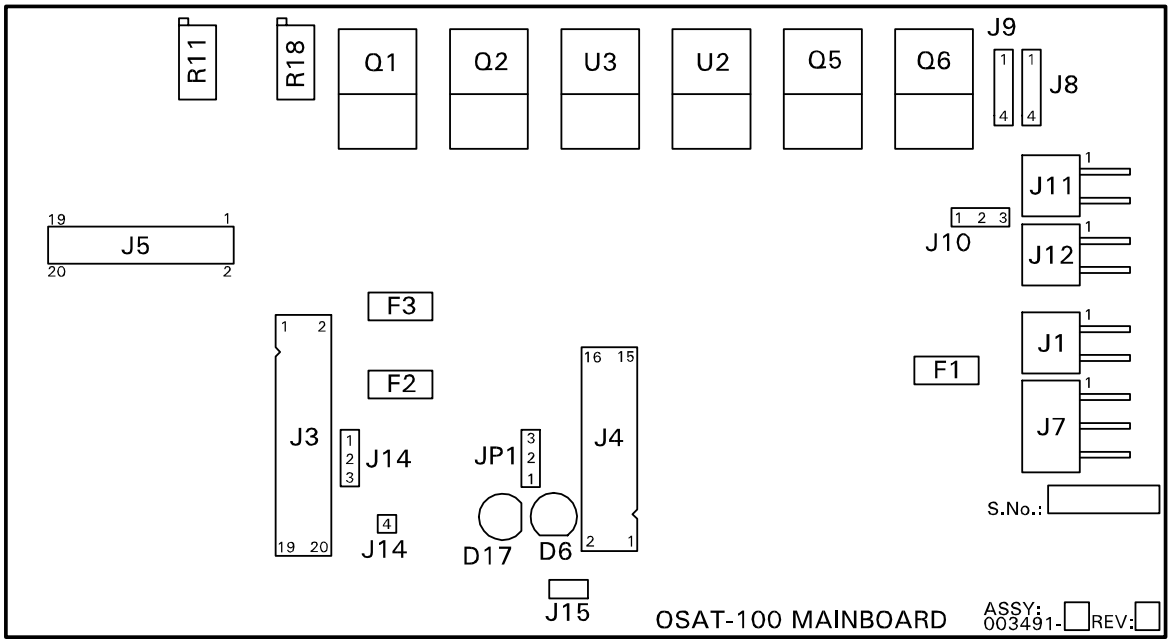



FIGURE 3-4 Jumper Locations

# APPENDIX A

## POST INSTALLATION EMI TEST

### PURPOSE

The purpose of this test is to identify any interference that the OSAT-100 may cause with existing aircraft systems.

### TEST CONDITIONS

The OSAT-100 and PDA should be installed and function tested. The PDA must be loaded with the EMI test software. PLEASE CONTACT SKYTRAC SYSTEMS DIRECTLY FOR THE EMI TEST SOFTWARE. The VHF antenna VSWR should be checked. A forward/reverse power check with an in-line wattmeter should show no more than 10% reflected power.

### METHODOLOGY

Most of the EMI tests can be accomplished on the ground. In some cases flight testing is required or is easier. If the aircraft is approved for IFR operations, then it is mandatory that interference between the OSAT-100 and the approach aids be checked in flight.

The existing on-board GPS should be operational and navigating with at least the minimum compliment of satellites. The VHF comm should be set to the frequencies indicated with the squelch open. VOR/DME receivers should be selected for display. If possible, set up a DME ramp test set on the frequencies indicated and adjust the output until the flags are out of view. The transponder and encoder should be monitored with ramp test equipment. Set the output of the transponder test set to 3db above the output necessary to achieve 90% reply. If possible set the ADF to a nearby navigation station.

Operate the OSAT-100 transmitter using the EMI test software for at least 5 minutes.

Observe the GPS for any degradation in satellite status or availability or flags. Listen for any noise or detected audio signals on the VHF comm(s). Listen for any noise or detected audio signals on the VOR/LOC receiver audio; look for any movement of flags or needles on the VOR/LOC/GS navigation display(s). Observe the transponder for any loss of reply or spurious reply.

List the power plant, fuel and other electric instruments in the chart provided and note any anomalies that occur while transmitting. Assess the results.

If the aircraft is equipped with an autopilot or a stability augmentation system, then test fly the aircraft and verify that operation of the OSAT-100 transceiver does not have adverse effects on these systems. After checking for gross effects at a safe altitude, fly an approach with each of the different navigation systems coupled to the autopilot (ILS, GPS ETC.) and look for any anomalies.

### RESULTS

If the installed system passes all of the applicable EMI tests, then no further action is required. If interference is observed then the interference must be assessed against the appropriate standards of airworthiness for the system in question. For example it is permissible for a VFR certified GPS to lose navigation capability while the OSAT-100 unit is transmitting, providing that it recovers properly and promptly, but it is not permissible for an IFR Approach certified GPS to be affected in the same way. A complete discussion of all the standards of airworthiness to be applied in assessing EMI effects is beyond the scope of this document.

PROCEDURE

A. Determine if the image frequency for the VHF Comm falls within the range of the OSAT-100. If so, select a set of frequencies that will cause the OSAT-100 to be set as close as possible to the image frequency. Any one of the many possible sets will suffice. Record those values in the spaces provided in the following chart. Operate the OSAT-100 transmitter on these frequencies for at least 5 minutes. Listen for any noise or detected audio signals on the VHF comm.

Example - Bendix/King KY 196A:
The first IF frequency is 11.4 MHZ. The L.O. is above the received frequency (high side injection), therefore the image frequency is 22.8 MHZ above the selected frequency. Set the KY 196A to 126.200 MHZ and the OSAT-100 to 149.000 MHZ.

| FREQUENCIES | | RESULTS | |
|---|---|---|---|
| VHF #1 | OSAT-100 | PASS | FAIL |
| Image: | | | |
| | | | |
| | | | |

| FREQUENCIES | | RESULTS | |
|---|---|---|---|
| VHF #2 | OSAT-100 | PASS | FAIL |
| Image: | | | |
| | | | |
| | | | |

NOTES:

B. Determine if the image frequency for the VOR/ILS Nav falls within the range of the OSAT-100. If so, select a set of frequencies that will cause the OSAT-100 to be set as close as possible to the image frequency. Choose one set in the localizer frequency range, and one in the VOR frequency range. Record those values in the spaces provided in the following chart. Operate the OSAT-100 transmitter on those frequencies for at least 5 minutes. Listen for any noise or detected audio signals on the receiver audio; look for any movement of flags or needles on the navigation display.

| FREQUENCIES | | RESULTS | |
|---|---|---|---|
| VOR/ILS #1 | OSAT-100 | PASS | FAIL |
| Image: | | | |
| Image: | | | |
| | | | |

| FREQUENCIES | | RESULTS | |
|---|---|---|---|
| VOR/ILS #2 | OSAT-100 | PASS | FAIL |
| Image: | | | |
| Image: | | | |
| | | | |

NOTES:

NOTE:

Tests C and D are flight tests. For these tests set the OSAT-100 transmitter to a random frequency.

Frequency: _____.

C. At a safe altitude engage the autopilot or stability augmentation system. Operate the OSAT-100 transmitter on the above frequency for at least 5 minutes. Observe any effect on the autopilot or stability augmentation system.

Observations:

D. Perform a coupled ILS approach to the aircraft's certified limits. Operate the OSAT-100 transmitter on the above frequency for the duration of the approach. Observe any effect on the autopilot. Repeat for second flight director/autopilot if equipped.

Observations:

E. List the power plant, fuel and other electric instruments in the chart provided and note any anomalies that occur while transmitting. Assess the results.

| STEP | SYSTEM | PASS | FAIL | NOTES |
|---|---|---|---|---|
| 1 | Com 1&2 | | | |
| 2 | Transponder & Encoder | | | |
| 3 | ADF 1 & 2 | | | |
| 4 | VG | | | |
| 5 | Glideslope 1&2 | | | |
| 6 | VOR/LOC 1&2 | | | |
| 7 | Compass | | | |

| STEP | SYSTEM | PASS | FAIL | NOTES |
|---|---|---|---|---|
| 8 | Directional Gyro | | | |
| 9 | Fuel Pressure | | | |
| 10 | Oil Temp | | | |
| 11 | Amps | | | |
| 12 | Bus Voltage | | | |
| 13 | Fuel % | | | |
| 14 | Ng | | | |
| 15 | TOT | | | |

| STEP | SYSTEM | PASS | FAIL | NOTES |
|---|---|---|---|---|
| 16 | Torque % | | | |
| 17 | Annunciators | | | |
| 18 | Digital Clock | | | |
| 19 | Oil Pressure | | | |
| 20 | DME | | | |
| 21 | GPS 1&2 | | | |
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| STEP | SYSTEM | PASS | FAIL | NOTES |
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| STEP | SYSTEM | PASS | FAIL | NOTES |
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NOTES: