



**LatitudeTechnologiesCorporation**

# **SkyNode<sup>®</sup> S200 Installation and Operation Manual**

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0.03	MI	30/11/05	Added: sec 5.1 plug diagram and sec 8.2.2 – 8.2.4 text.
1.00	MI	13/01/06	First release, reformatted with new sections.

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## 1. Foreword

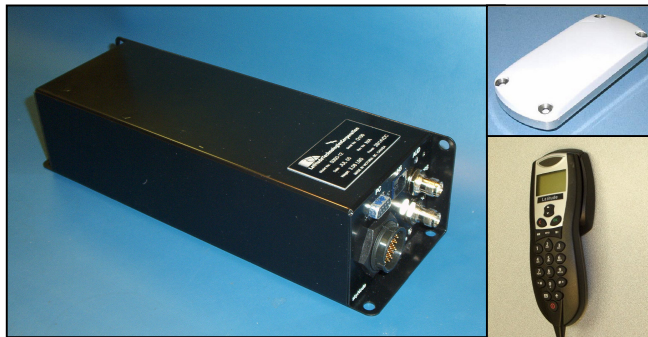
The following information refers to the S200-xxx models of the SkyNode Internet terminal products family; designed and manufactured by Latitude Technologies Corporation. This information is intended solely for reference by End Users, Installers, and Application Developers. Software or hardware changes may have occurred since the printing of this document. Please contact Latitude Technologies Corporation for the most recent version.

## 2. Description

### 2.1. Overview

The SkyNode S200 provides both voice and tracking (autonomous and host-polled asset positioning) including messaging functions using various serial data interfaces and integrated GPS receiver and Iridium satellite L-Band Transceiver modules.

The SkyNode S200 is available in different factory configurations indicated by part number suffix "S200-XXX", where "X" defines features ranging from basic tracking, data and voice interfaces, to additional audio communications support, including 2-wire POTS<sup>1</sup> phone, and ARINC-429 data bus interfaces. Please refer to section 3 for details or call Latitude Technologies Corp. for further configuration details.



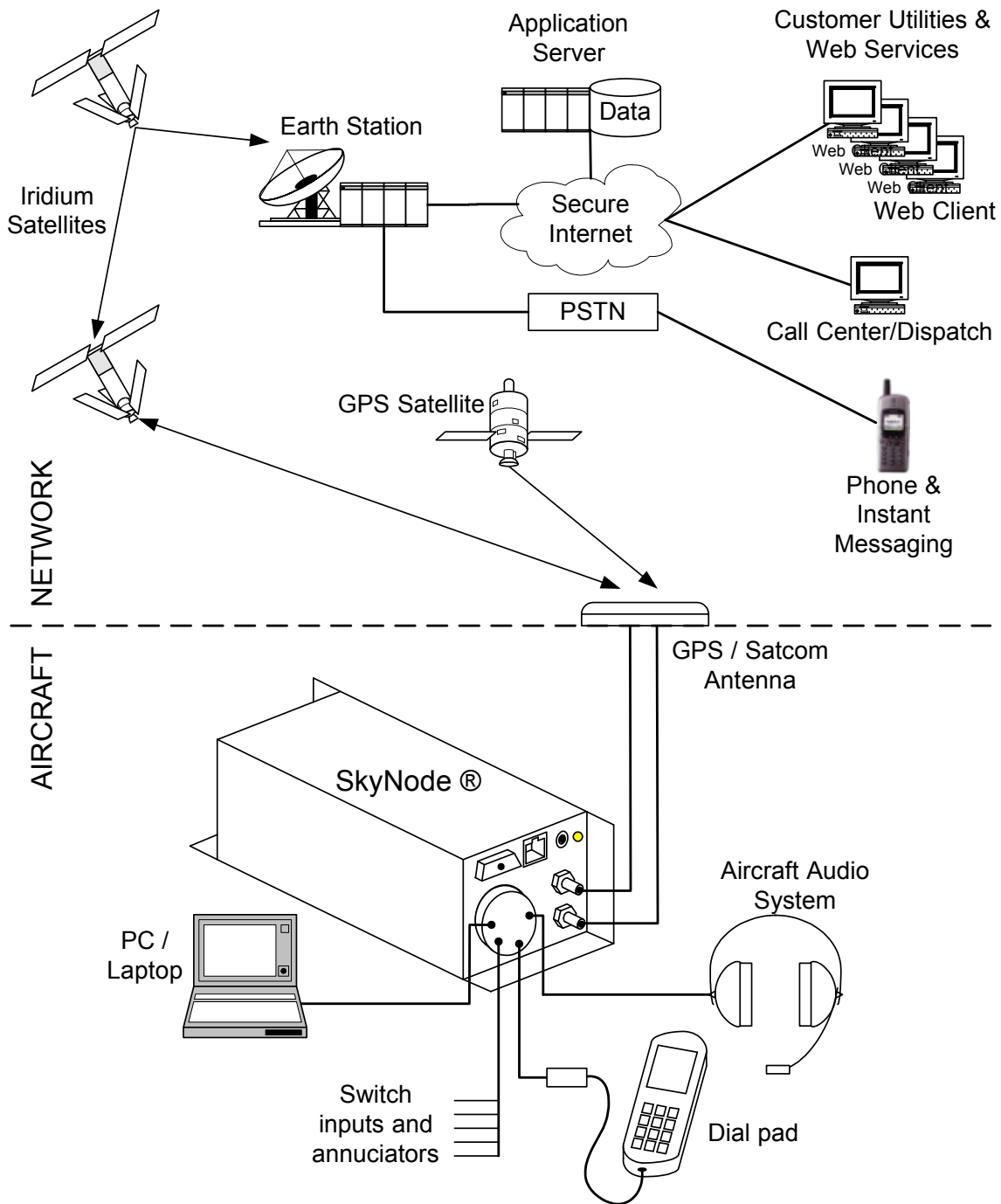
Above: Photo of S200 Satphone flight-following P/N SkyNode S200-011, shown with some typical system accessories: dual Iridium/GPS antenna and handset dial pad.

Note: Basic Flight-following system S200-001 requires only S200 and antenna.

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<sup>1</sup> POTS models S200-x2x, have not yet been formally approved by Transport Canada.  
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**Figure 1 – SkyNode System Overview**

## 2.2. System Components

<b>PART #</b>	<b>DESCRIPTION</b>	<b>Interconnect Diagram/Drawing</b>
S200-001	Basic Automated Flight Following (AFF) Tracker model. Phone interface for ground operation only, internal GPS	Sec 2.5.1 and also Appendix B
S200-003	Basic AFF Tracker model. Phone interface for ground operation only, external GPS received through serial data bus.	Appendix C
S200-011	Provides airborne communications and tracking capability, audio interfaced to aircraft audio system.	Sec 2.5.2 and also Appendix D
S200-012	Full configuration (all modules except POTS dialer installed).	Appendix E
S200-021 <sup>2</sup>	Provides for support of external POTS dialer unit. Internal GPS.	Sec 2.5.3
S200-022 <sup>2</sup>	Provides for support of external POTS dialer unit. Internal GPS, or external GPS received through serial data bus.	N/A

**Table 1 – Primary System Components for Factory Set Configurations**

<b>PART #</b>	<b>DESCRIPTION</b>
LT-DPLS0401	Satcom handset provides controls for operating the satcom communications part of the Skynode system. Short cord length.
LT-DPLL0401	Satcom handset provides controls for operating the satcom communications part of the Skynode system. Long cord length.
S5GIR1516RR-AP-XTT-1	Combined Iridium and GPS antenna
3G1215A2-XT	GPS antenna
S31R16RR-P-XTB-1	Satcom antenna

**Table 2 – Peripheral System Components**

<sup>2</sup> POTS models S200-x2x, have not yet been formally approved by Transport Canada.



## 2.3. Specifications

### 2.3.1. Electrical Specifications

#### Power Supply

Specifications	Power input Voltage (with reverse & over voltage and over current protection)
Normal	+28.0 Vdc nominal +22.0 Vdc minimum +30.3 Vdc maximum +14.0 Vdc Emergency
Abnormal	+28.0 Vdc nominal +20.5 Vdc minimum +32.2 Vdc maximum
Input Current:	0.3 A Standby 0.5 A Receive 0.8 A Transmit

#### Input Signals

##### **J100:**

+28VDC PWR	Main input power
CHASSIS GND	Airframe connection
DPL RX	DPL serial data
AUX RX	RS232 (DTE) serial data
AUX CTS	RS232 (DTE) serial data
A429 RX A <sup>3</sup>	ARINC-429 differential data (receive only)
A429 RX B	ARINC-429 differential data (receive only)
AUDIO SHUNT	DC discrete logic
GND	OV signal reference
PRIM MIC <sup>4</sup>	
Microphone	250 mVrms rated input level, amplified dynamic
Impedance	150 Ohm ±10%
Circuit type	single-ended
GPS IN	RS232 serial data

##### **PC:**

PC TX	RS232 (DCE) serial data
PC DTR	RS232 (DCE) serial data
PC RTS	RS232 (DCE) serial data

<sup>3</sup> ARINC-429 supported by S200-0x2 and S200-0x3 models only.

<sup>4</sup> Supported by S200-01x models only. Other models have PRIM MIC electrical characteristics identical to "HS".

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### HS:

HS DPL RX	DPL serial data
EXT_ON_OFF	DC discrete logic
HS MIC	
Microphone	110mVp-p nominal input level, max 2Vp-p
Impedance	10kOhm
Circuit type	single-ended

### AUD:

2.5mm MIC	
Microphone	110mVp-p nominal input level, max 2Vp-p
Impedance	10kOhm
Circuit type	single-ended

### Output Signals

#### J100:

PWR GND	Main input power ground
+12VDC OUT	+12Vdc, 0.5mA current limited
DPL TX	DPL serial data
+5VDC OUT	+5Vdc, 0.5mA current limited
AUX TX	RS232 (DTE) serial data
AUX RTS	RS232 (DTE) serial data
PRIM SPKR <sup>5</sup>	
Analog audio	100mW into 8 or 600 Ohm nominal
Freq response	<3dB from 350 Hz to 6 Hz
Distortion	<10% @ rated output
Audio noise	
(no signal)	>50dB down from rated output
Regulation	<10% variation from 75% to 400% of load
GPS OUT	RS232 serial data

#### PC:

PC DCD	RS232 (DCE) serial data
PC RX	RS232 (DCE) serial data
PC DSR	RS232 (DCE) serial data
PC CTS	RS232 (DCE) serial data
PC RI	RS232 (DCE) serial data

#### HS:

+12VDC OUT	+12Vdc, 0.5mA current limited
HS DPL TX	DPL serial data
HS SPKR	
Analog audio	110mVp-p nominal input level, max 2Vp-p
Impedance	>600 Ohm nominal

<sup>5</sup> Supported by S200-01x models only. Other models have PRIM MIC electrical characteristics identical to "HS".

**AUD:**

2.5mm SPKR	
Analog audio	110mVp-p nominal input level, max 2Vp-p
Impedance	>600 Ohm nominal

Bi-directional Signals

**J100:**

AUDIO GND	Analog Mic and Audio ground
EXT_ON_OFF/TIP	DC discrete logic (S200-01x, S200-00x models only)
	POTS (S200-02x models only)
RING	POTS (S200-02x models only)
GPI/O 1	DC discrete logic
GPI/O 2	DC discrete logic
GPI/O 4	DC discrete logic
RS485 A <sup>6</sup>	RS485 differential data
RS485 B	RS485 differential data

**PC:**SERIAL GND                      RS232 signal ground

**HS:**GND                                      DPL signal ground

**GPS:**

Impedance	50 Ohm
RF input frequency	1575 MHz
RF Input Level	-130 dBW and -163 dBW
Active bias voltage	+5 Vdc
Active Bias Current	Maximum 100 mA (center conductor)

**SAT:**

Impedance	50 Ohm
Frequency	1.616 MHz – 1.625 MHz (transmit and receive)
RF transmit power	Average 7W max per slot, 0.6W per frame typical
RF receive sensitivity	-118.5 dBm

**2.3.2. Physical Specifications**

Height:	2.75 inches (7.2 cm)
Width:	3.81 inches (9.7cm)
Depth:	11.50 inches (29.2 cm)

Weight:	
Satcom	3.08 lbs (1400 g)

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<sup>6</sup> RS-485 supported by S200-0x2 and S200-0x3 models only.

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Handset dialer	0.59 lbs (45g)
Mounting:	Bulkhead mount along either width, or height using four #8 or # 10 screws.
Material/Finish:	Chassis and cover are 5052-H32 brushed aluminum with black semi-gloss powder coat finish.
Connectors:	
Satcom	
SAT	TNC female
GPS	TNC female
J100	Conxall Mega-Con 31 pin circular jack
PC	9 pin female D-sub
HS	RJ45 Jack
AUD	2.5 mm jack
Handset	Amphenol Plug MS310F-10-6S

### 2.3.3.Environmental Specifications

Temperature Range:	
(Operating)	-30 C to +60 C
(Survival)	-40 to +85 C
Altitude:	50,000 ft
Humidity:	>95%
Shock:	6g, 20g
Vibration:	DO-160E Section 8, Cat. (SM) and (U2F)
Magnetic Effect:	DO-160E Section 15, Cat. Z (< 0.3 m)
Power Input:	DO-160E Section 16, Cat. B
Voltage Spike:	DO-160E Section 17, Cat. B
RF Emissions:	DO-160E Section 21, Cat B
Qualification:	
	DO-160E Env. Cat. A4-BAB[(SM)(U2F)]XXXXXXZBBXXBXXXXX

## 2.4. S200-xxx Factory Set Configurations

There are three principal factory-set hardware configurations (-x0x, -x1x, & -x2x); each designed to support a specific class of phone interface equipment with or without amplified microphone and audio signals.

Within each class is the further option to pre-define (or limit) the source of spatial positioning data source (i.e. internal and/or external GPS or ARINC-429 bus)

Part number	Description	Supported Interfaces						Notes
		Handset Dialer	Handset Audio	Audio Amp	POTS Interface	Internal GPS	ARINC-429	
S200 - 000		•	•					
001	Basic 'Tracker' model. Phone interface via DPL handset and hands-free jack.	•	•			•		
002		•	•			•	•	
003		•	•				•	
010		•		•				
011		•		•		•		
012	Tracking, w/ amplified audio to AC com panel. DPL handset used as dialer/user interface.	•		•		•	•	Qualification Baseline
013		•		•			•	
020*					•			
021*	Tracking, 2-wire phone interface.				•	•		Will support PTA12-100 dialer
022*					•	•	•	
023*					•		•	

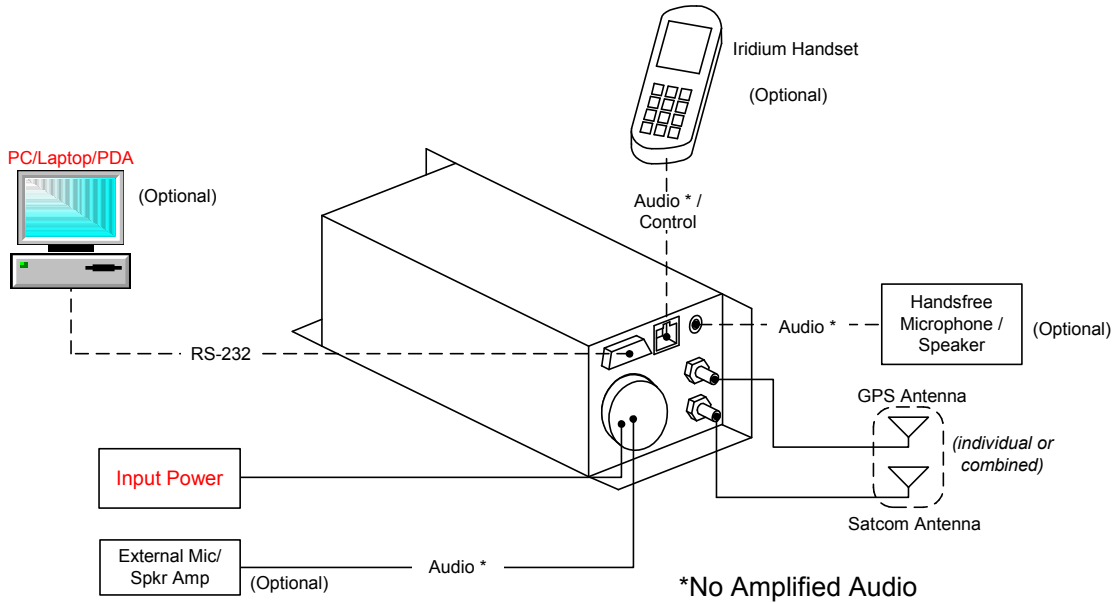
**Table 3 – S200 Factory Set Configurations**

\* Note – POTS models S200-x2x, have not yet been formally approved by Transport Canada.

## 2.5. Typical System Configurations

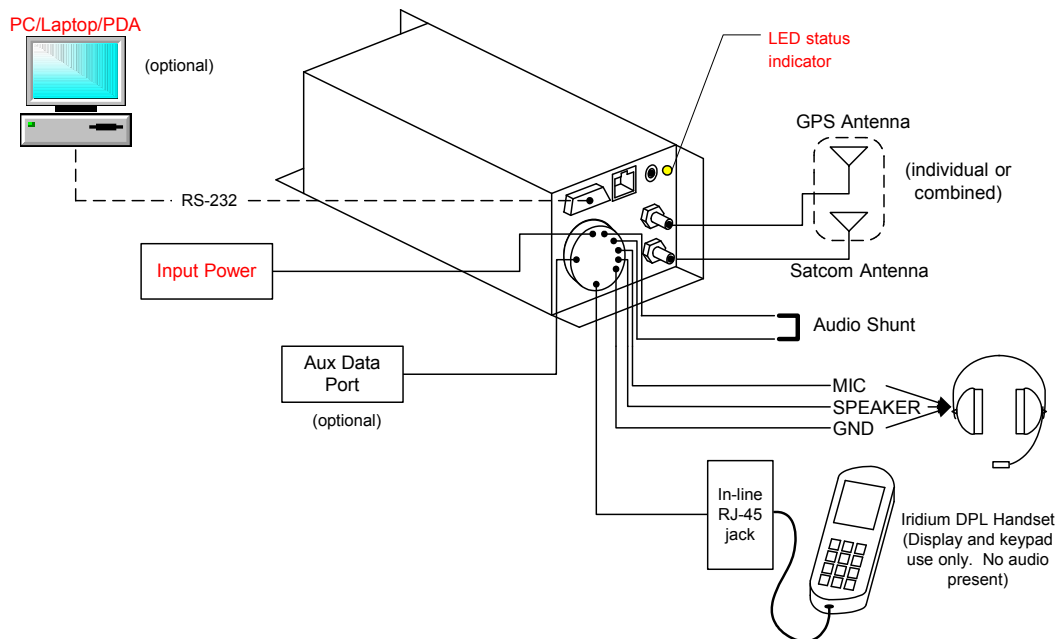
Some common factory-set hardware configurations are illustrated below:

### 2.5.1. System with PN: S200-001



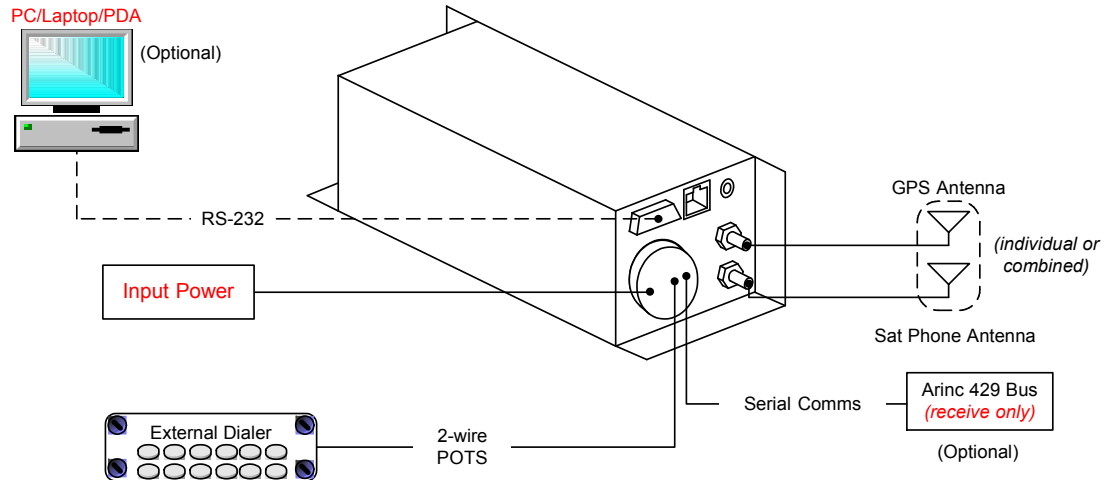
**Figure 2 – S200-001 Typical Equipment Interconnection Diagram**

### 2.5.2. System with PN: S200-011



**Figure 3 – S200-011 Typical Equipment Interconnection Diagram**

### 2.5.3. System with PN: S200-022 (w/ POTS Dialer)



**Figure 4 – S200-022 Typical Equipment Interconnection Diagram \***

\* Note – POTS models S200-x2x, have not yet been formally approved by Transport Canada.

## 3. Installation

### 3.1. Inspection

Carefully unpack all equipment. Inspect the equipment visually for any damage due to shipping and immediately report all such claims to the carrier involved.

Verify against the packing list all components are present before proceeding and report any shortage to the supplier.

### 3.2. Installation Procedures

#### 3.2.1. Warnings

Do not position this unit next to any device with a strong alternating magnetic field such as an inverter, motor, or blower as significant audio interference may result.

Do not route any lines from this unit with high current carrying wire bundles including 400 Hz synchro wiring or AC power lines.

When routing antenna cable, avoid high current wiring, other transmitting antenna cables, and sharp bends.

### **3.2.2. Cautions**

Use shielded cable as shown on installation drawings and ground as indicated. Ensure chassis is grounded to provide proper shield terminations. Do not jumper to power ground wire connection.

Failure to observe proper cable routing and shield terminations may result in significant noise problems for data and audio transmission.

### **3.2.3. Notes**

The S200 chassis must be electrically grounded to avoid low frequency interference. Pin 28 (CHASSIS GND) must be connected by a short wire to a clean ground, not jumpered to the power ground wire connection.

If utilized, the LT-DPLS0401/LT-DPLL0401 Handset is powered by the S200 which is current limited internally by the S200 to a maximum of 0.5A, 12Vdc. The function of the LT-DPLS0401 Handset is limited to that of a dial pad and display only, as the handset's microphone and speaker audio are disabled.

For on ground testing purposes only, a Iridium DPL handset with RJ45 plug may be connected to the "HS" jack. DO NOT connect both LT-DPLS0401/LT-DPLL0401 and Iridium DPL Handsets in both of these locations simultaneously or damage may occur to the S200. The S200 will support only a single handset at a time.

### **3.2.4. Cable and Wiring**

Fabrication and installation of wiring harness in accordance with AC43, 13-1B/2A. Install appropriate standoffs and wiring clamps to ensure the wiring is protected from chafing and vibration damage. Follow the specific wiring diagrams in the Appendices.

All wiring should be at least 22 AWG, except power and ground lines that should be at least 20 AWG. Ensure all ground connections are clean and well secured.

### **3.2.5. Coaxial Cables & Connectors**

When routing antenna cables observe the following precautions:

- All cable routing should be kept as short as possible.
- Avoid sharp bends.
- Avoid routing cable near power sources such as 400Hz generators, trim motors, etc., or near power for fluorescent lighting.



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Satcom antenna cable should be selected to obtain a maximum 2.5dB signal loss, including connector losses at 1.625GHz.

GPS antenna cable should be selected to obtain an optimum total signal gain (combined antenna, amplifier, cable loss) presented to the GPS port between 10 and 20dB at 1.575GHz.

*NOTE. Because both Satphone and GPS use the same TNC-style connectors, extra care should be exercised to avoid crossover connection errors.*

The installer is responsible for providing antenna cables. Use the following charts as an aid to determine the appropriate cable type for the Satcom and GPS cables. Follow industry practices when assembling the TNC connectors.

<b>SATCOM CABLE CHART</b>								
Max. Cable length (feet)	Coaxial Cable Type	P/N	Total Signal Loss at 1625MHz (dB)	Signal Loss per foot (dB/ft)	Cable OD (inches)	Min. Bend Radius (inches)	Matching Connectors	
							TNC- male straight plug (P/N)	TNC- male RA plug (P/N)
≤ 10	MIL-C-17	RG400	2.01	0.201	0.195	1.00		
≤ 12	MIL-C-17	RG400	2.41	0.201	0.195	1.00		
≤ 12	PIC	S44191	1.98	0.165	0.195	1.00	190108	190109
≤ 15	ECS	311901	2.23	0.149	0.195	1.00	CTS722	CTR722
≤ 20	ECS	311601	2.17	0.109	0.229	1.15	CTS922	CTR922, CTRE922 (extended), CTRL922 (long)
≤ 25	ECS	311501	2.28	0.091	0.229	1.20	CTS922	CTR922, CTRE922 (extended), CTRL922 (long)
≤ 25	PIC	S33141	2.24	0.090	0.270	1.40	190308	190309
≤ 30	ECS	311201	2.01	0.067	0.317	1.59	CTS122	CTR122
≤ 40	PIC	S22089	2.04	0.051	0.435	2.50	190408	190409
≤ 50	ECS	310801	2.35	0.047	0.452	2.26	CTS022	CTR022
≤ 70	ECS	8C0500	2.10	0.030	0.630	5.00		

**Table 4 – Example Satcom cable and connector choices for a given cable run**

GPS CABLE CHART								
Cable length (feet)	Coaxial Cable Type	P/N	Total Signal Loss at 1575MHz (dB)	Signal Loss per foot (dB/ft)	Cable OD (inches)	Min. Bend Radius (inches)	Matching Connectors	
							TNC- male straight plug (P/N)	TNC- male RA plug (P/N)
5	MIL-C-17/113	RG316	2.00	0.400	0.098	0.50		
10	MIL-C-17/113	RG316	4.00	0.400	0.098	0.50		
15	MIL-C-17/113	RG316	6.00	0.400	0.098	0.50		
15	MIL-C-17/128	RG400	3.00	0.201	0.195	1.00		
20	MIL-C-17/128	RG400	4.00	0.201	0.195	1.00		
25	MIL-C-17/128	RG400	5.00	0.201	0.195	1.00		
30	MIL-C-17/128	RG400	6.00	0.201	0.195	1.00		
40	MIL-C-17/128	RG400	7.92	0.201	0.195	1.00		
50	MIL-C-17/128	RG400	9.91	0.201	0.195	1.00		
60	MIL-C-17/128	RG400	11.90	0.201	0.195	1.00		
70	MIL-C-17/128	RG400	13.87	0.201	0.195	1.00		

**Table 5 – Example GPS cables for a given cable run**

*NOTE. When using an active GPS antenna select a cable that has at least 3 dB of attenuation.*

### 3.2.6. Antennas

#### 3.2.6.1. Antenna Location

Mount the antenna(s) to have the best possible sky view of the satellites possible.

Proper antenna placement and mounting is critical in order to achieve the best possible performance. In General, keep all antennas as widely separated as possible and clear of large airframe obstacles.

Installation of the antenna should be in accordance with AC 43.13-1B, chapter 4, section 4, and AC 43.13-2A chapter 3.

#### 3.2.6.2. Iridium Antenna

The antenna performance requirements for the S200’s internal Iridium Satcom transceiver are summarized in the following table.

Parameter	Value
Transmit and Receive Frequency Range	1616 MHz to 1626.5 MHz
Return Loss (minimum)	9.5 dB (<2:1 VSWR)
Gain (weighted average minimum)	0.0 dBic
Minimum ‘Horizon’ Gain	-2.0 dBic (82 degree conic average)
Nominal Impedance	50 Ω
Polarization	Right Hand Circular (RHCP)
Basic Pattern	Omnidirectional and Hemispherical

**Table 6 – Iridium Satcom Antenna Specification (typical)**

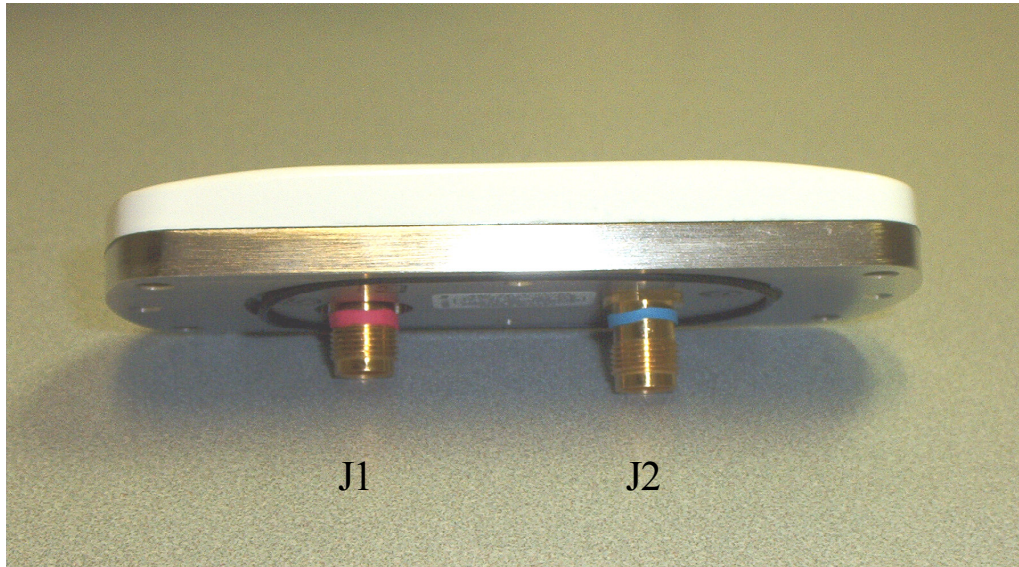
### 3.2.6.3. GPS Antenna

The antenna performance requirements for the S200's internal Iridium Satcom transceiver are summarized in the following table.

Parameter	Value
Receive Frequency	1575.42 (GPS L1 frequency)
Active Gain	Typical between 12 dB to 33 dB gain
Active DC bias voltage	+5 VDC (supplied by S200)
Active Bias Current	Maximum 100 mA (supplied by S200)
Nominal Impedance	50 $\Omega$

**Table 7 – GPS Receiver Parameters**

### 3.2.7. Dual Antenna Connection Example



**Figure 5 – Dual GPS/Iridium antenna, Antcom P/N: S5GIR15161RR-AP-XTT-1.**

The "J1" (RED-banded, short) TNC jack connects to S200 "SAT" TNC jack.

The "J2" (BLUE-banded & tallest) TNC jack connects to S200 "GPS" TNC jack.

### 3.3. Installation Drawings

Installation drawings for each specific S200 model are found in Appendices B through E.

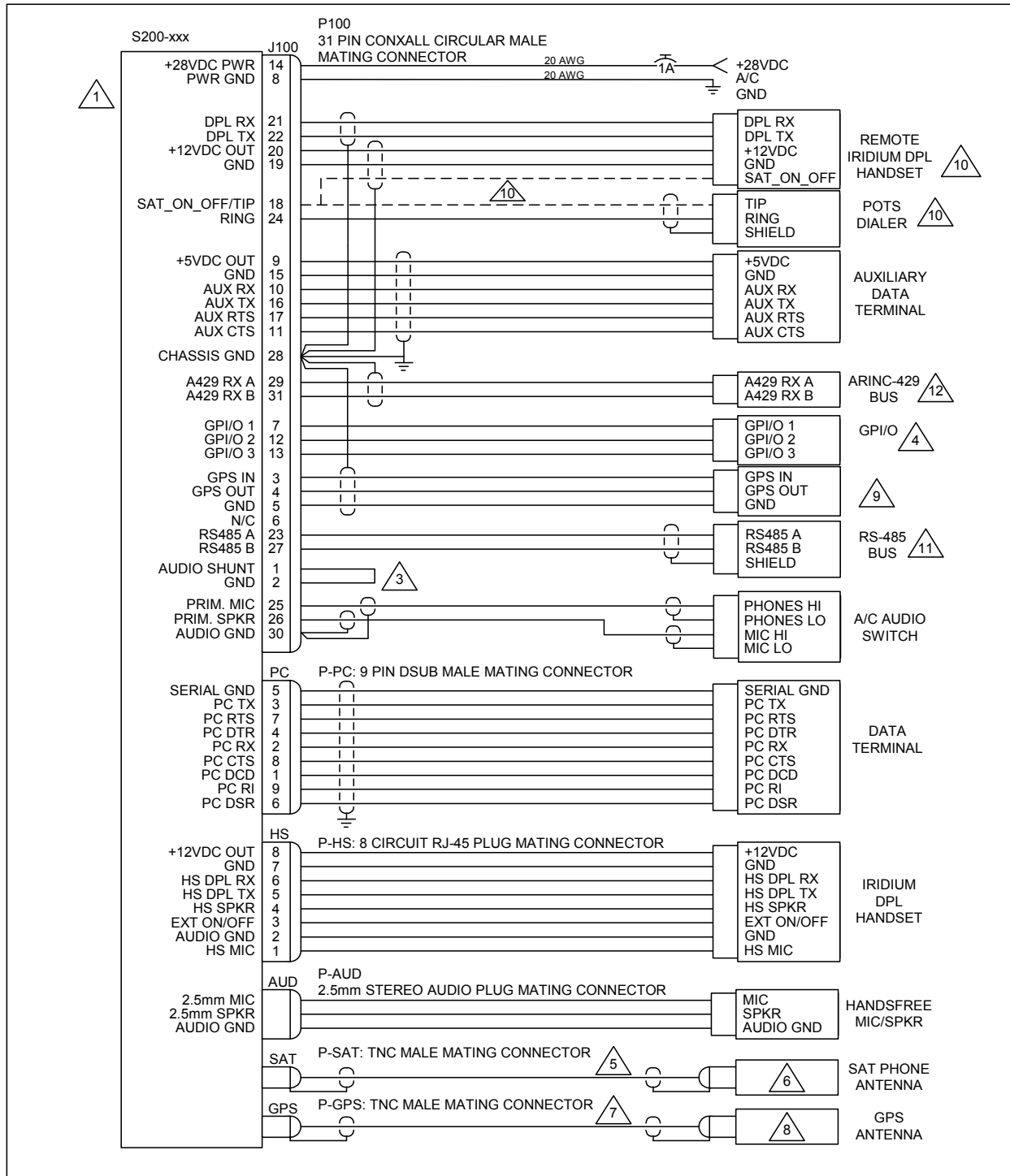
Title	Drawing #	Rev #	Appendix
Skynode S200-001 Satcom System Interconnect	1107-M-441	A 10Dec05	B
Skynode S200-003 Satcom System Interconnect	1107-M-442	A 10Dec05	C
Skynode S200-011 Satcom System Interconnect	1107-M-443	A 10Dec05	D
Skynode S200-012 Satcom System Interconnect	1107-M-444	A 10Dec05	E

**Table 8: List of System Interconnect Drawings**

NOTE. A typical installation will generally not require all S200 ports/pins to be connected.

# Skynode S200 Installation and Operation Manual

## 3.3.1. Interconnect





CONFIDENTIAL AND PROPRIETARY TO LTC	Latitude Technologies Corporation			
	S200 External Interconnect			
DWG TYPE: INTERCONNECT	SIZE A	DATE Jan 06/06	PART NO S200-0xx	REV 1.04
FILE: S200-305-001.VSD	SCALE 1 : 1	DRAWN: MI	SHEET 1 OF 2	


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REVISIONS			
REV	SHEET	DATE	DESCRIPTION OF CHANGE
1.01	1	AUG 2005	- Changed Breaker Current Rating
1.02	1,2	SEP 2005	- Updated Chassis Ground
1.03	1	DEC 2005	- Updated SAT_ON_OFF/TIP name
1.04	1	JAN 2006	- Updated Chassis GND, rearranged signals


**NOTES:**


- 


ALL WIRES SHOULD BE 22 AWG UNLESS OTHERWISE SPECIFIED.  
ALL WIRES SHOULD BE IN ACCORDANCE WITH MIL-W-22759.  
ALL SHIELDED CABLES SHOULD BE IN ACCORDANCE WITH MIL-C-27500.
  
- 


PINS 1-2 ON J100 SHOULD BE SHORTED IF AUDIO IS PRESENT ON PINS 25-26 OF J100
  
- 


GPI/O SIGNALS MUST BE WITHIN 0-3.3VDC RANGE.
  
- 


MAXIMUM INSERTION LOSS < 3dB. I.e: < 12' RG400, or<50' LMR400 or equivalent CABLE/CONNECTOR ASSEMBLY.
  
- 


SAT PHONE ANTENNA PART: Acceptable P/N's: Sensor Systems S67-1575-109, Antcom P/N: S3IR16RR-P-XTB-1 or Antcom P/N: S5GIR15161RR-AP-XTT-X-1.
  
- 

OPTIMUM GAIN IS BETWEEN 12 TO 18dB. I.e. < 18' RG400, OR 50' LMR240 CABLE/CONNECTOR ASSEMBLY.
  
- 

GPS ANTENNA PART: Acceptable P/N: Sensor Systems S67-1575-39, Antcom P/N: 3G1215A2-XT-1 or Antcom P/N: S5GIR15161RR-AP-XTT-X-1.
  
- 

GPS IN: A RS232 serial data input dependant on the SN200-xxx program setup.  
GPS OUT: A RS232 serial data output of GPS data.
  
- 

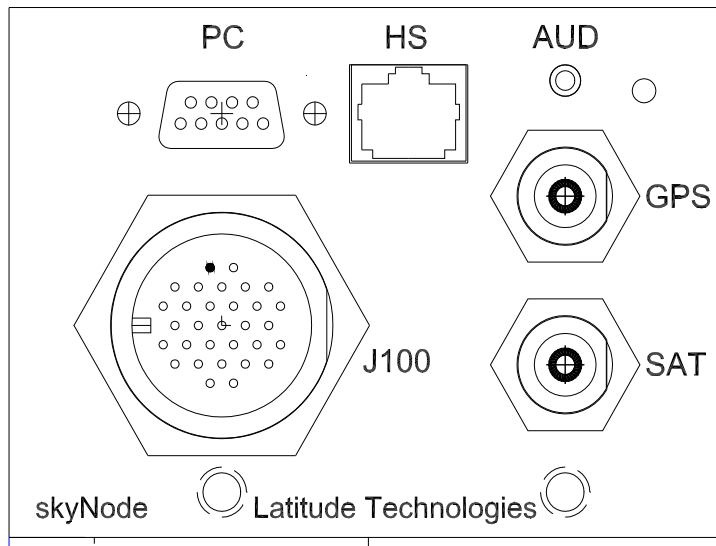
Either POTS DIALER OR Remote Iridium DPL Handset to be installed, not both. POTS DIALER Interface only available on "S200-x2x" configured models. SAT\_ON\_OFF/TIP signal (and subsequent shielding setup) to be installed for either POTS interface or Remote Iridium DPL Handset, not both.
  
- 

RS485 data bus interface available only on S200-xx2 and S200-xx3 models.
  
- 

ARINC-429 data bus interface available only on S200-xx2 and S200-xx3 models and is capable of receive mode only.

CONFIDENTIAL AND PROPRIETARY TO LTC	Latitude Technologies Corporation			
	Skynode S200 Voice and Data Satellite Transceiver			
DWG TYPE: INTERCONNECT	SIZE A	DATE Jan 06/06	PART NO S200-0xx	REV 1.04
FILE: S200-305-001.VSD	SCALE 1 : 1	DRAWN: MI	SHEET 2 OF 2	

**3.3.2. Front Panel**



**Figure 6 – S200 Front Panel Layout**

Port Name	Description	Type	Mates with... (cable side)	Notes
PC	RS232 Serial Data Port	D9 pin-female	D9 pin-male connector	Details table 6
HS	Handset jack	RJ-45 receptacle	DPLS0401 Handset	Ground operation: Full phone & text messaging functions
AUD	Hands-free Microphone and Audio jack	2.5 mm stereo receptacle	2.5 mm stereo plug	Limited amplification, use J100 instead for noisy environments
Status	Status Indicator	Yellow LED		Lit when power ON
J100	Main power and data I/O connector	Circular 31 pin jack	Conxall Mega-Con-X p/n: 23280-31SG-350	Details table 10
SAT	Iridium Antenna connector	TNC bulkhead jack	TNC Plug (male)	Refer to Sec 3.2.5 & 3.2.6.2
GPS	Active GPS Antenna connector	TNC bulkhead jack	TNC Plug (male)	+5VDC, max 100mA center pin bias (refer to Sec 6.2)

**Table 9 – S200 Front Panel Description**

### 3.3.3.J100 Connector

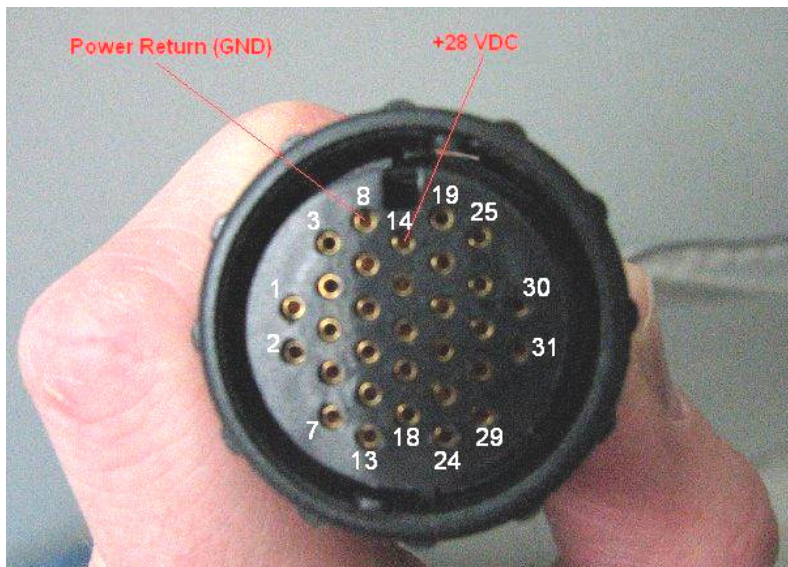
Pin	Name	Description	Pin	Name	Description
1	Audio Shunt	Input	17	AUX RTS	RS232 signal
2	Ground	0V reference	18	TIP**	Analog POTS signal
3	GPS IN	RS232 data RX	18*	EXT_ON_OFF	Discrete I/O (handset)
4	GPS OUT	RS232 data TX	19	Ground	0V reference (handset)
5	Ground	0V reference	20	+12 VDC OUT	12VDC max 0.5A (handset)
6	N/C		21	DPL RX	RS232 data (handset)
7	GPI/O 1	0-3.3VDC discrete I/O	22	DPL TX	RS232 data (handset)
8	PWR GND	0V return	23	RS485 A***	Differential data
9	+5 VDC OUT	5VDC max 0.5A	24	RING**	Analog POTS signal
10	AUX RX	RS232 signal	25	PRIM MIC	Mic analog input
11	AUX CTS	RS232 signal	26	PRIM SPKR	Audio Speaker analog output
12	GPI/O 2	0-3.3VDC discrete I/O	27	RS485 B***	Differential data
13	GPI/O 3	0-3.3VDC discrete I/O	28	Chassis GND	Chassis Ground
14	+28 VDC	Power input	29	A429RX A***	ARINC-429 receiver
15	Ground	0V reference	30	AUDIO GND	Audio 0V reference
16	AUX TX	RS232 data	31	A429RX B***	ARINC-429 receiver

\*Applies only to models S200-01x that support the LT-DPLS0401 handset dialler.

\*\* POTS models S200-x2x, have not yet been formally approved by Transport Canada.

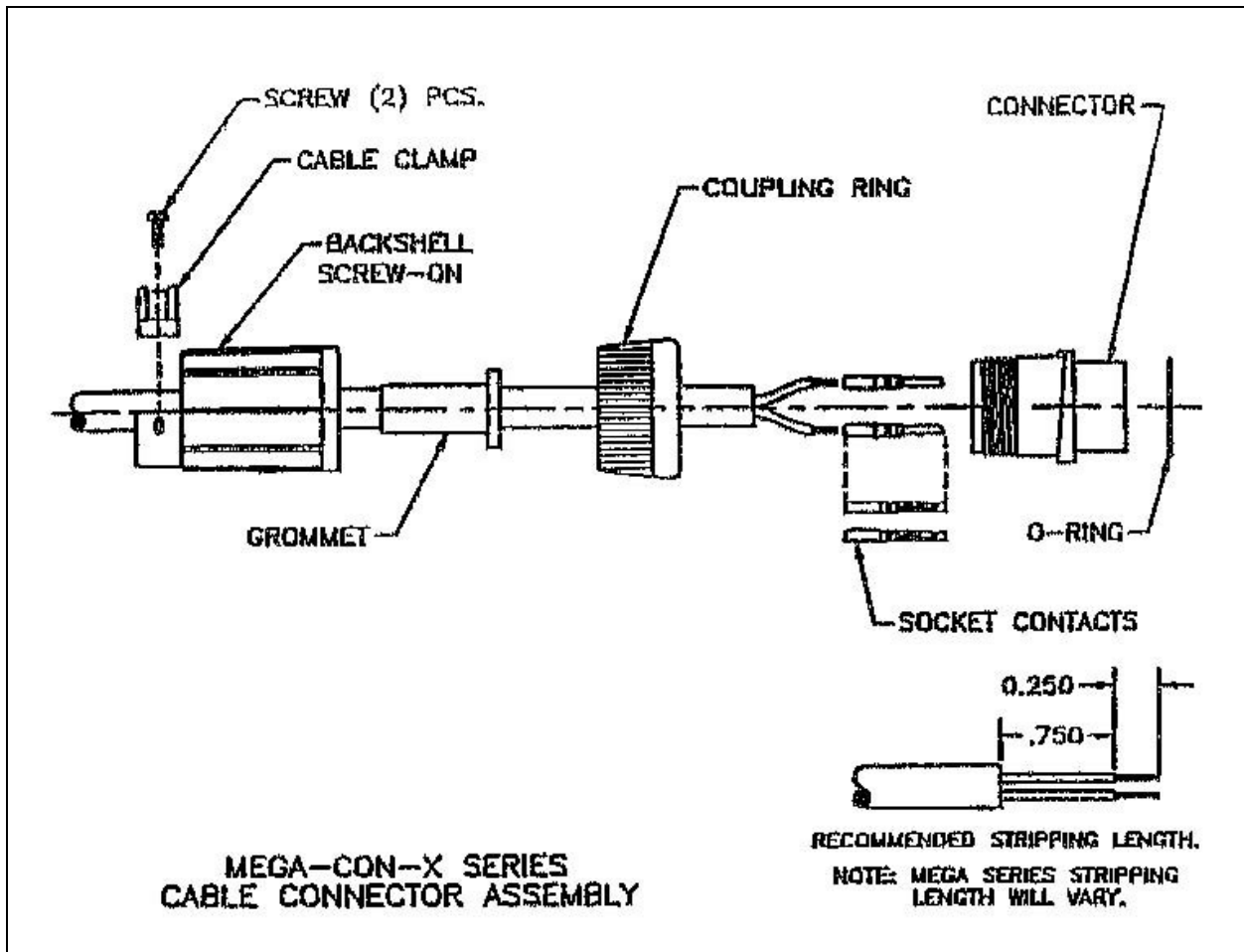
\*\*\* Present only in models S200-0x2 and S200-0x3.

**Table 10 – J100 Connector Pin-outs**



**Figure 7 – Quick-connect Cable Plug (p/n: 23280-31SG-350) mates with J100.**





**Figure 8 - Assembly diagram for Quick-connect Plug (p/n: 23280-31SG-350). IMPORTANT: Crimp socket contact pins are not removable without a special factory tool once inserted into the connector body.**

**Crimp Tool:** Use Daniels M22520/2-01 and Daniels SK2/2 Positioner.

### 3.3.4. PC Port

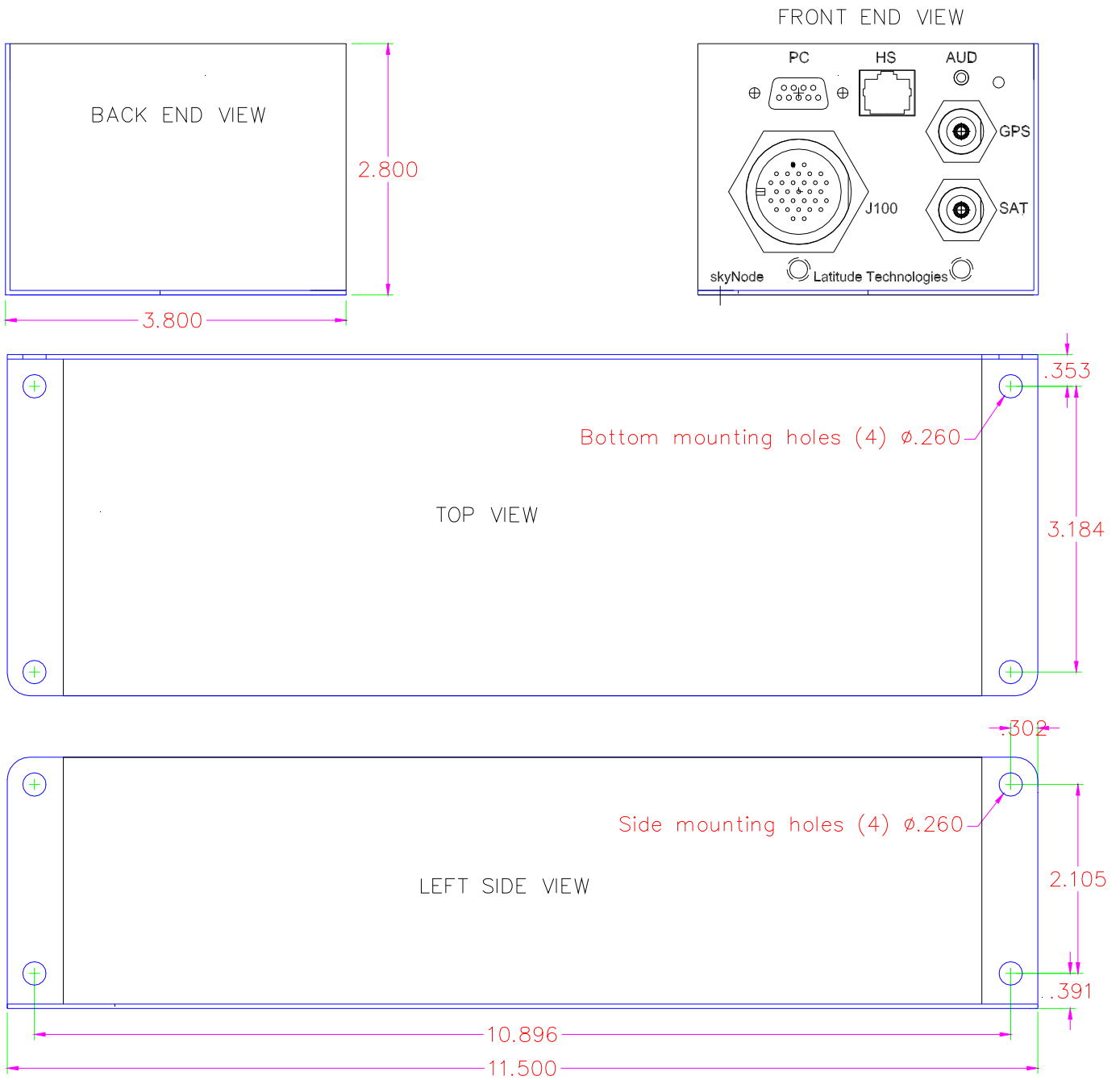
The PC Port is typically used to connect the S200 to a PC or Laptop for dial-up-data applications, diagnostic or firmware updating.

Pin	Name	Description	Pin	Name	Description
1	DCD	RS232 signal output	6	DSR	RS232 signal output
2	RX	RS232 data output	7	RTS	RS232 signal input
3	TX	RS232 data input	8	CTS	RS232 signal output
4	DTR	RS232 signal input	9	RI	RS232 signal output
5	Ground	0V reference			

**Table 11 - PC Port Pin-outs. Note: The S200 is a RS232 "DCE".**

### 3.4. Mechanical

#### 3.4.1. Dimensions and Mounting Hole Locations



**Figure 9 – Skynode S200-xxx Enclosure Dimensions.**

### 3.5. Antenna Installation Checklist

For mechanical installation instructions, refer to the STC approved drawing for the specific aircraft being modified.

### 3.6. S200-001 Installation Checklist

		TECH	INSP
b)	<b>For Skynode S200-001 Installation</b>		
i)	Mechanically Install the S200 unit in accordance with the aircraft specific equipment mounting drawing		
ii)	Route wiring in accordance with the aircraft specific equipment mounting drawing		
iii)	Electrically install the S200 unit in accordance with LTC drawing 1107-M-441 (Appendix B).		
iv)	Test the system in accordance with the "POST INSTALLATION TEST" below.		
v)	Amend the aircraft's documents and make log entries per "CERTIFICATION" below		

### 3.7. S200-003 Installation Checklist

		TECH	INSP
c)	<b>For Skynode S200-003 Installation</b>		
i)	Mechanically Install the S200 unit in accordance with the aircraft specific equipment mounting drawing		
ii)	Route wiring in accordance with the aircraft specific equipment mounting drawing		
iii)	Electrically install the S200 unit in accordance with LTC drawing 1107-M-442 (Appendix C).		
iv)	Test the system in accordance with the "POST INSTALLATION TEST" below.		
v)	Amend the aircraft's documents and make log entries per "CERTIFICATION" below		

### 3.8. S200-011 Installation Checklist

		TECH	INSP
d)	<b>For Skynode S200-011 Installation</b>		
i)	Mechanically Install the S200 unit in accordance with the aircraft specific equipment mounting drawing		
ii)	Route wiring in accordance with the aircraft specific equipment mounting drawing		
iii)	Electrically install the S200 unit in accordance with LTC drawing 1107-M-443 (Appendix D).		
iv)	Test the system in accordance with the "POST INSTALLATION TEST" below.		
v)	Amend the aircraft's documents and make log entries per "CERTIFICATION" below		

### 3.9. S200-012 Installation Checklist

		TECH	INSP
e)	<b>For Skynode S200-012 Installation</b>		
i)	Mechanically Install the S200 unit in accordance with the aircraft specific equipment mounting drawing		
ii)	Route wiring in accordance with the aircraft specific equipment mounting drawing		
iii)	Electrically install the S200 unit in accordance with LTC drawing 1107-M-444 (Appendix E).		
iv)	Test the system in accordance with the "POST INSTALLATION TEST" below.		
v)	Amend the aircraft's documents and make log entries per "CERTIFICATION" below		

### 3.10. Post Installation Test

A failure of any of the below tests requires corrective action before signing off the installation of the SKYNODE system as serviceable.

1. Pull the 1A SATCOM circuit breaker
2. Position the aircraft away from structures to allow the GPS and SATCOM signal reception.
3. Perform a normal ground start with the engine(s).
4. Turn on all normally operated electrical busses and equipment.

5. Confirm normal operation of the audio system.
6. Confirm normal operation of the communication radios.
7. Confirm normal operation of the navigation radios.
8. Confirm normal operation of the navigation GPS unit(s).
9. Note the reading on the stand-by magnetic compass.
10. Push in the 1A SATCOM circuit breaker.
11. Confirm that the SKYNODE system has not introduced any noises into the audio system.
12. Confirm that the communication radios receive and transmit normally without extraneous noises introduced by the SKYNODE system.
13. Confirm that the navigation radios are not affected by the SKYNODE system.
14. Confirm that the navigation GPS unit(s) maintain lock and the WARN indicator does not come on due to the SKYNODE system.
15. Note that the Magnetic Compass has not changed more than 1°.
16. Confirm normal operation of the SKYNODE system data transmission and voice communication (if applicable).

Upon satisfactory completion of all performance checks, make the required log entries and complete the necessary Regulatory Agency paperwork before releasing the aircraft for service.

### **3.11. Continued Airworthiness**

Maintenance of the S200-xxx is "on condition" only. Periodic maintenance of this product is not required.

## **4. Operation**

### **4.1. Normal Start Up**

When power is first applied to a S200-xxx device there is a 6 to 10 second delay before the front panel indicator light (yellow LED) turns ON. During this time the S200 performs an internal diagnostic on its processor, memory, circuit communications, including all model-specific installed modules (transceiver, GPS receiver, audio card, ARINC-429, etc.).

If the indicator light does not come on within 15 seconds, then some aspect of the initialization has failed. Follow procedures outlined in the following sections to help determine the issue and remedy.

During normal operation the indicator light turns on, and the S200 automatically begins its position/data gathering and messaging according to whatever configuration settings have been previously stored in its non-volatile memory (NVRAM).

NOTE. A lit indicator light (i.e. normal start-up condition) does not necessarily mean that the S200 is successfully collecting GPS positions, or that satellite data communication is working. External problems due to factors such as obscured antennas, loose connectors, or network related issues might result in the inability to gather GPS positions or transmit reports over the satellite communication system. Use the following sections to verify successful end-to-end system operation.

### **4.2. Iridium Network Registration**

Before the S200 can operate the Iridium transceiver must have RF communication with the Iridium satellites, and must be able to register to the Iridium network.

The internal SIM (Subscriber Identity Module) card, and IMEI (International Mobile Equipment Identifier) must be activated by an Iridium Service Provider/equipment dealer before the device can be used for either voice or data transmissions over the satellite network.

The S200-xxx is usually shipped from Latitude Technologies in a de-activated state. The End User typically arranges SIM card activation before the dealer ships the unit to them. However, this may not always be the case so it is important to verify that the unit has been provisioned: either directly with the Iridium dealer outlet that the unit was purchased from, or by contacting Latitude Technologies Corporation.

The S200 Serial Number can be located on the equipment label on the S200's top surface.

The IMEI sticker is located on the rear end of the S200.

NOTE 1: For privacy reasons the SIM card number is not displayed on the outside. However both Service Provider and the Manufacturer can provide this if required.

NOTE 2: If a Handset is available to the User or Installer, then Iridium network registration can be easily verified by the LCD screen display by the text "Registered" or by counting 1 or more signal bars in the display's top left hand corner.

## **4.3. AFF System Operation**

### **4.3.1. Introduction**

Automated Flight Following (AFF) operation provides a method for the S200 to automatically relay position or event status reports to a ground-based logistics network.

Reports can be based on time, speed, altitude, or other event triggers including ground contact (logic) switch changes. Depending on the specific application, Aircraft positions are typically displayed on a web-based map system, and are often overlaid with other relevant GIS features like weather, routing, and historical flight tracks.

AFF plays an important role in today's air, ground, and marine fleet routing and safety check-in. This includes applications such as medical evacuation, forestry fire fighting and wherever management of risk and location of critical assets is of primary importance.

### **4.3.2. AFF Registration**

The S200 is designed for AFF operations provided that:

1. The unit has been provisioned by the Iridium Service Provider (satellite phone dealer) to support SBD messaging. Refer to section 4.2 above.
2. The Iridium Service Provider has also provisioned the appropriate SBD destination email addresses.
3. The S200 is installed correctly and is able to register to the Iridium satellite network.
4. The AFF agency has set up your account and provided you with a logon username and password to view your AFF asset.

Contact your supplier or Latitude Technologies directly for more information regarding getting AFF activated and tailored for your specific application. At a minimum, you will likely need to provide the following information:

- S200-xxx serial number
- IMEI number
- Tail number registration

## 4.4. Phone operation

### 4.4.1. Placing a Call from the Iridium phone

To make a phone call the S200-xxx and handset must be turned on, be activated with the Iridium network, and be in contact with the satellite network.

1. Verify the handset display indicates it has sufficient signal strength (more than 2 `bars`).
2. Enter the number to dial in the following format: [International access code, "00" or "+"], [country code, or Iridium country code if calling another Iridium phone] [phone number].
3. Press the "OK" button – you will see "Calling" followed by the number you dialed on the handset display.

Example: To call Latitude Technologies office dial 0012504750203, and then press the OK button.

### 4.4.2. Answering a call

To receive a call the S200-xxx and handset must be turned on, be activated with the Iridium network, and be in contact with the satellite network.

When the phone receives a call it will create an audible ring, and the phone displays "Call", followed by "Answer?".

Press "OK" or any digit key (1 – 9), "\*", or "#". You will see "Connected" on the display.

### 4.4.3. Handset Model Differences

Models S200-xx1 and S200-x1x both support phone operation using the DPLS0401 Handset with a few important differences.

- S200-xx1 models (Handset for *ground use only*):
  - DPLS0401 Handset interfaces via the "**HS**" RJ45 jack located on the S200's front panel. *Refer to Sec 2.5.1 diagram.*
  - Handset has full keypad/display, plus talk and listen functions. Audio amplification is limited to that provided internally by handset volume controls.
  - "Handsfree" MIC and Audio is available thru "**AUD**" high impedance 2.5mm jack located on the S200's front panel.
  - If additional "Handsfree" MIC and Audio amplification is required, it must be provided external to S200. Or, return unit for a factory upgrade.
- S200-x1x models (Handset used for dial-pad operation):
  - LT-DPLS0401 Handset interfaces via the "**J100**" Circular connector. *Refer to Sec 2.5.2 diagram.*



- Handset has keypad/display functions only. It is used as a Dialer or text-messaging pad.
- MIC and AUDIO signals are amplified, suitable for aircraft headsets.
- MIC and AUDIO signals interface via "J100" Circular connector.

## **4.5. Data operations**

### **4.5.1. Typical Tracking Program Operation**

After the Terminal Menu (refer to section 4.5.2 below) has been exited, or if it was never entered at all (i.e. typical autonomous operation), then regular program execution begins as follows.

The SkyNode S200 starts the GPS receiver and after a fix has been determined and saved to memory the S200 attempts to establish a data session with the satellite equipment. If the satellite channel is "busy" (i.e. a voice call may be in progress) or otherwise unable to allow the S200 to setup up a data link, then an error code is returned to the S200 and the S200 will wait for the next available opportunity before trying again.

When the connection is successful, the S200 sends a 30 byte encrypted data packet to the destination host server.

Once a data session is established with the host server, data transfer of all stored position records is completed following the specific S200 protocol conventions. The S200 then checks for acknowledgement and any commands that there may be before terminating the session and closing the satellite link.

After a successful connection session with the host server the S200 executes any instruction received during the communications session, before repeat cycling through its normal program routine of: waiting a Position Reporting Interval period of time, collecting a position, then attempting a new data transmission. And so on.

*Please note: Other application programs are also available to support different information gathering and reporting methods including specialized discrete and serial input/output (I/O) functions. Please contact Latitude Technologies for more information.*

### **4.5.2. Terminal Menu and System set-up**

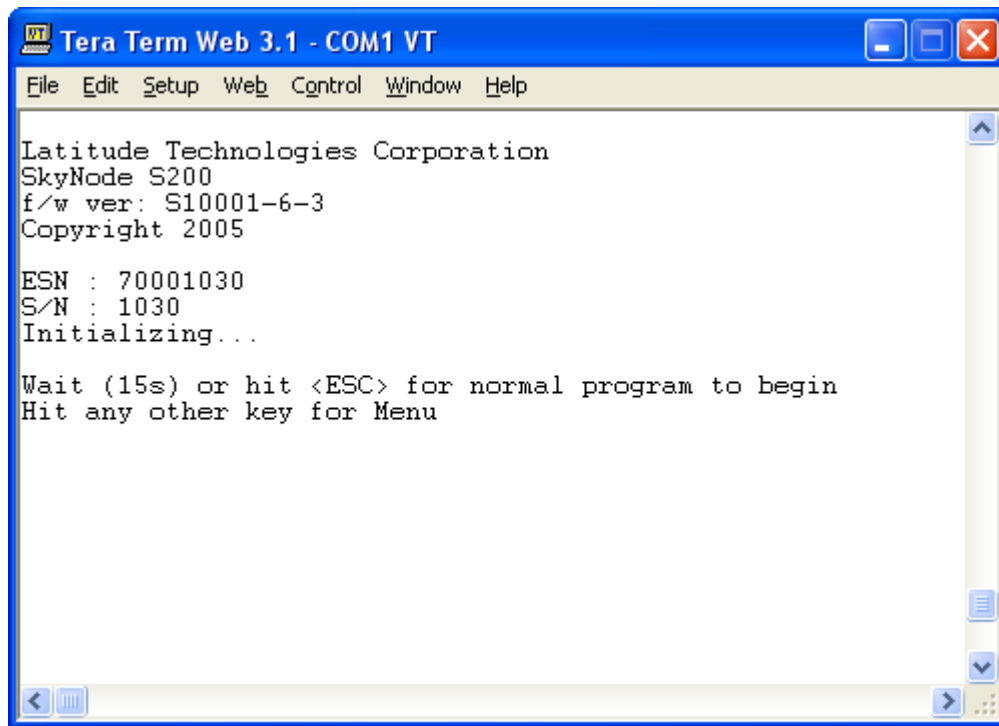
All S200 units are factory pre-configured to standard default settings. However, should the need arise to modify them, the following steps describe how to use the menu to view and configure the reporting parameters of the SkyNode S200 device.

Diagnostic test routines are also available in the menu and are described in [Section 4.8 System Check & Diagnosis](#). *It is highly recommended that all changes be double checked and verified whenever changes are made.*

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Refer to [Appendix A, PC Terminal Set-up](#) to configure a PC Terminal Program to interface to the S200.

To determine what firmware version is currently installed and the unit's serial number power up the S200 and observe the serial port data output display. This screen is only displayed on power up, and lasts about 15 seconds while system initialization is performed. Communication settings are 9600, 8, N, 1.



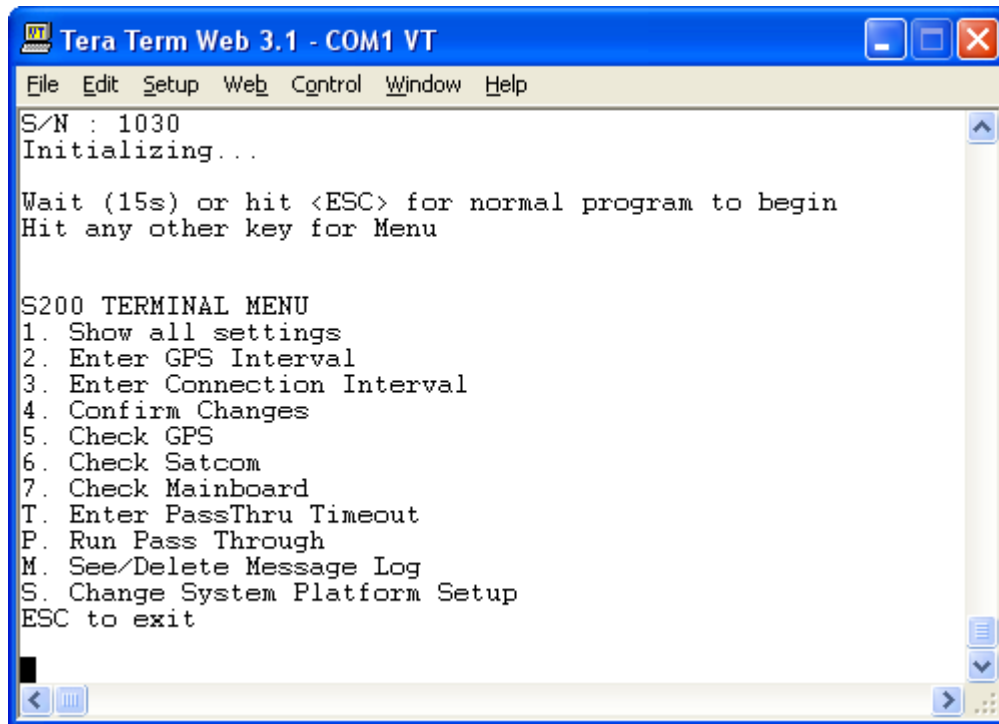
```
Latitude Technologies Corporation
SkyNode S200
f/w ver: S10001-6-3
Copyright 2005

ESN : 70001030
S/N : 1030
Initializing...

Wait (15s) or hit <ESC> for normal program to begin
Hit any other key for Menu
```

**Figure 10 – S200 Startup Screen**

Upon completion of the startup initialization process, the menu will be displayed as shown below.



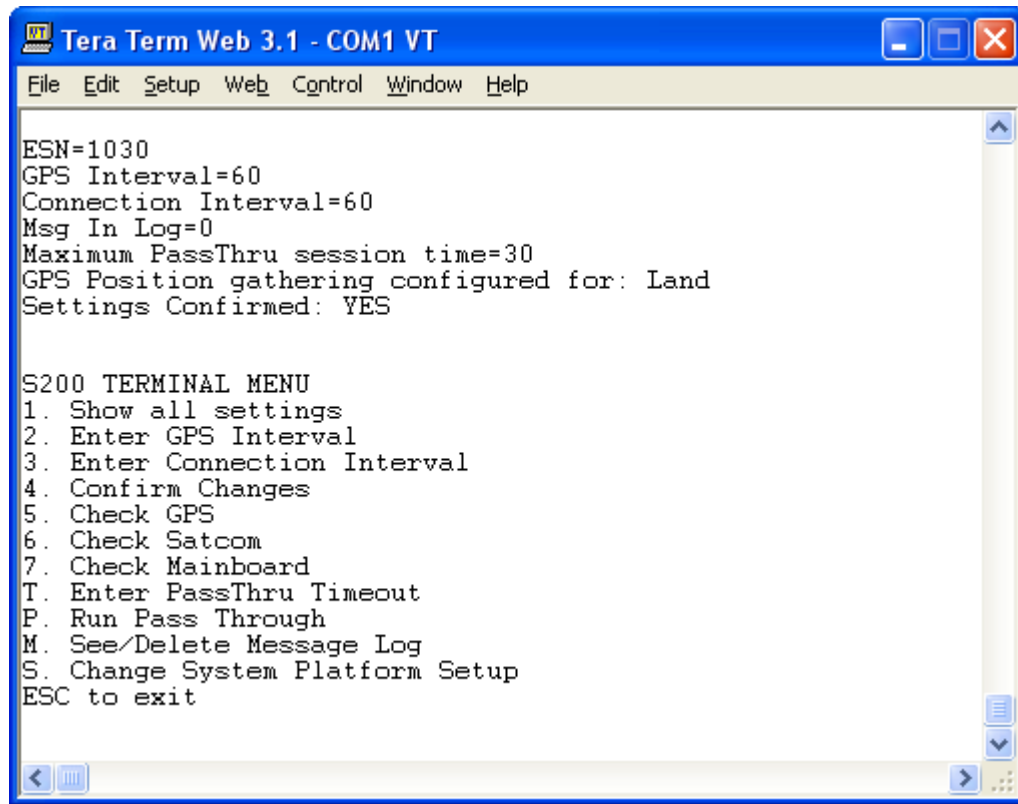
**Figure 11 – S200 Terminal Menu**

All menu entries are accessed by hitting the key to the left of the menu item description. Diagnostic items, as mentioned, are discussed in [Section 4.8 System Check and Diagnosis](#). As such, the following menu items available are:

- 1. Show all settings
- 2. Enter GPS Interval
- 3. Enter Connection Interval
- 4. Confirm Changes
- T Enter PassThru Timeout
- P Run PassThru
- M. See/Delete Message Log
- S. Change System Platform Setup

#### **4.5.3. Showing All Settings**

To display the current settings configured on the S200 unit, press '1' at the Terminal Menu. Following this keystroke, the following screen will be displayed (setting values may vary from that shown in the diagram below). Immediately following display of the settings, the Terminal Menu is reprinted to the screen.



**Figure 12 – Show All Settings function activated**

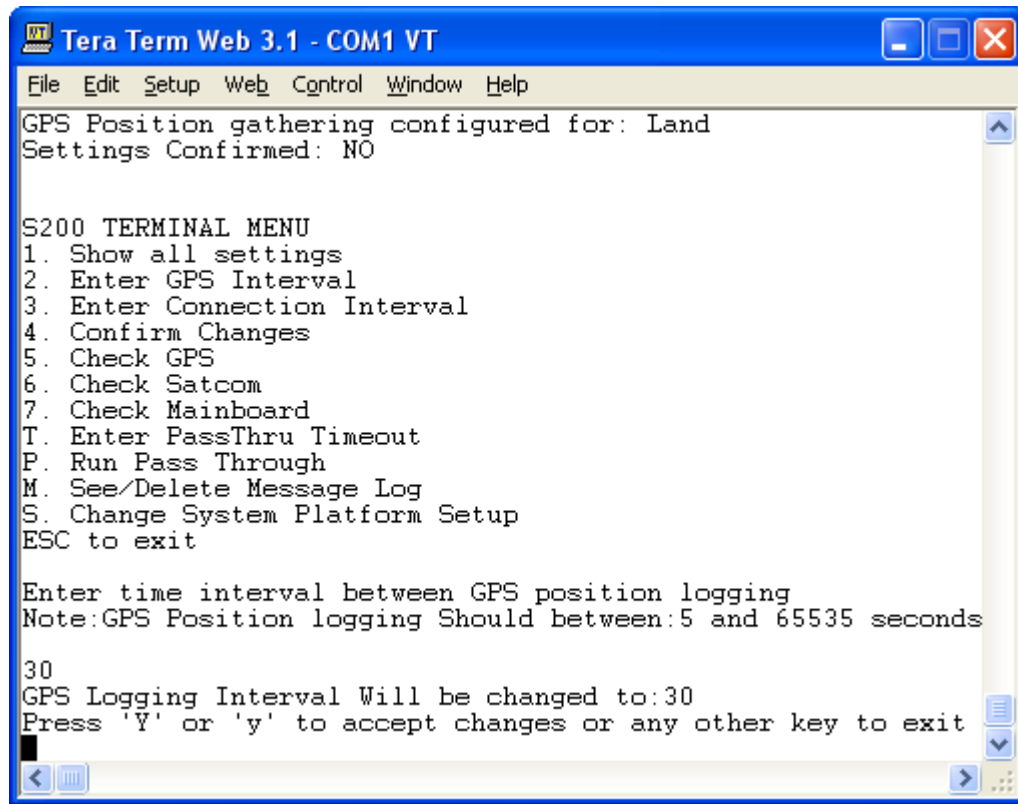
Note the final line of the Settings Display: 'Settings Confirmed: YES'. If the setting on this line is 'NO', the values displayed by performing the Show All Settings function may not be activated. For more information, see [Section 4.5.6 Confirming Changes](#).

#### **4.5.4. Setting the GPS Interval**

The GPS Interval determines the frequency that GPS positions are stored into the internal memory of the S200. GPS Positions will be recorded to memory until the connection interval has been reached (see [Section 4.5.5 Setting the Connection Interval](#)), at which time all stored GPS positions will be transmitted and when confirmed successful, erased from the S200's internal memory.

In order to modify the value of the GPS Interval, press '2' at the Terminal Menu. The user is then prompted to enter the desired GPS interval (in seconds). After the new value is entered, the user will then be prompted to press 'Y' to accept the modification. Please note that the user is still required to perform the Confirm Changes from the Terminal Menu in order to commit the updated values to memory.

The following screenshot shows the entire GPS Interval update process (up to the final accept keystroke).



**Figure 13 – GPS Interval Update Process flow**

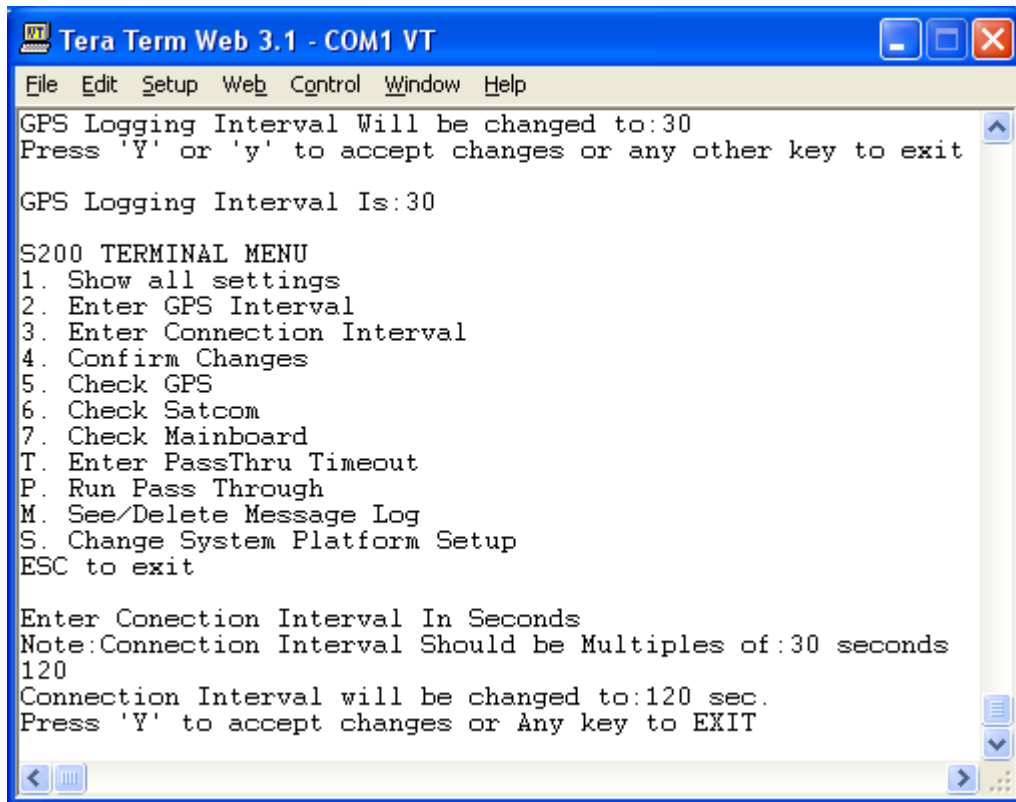
Once the settings have been accepted by pressing 'Y' the Terminal Menu will be reprinted to the screen and the user may continue with other Menu items.

#### **4.5.5. Setting the Connection Interval**

The Connection Interval defines the frequency that the S200 will connect via the Satellite Communication link to transmit stored GPS data to the Sentinel Server or alternate forwarding Server. Due to the S200's internal timing mechanism, the only requirement on the Connection Interval is that it is set as a multiple of the GPS Interval setting. (i.e. if the GPS Interval is 30 s, the Connection Interval can be 30 s, 60 s, 90 s... etc.)

In order to modify the value of the Connection Interval, press '3' at the Terminal Menu. The user is then prompted to enter the desired Connection interval (in seconds). After the new value is entered, the user will then be prompted to press 'Y' to accept the modification. Please note that the user is still required to perform the Confirm Changes from the Terminal Menu in order to commit the updated values to memory.

The following screenshot shows the entire Connection Interval update process (up to the final accept keystroke).



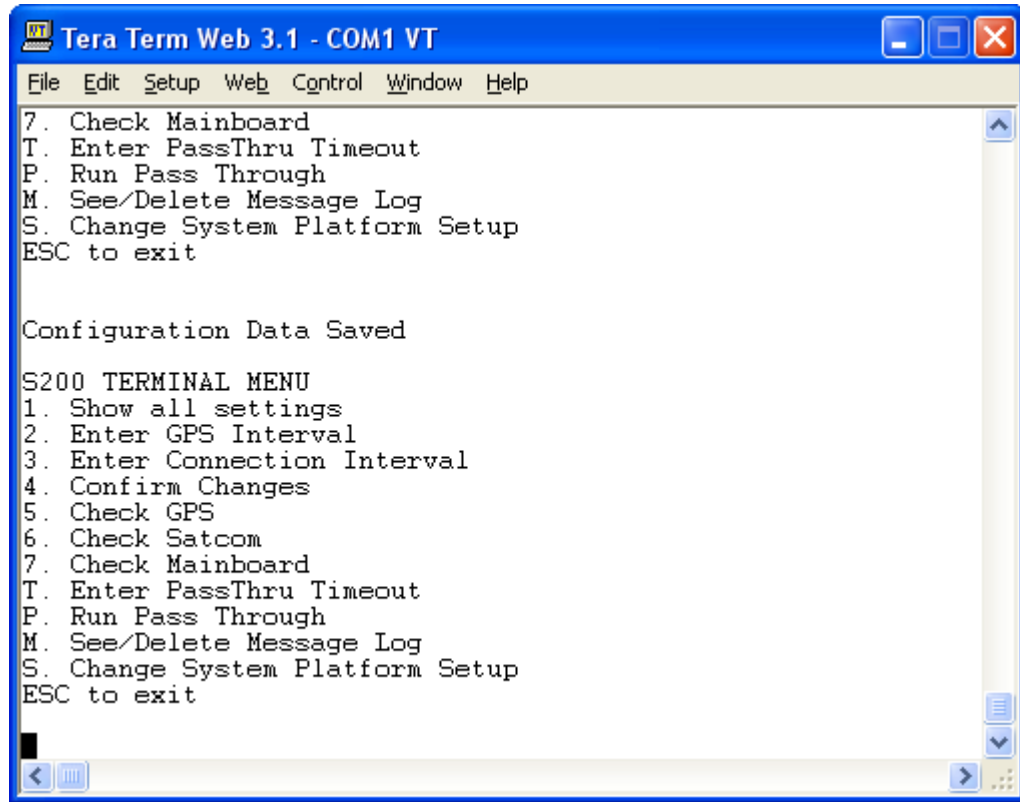
**Figure 14 – Connection Interval Update process flow**

Once the settings have been accepted by pressing 'Y' the Terminal Menu will be reprinted to the screen and the user may continue with other Menu items.

#### **4.5.6. Confirming Changes**

When the user selects '4' in the Terminal Menu, the current configuration settings are committed to the S200's internal memory. After modifying the GPS Interval, Connection Interval, PassThru Timeout, or System Platform Setup, the user **MUST PERFORM A 'CONFIRM CHANGES' FOR THE NEW SETTINGS TO BE STORED.** The 'Confirm Changes' function will store all modified values, so it is not necessary to perform a 'Confirm Changes' after each settings update, but it *must* be performed prior to exiting the Terminal Menu.

In order to commit the configuration settings to memory the user should press '4' at the Terminal Menu. Once pressed, the statement "Configuration Data Saved" will be displayed, and the Terminal Menu will be reprinted. The diagram below shows this process.



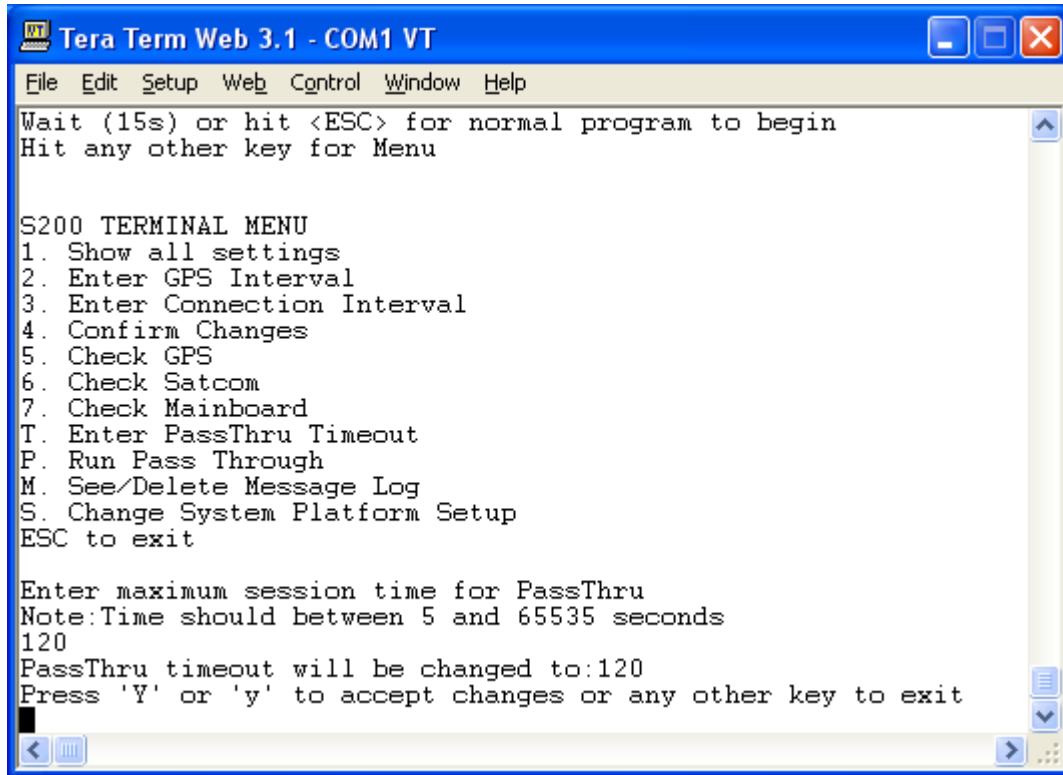
**Figure 15 – Confirming Changes in S200**

#### **4.5.7. Setting Maximum PassThru Timeout**

PassThru mode allows a user direct access (via the S200’s front panel PC PORT connector) to the Satellite Communications equipment internal to the S200. While in PassThru mode, the S200’s internal link to the Satellite Communication equipment is disabled. In order to maintain the S200’s tracking capabilities, a timeout period is imposed on PassThru mode to avoid unnecessarily long PassThru sessions. During PassThru mode, GPS positions will continue to be obtained and stored in internal memory at the configured GPS Interval; however, stored positions will not be transmitted over the Satellite link as this connection is disabled.

In order to modify the PassThru Timeout duration, press 'T' at the Terminal Menu. The user is then prompted to enter the desired PassThru Timeout (in seconds). After the new value is entered, the user will then be prompted to press 'Y' to accept the modification. Please note that the user is still required to perform the Confirm Changes from the Terminal Menu in order to commit the updated values to memory.

The following screenshot shows the entire PassThru Timeout update process (up to the final accept keystroke).



**Figure 16 – PassThru Timeout update process flow**

Once the settings have been accepted by pressing 'Y' the Terminal Menu will be reprinted to the screen and the user may continue with other Menu items.

#### **4.5.8. Running PassThru**

In order to launch the PassThru mode from the Terminal Menu press 'P'. This will start an untimed PassThru session. For more information on PassThru mode see [Section 4.7 PassThru Data Access](#) .

A screenshot showing entry into PassThru mode is provided below. Once PassThru mode has been entered via the Terminal Menu the only way to disable it and therefore return to regular program operation is to toggle the DTR signal of the PC Port. This may be achieved by simply disconnecting and reconnecting the serial cable on the front panel of the S200.



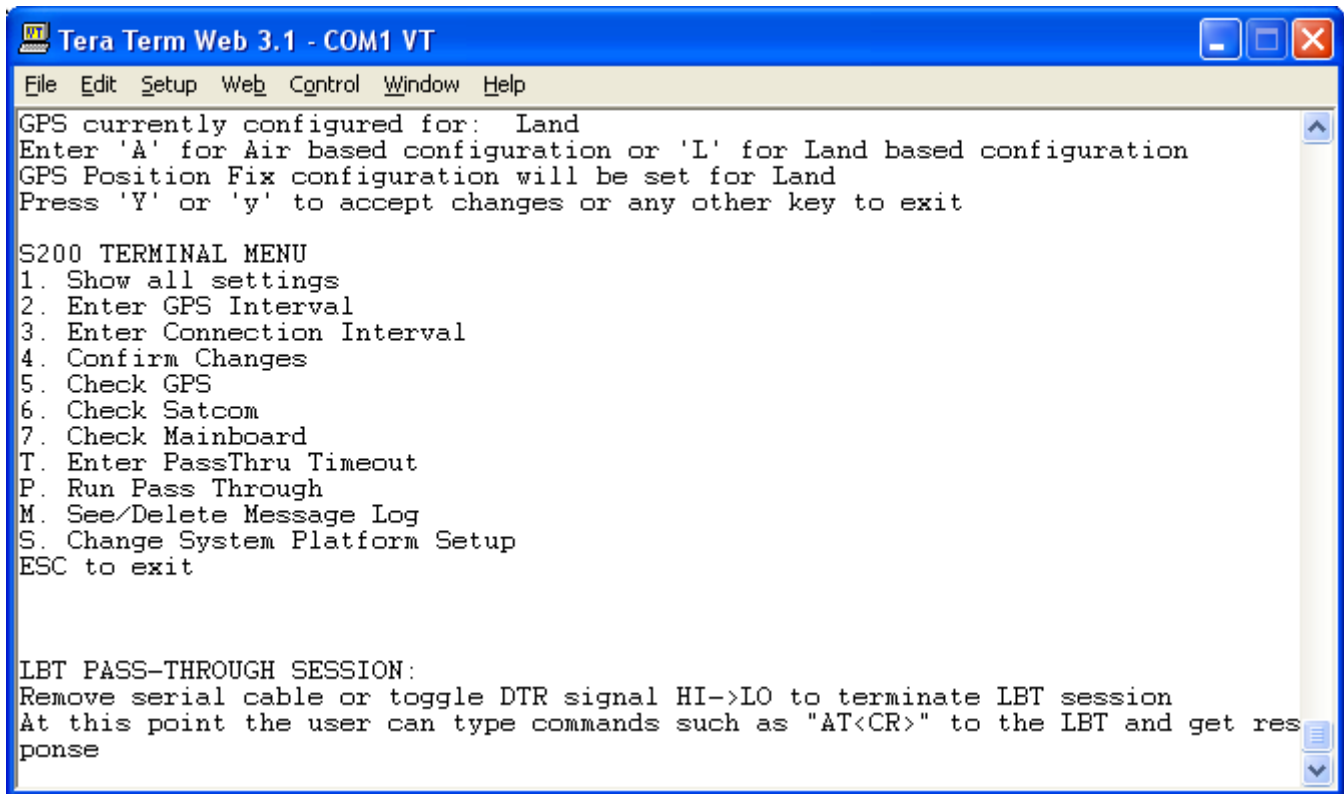


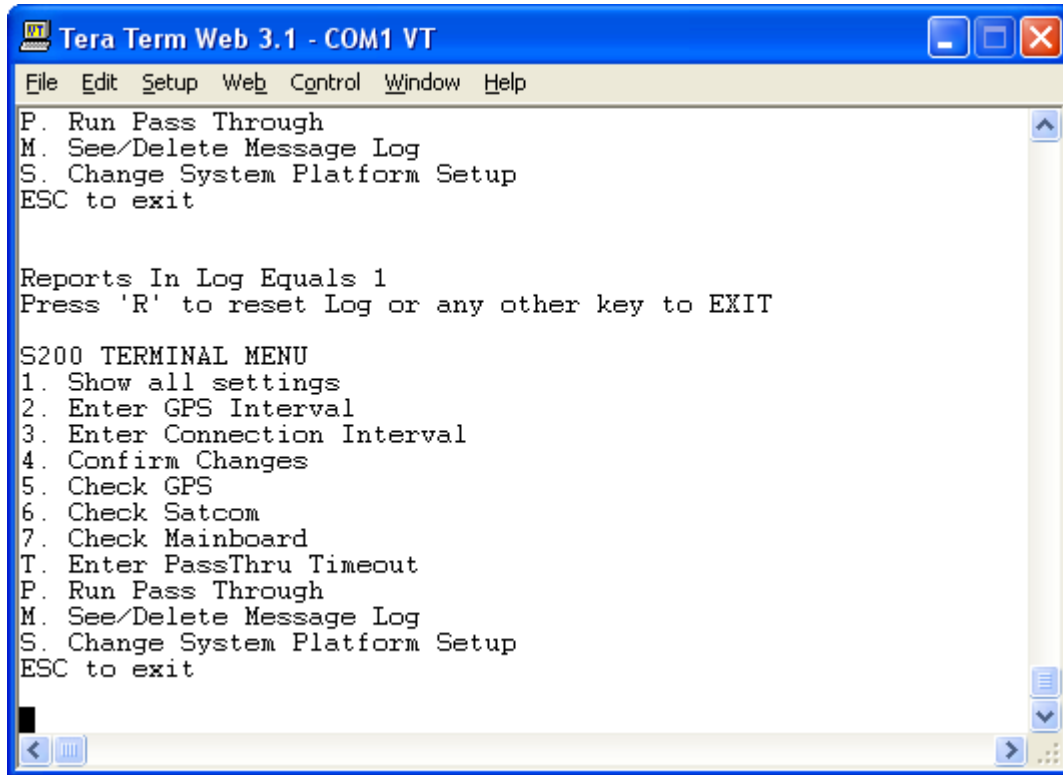
Figure 17 – PassThru Mode entry screen

#### 4.5.9. Message Log Settings

By selecting 'M' in the Terminal Menu the user will be provided with the number of GPS positions currently stored in the S200's internal memory. If the user wishes, these GPS positions can be deleted from memory so that they are not transmitted. Once prompted, the user may select 'R' to reset the log to 0 messages.

If any other key is pressed at this point the Terminal Menu will be reprinted and the GPS messages stored to memory will be left alone.

The following figure shows the flow that occurs by first pressing 'M' and following it with 'R'. The Terminal Menu is reprinted following the resetting of the log.



**Figure 18 – Message Log View/Delete process flow**

#### **4.5.10. System Platform Setup**

The S200's GPS receiver performance can be optimized for AIR, LAND or MARINE vehicle platform types.

If the S200 is to be utilized for vehicular tracking or marine tracking, the user should select "Land" based optimization. If the S200 is to be utilized in an aircraft, the user should select "Air" based optimization. The factory default setting is "AIR".

In order to modify this setting, the user should begin by pressing 'S' to enter the "Change System Platform Setup". The user will then be prompted to select either "Land" or "Air" based configuration by selecting 'L' or 'A' respectively. Once the selection has been made, the user will be prompted to accept the changes by pressing 'Y'.

The screenshot below shows the process flow where the "Land" based configuration has been selected. The flow is identical for the "Air" based selection with the exception of the confirmation statement.

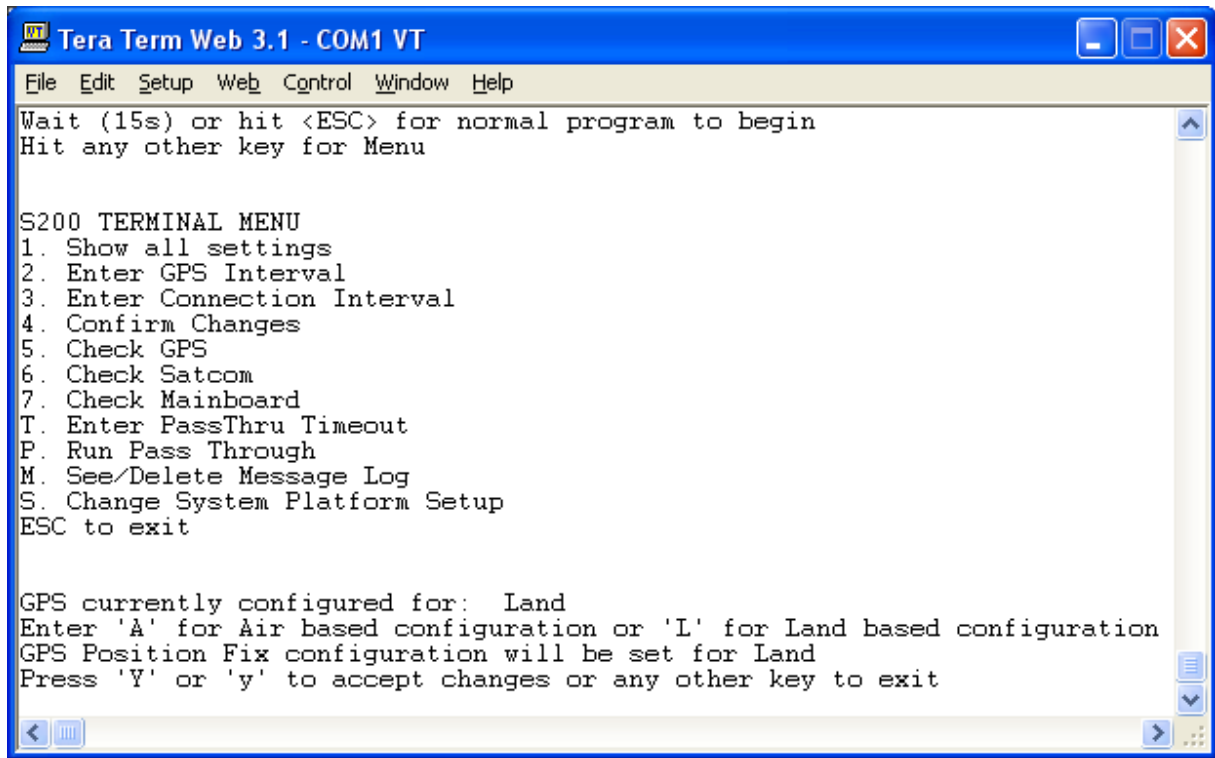


Figure 19 – System Platform Selection update process flow

#### 4.5.11. Continuing with Regular Operation

When the user has completed all required modifications to the system configurations, regular operation of the S200 can be achieved by pressing <ESC> or by waiting for approximately 15 seconds. After this timeout period, if the <ESC> has not yet been pressed, the Terminal Menu will be exited and the S200 will begin its regular operation functions.

It should be noted that while in the Terminal Menu, GPS positions are not stored to the S200's internal memory.

#### 4.6. Remote Configuration

It is possible to send configuration instructions to the S200 to modify its operation via a remotely connected terminal. Please contact Latitude Technologies Corporation for further details and assistance.

#### 4.7. Pass-thru™ Data Access

It is possible for a DTE device, such as a PC, laptop, or PDA application to have direct access to the internal Iridium Satellite radio modem.

S200 Pass-thru is typically employed to access Iridium World Data Services: Dial-Up Data or Direct Internet communication sessions to run email, ftp, or web browser applications. Pass-thru access may also be used for other specialty modem configuration or communication routines including SMS or SBD packet data.

To initiate a Pass-thru session the DTE must first have its RS232 terminal interface set to 9600 baud, 8 bits, No parity, 1 stop bit, flow control OFF.

There are two ways to initiate a Pass-thru session:

- i. Method 1: From the start-up menu "Pass-thru" option. Choosing this method allows the user an unlimited time (no timeout) of Iridium modem access. During this time all other S200 functions are dormant. If a Handset is connected it will indicate the call channel status. To end the Pass-thru session, the "DTR" RS232 signal line must be toggled – which is typically done by some dial-up programs. An alternative method to do this manually is to physically disconnect the RS232 serial cable between the S200 and the DTE (i.e. the laptop).
- ii. Method 2: At any point in normal S200 operation if the characters "+++" are typed rapidly then the S200 will enter Pass-thru mode. Note that the maximum session time is dependant on whatever the MaxPassThruTime value set by the user in the Start-up menu. To end the Pass-thru session, you may either wait until the MaxPassThruTime has elapsed, or alternatively as described above, use the "DTR" toggle method to immediately terminate the session.

When a Pass-thru session is finished, all modem settings revert to the default S200 configuration.

Note: When using Windows Dial-up adapter programs, it may first be necessary to run a "pre-dial screen" to send the "+++" to the S200 and initiate Pass-thru.

### **4.8. System Check & Diagnosis**

Within the S200 Terminal Menu there are some diagnostic functions that provide useful feedback on the operation of internal components in the S200. These tests can also be helpful to check the working/not working state of some of the S200's peripheral components, such as GPS and Satcom antenna and cabling.

There are three diagnostic tests that can be performed from the S200 Terminal Menu: GPS verification, Satcom verification and Mainboard verification, selected with '5', '6', and '7' respectively.

#### **4.8.1. Checking the GPS**

## Skynode S200 Installation and Operation Manual

In order to verify the operation of the GPS receiver, press '5' at the Terminal Menu. The GPS diagnostic routine will begin with streamed NMEA outputs from the GPS receiver to the screen. If the NMEA stream is output, the GPS is likely functioning properly, although this does not necessarily mean that it will be able to achieve a valid position. It is not necessary to understand the information provided in the NMEA outputs. At the end of this output stream a simple Diagnostic message will present information on the status of achieving a position fix (or valid position). There are two possible statements presented after the NMEA stream:

"Analyzing GPS Data... position fix OK"

OR

"Analyzing GPS Data... position not yet acquired"

The first possible output indicates that the GPS receiver is functioning as expected.

If the second message is presented, the GPS receiver may have not acquired a position fix yet. Repeated iterations of the GPS Diagnostic will likely result in a "position fix OK" message.

If the GPS receiver is unable to achieve a valid position in 5 minutes, check the antenna connection and ensure that the antenna has a clear unobstructed view of the sky before continuing.

The screenshot below shows an output where the position fix has been achieved.

```

Tera Term Web 3.1 - COM1 VT
File Edit Setup Web Control Window Help
$GPGSA,A,3,02,30,04,06,09,07,10,05,,,,,1.70,1.08,1.32*04
$GPGSV,3,1,10,05,77,232,46,02,72,098,48,30,54,297,52,04,38,055,49*7F
$GPGSV,3,2,10,06,20,271,43,09,16,203,36,10,11,150,42,07,10,086,44*7F
$GPGSV,3,3,10,01,01,319,,24,01,042,,,,,,*72
$GPRMC,205853,A,4827.0668,N,12322.7507,W,0.000,0.0,020106,19.2,E*56
$PRWIZCH,02,7,30,7,04,7,06,7,09,7,07,7,10,7,05,7,01,0,24,2,00,0,00,0*41
$GPGGA,205854,4827.0668,N,12322.7507,W,1.08,1.08,21.4,M,-17.3,M,,*74
$GPGSA,A,3,02,30,04,06,09,07,

Analyzing GPS Data... position fix OK

S200 TERMINAL MENU
1. Show all settings
2. Enter GPS Interval
3. Enter Connection Interval
4. Confirm Changes
5. Check GPS
6. Check Satcom
7. Check Mainboard
T. Enter PassThru Timeout
P. Run Pass Through
M. See/Delete Message Log
S. Change System Platform Setup
ESC to exit
    
```

Figure 20 – GPS Diagnostic output

#### 4.8.2. Checking the Satcom

By selecting '6' in the Terminal Menu the S200 will perform a check of the availability and quality of the Satellite link. In order for valid information to be displayed as a result of performing this diagnostic, the satellite link must have had sufficient time to achieve its preliminary communication with the satellites.

Once this has been achieved that the Satellite equipment has been confirmed to be registered on the Satellite network the remainder of the diagnostic information is related to the quality of the network link. Below are two screenshots showing two likely outcomes of performing the Satcom Check.

Note that a likely cause of the Satcom diagnostic indicating that the phone is not registered with the network is that the diagnostic was performed too soon, and the phone was not provided enough time to be verified by the satellite network. If this occurs, repeating the Satcom Check test will likely result in a successful diagnostic.

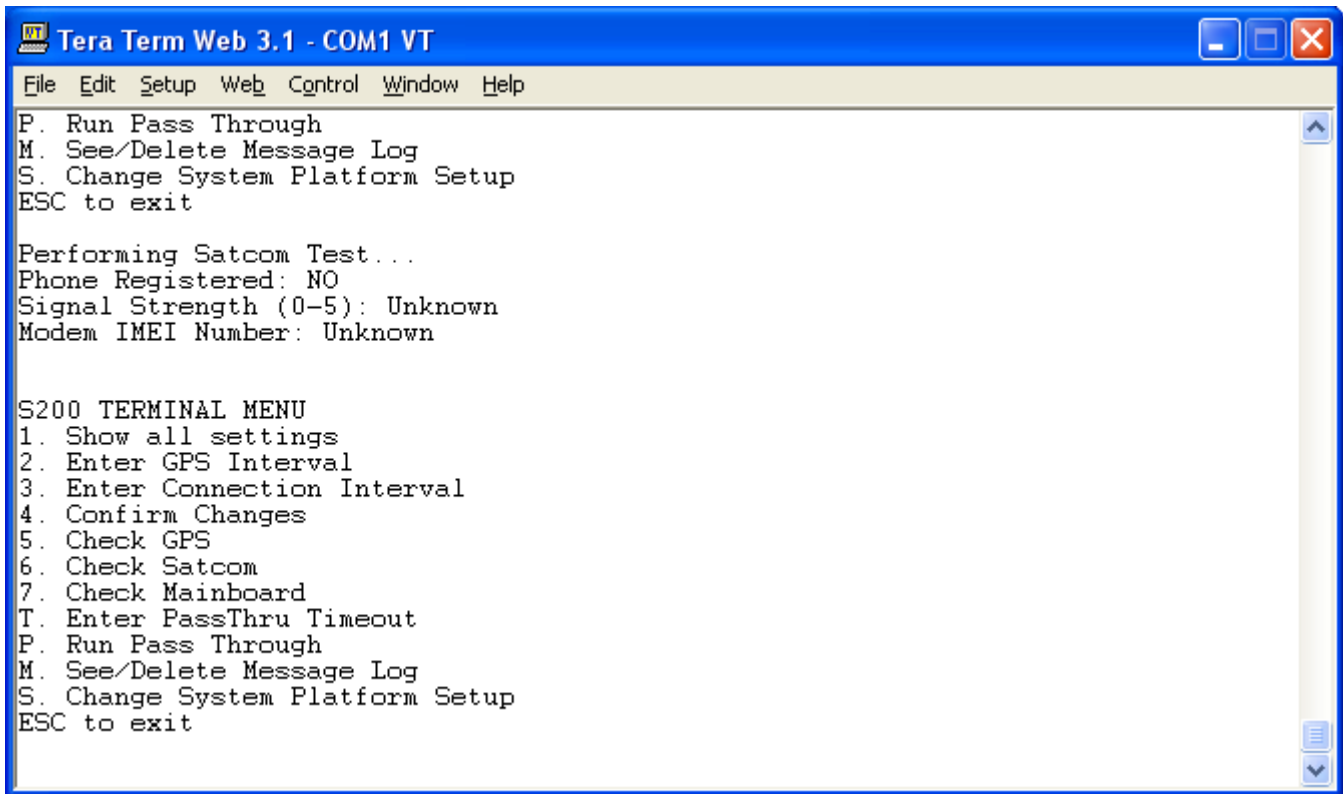


Figure 21 – Satcom Diagnostic returning Failure condition

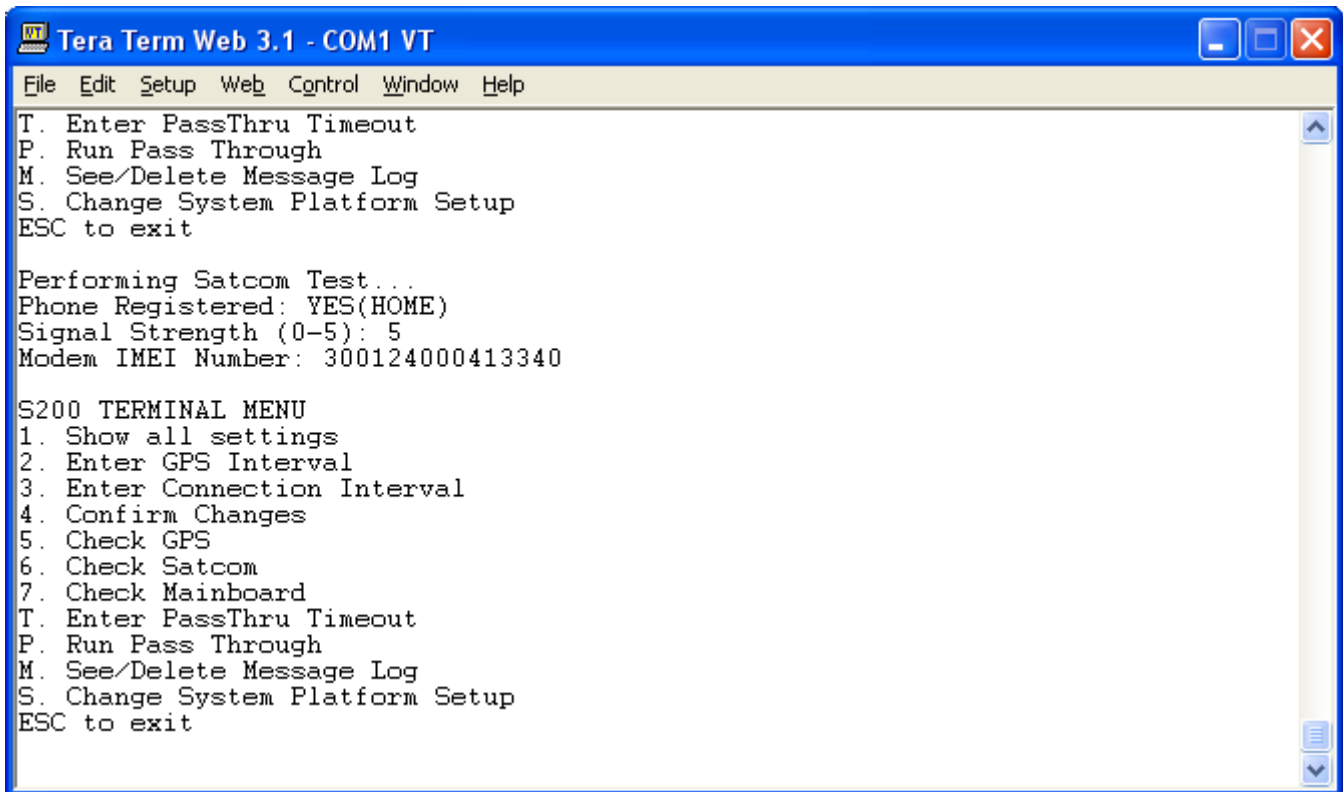
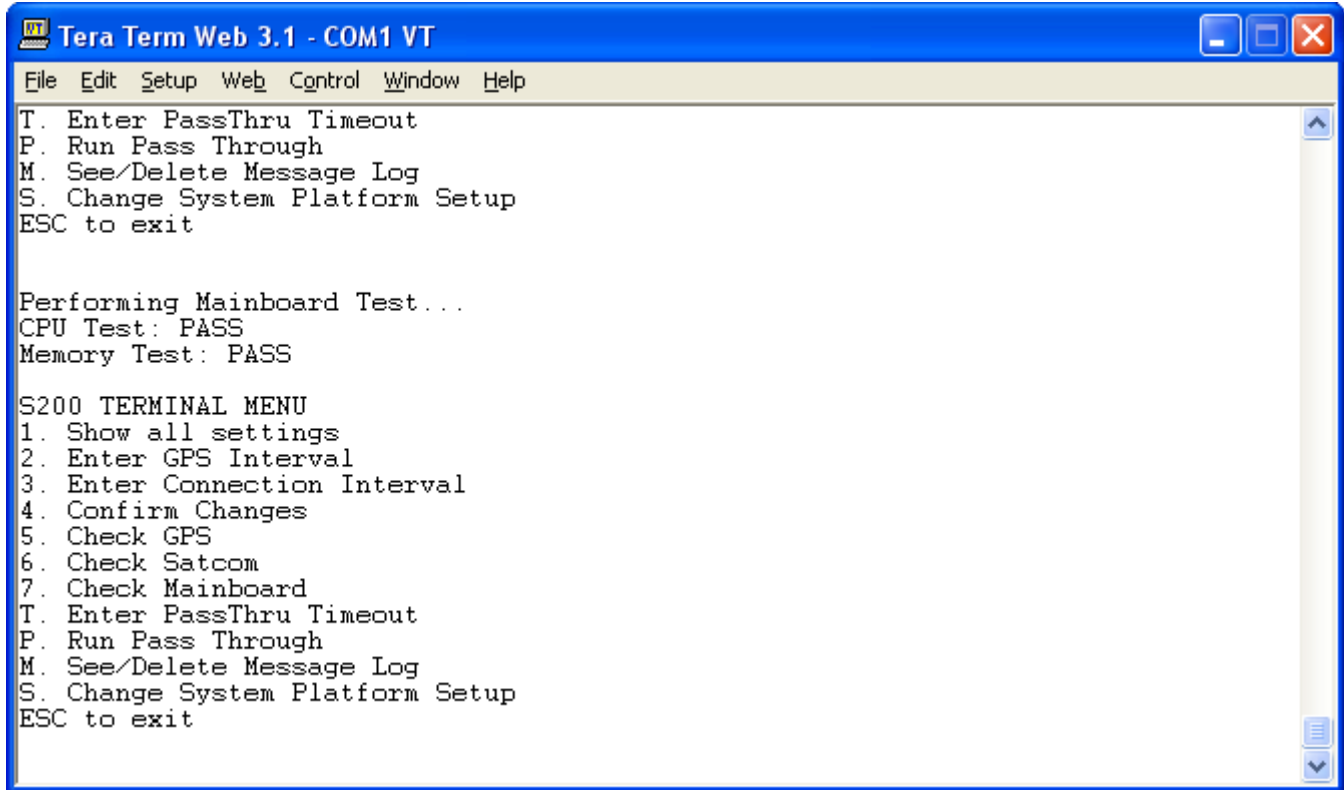


Figure 22 – Satcom Diagnostic returning Success condition

### 4.8.3. Checking the Mainboard

The final diagnostic test relates to internal validation of the operation of the main controller board inside the S200. The outputs provided by this test are displayed in the screenshot below.



```
Tera Term Web 3.1 - COM1 VT
File Edit Setup Web Control Window Help
T. Enter PassThru Timeout
P. Run Pass Through
M. See/Delete Message Log
S. Change System Platform Setup
ESC to exit

Performing Mainboard Test...
CPU Test: PASS
Memory Test: PASS

S200 TERMINAL MENU
1. Show all settings
2. Enter GPS Interval
3. Enter Connection Interval
4. Confirm Changes
5. Check GPS
6. Check Satcom
7. Check Mainboard
T. Enter PassThru Timeout
P. Run Pass Through
M. See/Delete Message Log
S. Change System Platform Setup
ESC to exit
```

Figure 23 – Mainboard Check Diagnostic output

## 4.9. Troubleshooting

For troubleshooting assistance please contact:

Latitude Technologies Support Desk:  
Tel: (250) 475-0203  
Fax: (250) 475-0204  
Email: [info@latitudetech.com](mailto:info@latitudetech.com)



## APPENDIX A: PC Terminal Set-up

### Tools and Software required:

- PC or Laptop with a working serial port
- RS232 serial data cable (9-pin)
- MS HyperTerminal or TeraTerm freeware terminal program (loaded on PC or Laptop)

### TeraTerm terminal program:

TeraTerm is a terminal program used to monitor serial data using a standard PC environment. At the time of writing it is the tool of choice used to monitor activity of the SkyNode S200. A MS-Windows based version of TeraTerm is a free download available from: <http://www.vector.co.jp/authors/VA002416/teraterm.html>.

*NOTE: Please read and respect the author's usage and distribution notice. Unix-based versions are also available.*

MS HyperTerminal, standard to most PCs and Laptops can also be used.

### Installing TeraTerm:

Unzip TeraTerm.zip to a temporary directory and then install it from there by double clicking the setup.exe (application file). Since the install will set up it's own directory under Programs/TeraTerm you can delete this temporary directory afterwards.

Once installed, start it up and set to your serial port (com 1-4). Set the other serial parameters (Setup/Serial port) to the following:

Baud rate: 9600  
Data: 8 bit  
Parity: none  
Stop: 1 bit  
Flow control: hardware

Click OK.

To save these settings for the next time, use the pull down menu (Setup/Save setup) to save the settings to the default TERATERM.INI file.

### Logging SkyNode S200 activity:

TeraTerm can be set up for data logging. To do so launch TeraTerm (9600 baud, 8,N,1, Flow control ON) and then click on "Log" under the FILE pull down menu. Then enter a file name with a ".txt" suffix (i.e. testlog.txt) including the file location (i.e. desktop). TeraTerm will then automatically write everything that passes through the serial port to this (text) file. Use any text editor (i.e. NotePad, WordPad, Word, etc.,) to open the file for later examination.

# Skynode S200 Installation and Operation Manual

## APPENDIX B: S200-001 System Interconnect

8	7	6	5	4	3	2	1
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REV. NO.		REV. DATE		REV. DESCRIPTION	
1	A	11/07/05	11/07/05	RELEASE	
2	B	11/07/05	11/07/05	AMPLIFIED NOTE 5. MINOR FORMATTING CHANGES	

**NOTES:**

- 1 REFER TO SKYNODE SATCOM INSTALLATION INSTRUCTIONS, DOCUMENT # 1107-400
- 2 INTERFACE/INSTALL EQUIPMENT ACCORDING TO THE FOLLOWING SECTIONS OF AC43.13-1B CHAPTER 11:  
SECTION 1 - INSPECTION AND CARE OF ELECTRICAL SYSTEMS 11-1, 11-2, 11-4, 11-7  
SECTION 3 - INSPECTION OF EQUIPMENT INSTALLATION 11-30, 11-31, 11-32, 11-33, 11-37  
SECTION 4 - INSPECTION OF CIRCUIT PROTECTION DEVICES 11-47, 11-48, 11-53, 11-54, 11-55  
SECTION 5 - ELECTRICAL WIRE RATING 11-66  
SECTION 6 - AIRCRAFT ELECTRICAL WIRE SELECTION 11-76, 11-77  
SECTION 8 - WIRING INSTALLATION INSPECTION REQUIREMENT 11-96, 11-98, 11-100, 11-102, 11-105, 11-106, 11-107  
SECTION 9 - ENVIRONMENTAL PROTECTION AND INSPECTION 11-115 TO 11-126  
SECTION 10 - SERVICE LOOP HARNESSSES (PLASTIC TIES STRAPS) 11-135 TO 11-139  
SECTION 11 - CLAMPING 11-146  
SECTION 12 - WIRE INSULATION AND LACING STRING TIE 11-155, 11-156, 11-157, 11-158, 11-159,  
SECTION 14 - TERMINAL REPAIRS 11-174 TO 11-179  
SECTION 15 - GROUNDING AND BONDING 11-186  
SECTION 16 - WIRE MARKING 11-205 TO 11-210, 11-214, 11-217, 11-222
- 3 ALL WIRING UNLESS NOTED:  
MIL 22759/41-XX-9 (XX=WIRE GAUGE)  
M27500-XX3M#14 (XX=WIRE GAUGE, #=NUMBER OF CONDUCTORS)
- 4 ALL WIRES #22 UNLESS NOTED
- 5 POWER AND CHASSIS GROUNDS TO BE TERMINATED WITHIN 12" OF CONNECTOR. . SHIELD GROUNDS TO BE TERMINATED WITHIN 3" OF SHIELD CONNECTION.
- 6 AUDIO MONITOR JACK FOR GROUND TEST OPERATION ONLY
- 7 HANDSET JACK FOR GROUND TEST OPERATION ONLY
- 8 DATA PORT FOR TEST/PROGRAMMING
- 10 INSTALLER MAY SELECT ITEM 3 GPS ANTENNA AND ITEM 4 SATCOM ANTENNA, OR ITEM 5 COMBINED GPS/SATCOM ANTENNA.
- 11 SELECT EITHER STRAIGHT OR 90° TNC PLUG CONNECTOR AS REQUIRED. FOR KING'S CONNECTORS USE: KTH1000 TOOL WITH KTH-2001 DIE SET. FOR AMPHENOL CONNECTORS USE: 227-944 TOOL WITH 227-1221-11 DIE OR CTL-1 TOOL
- 12 MAXIMUM LENGTH 30 FEET.
- 13 SELECT EITHER STRAIGHT OR 90° TNC PLUG CONNECTOR AS REQUIRED. FOLLOW ECS ASSEMBLY INSTRUCTIONS CTR122. USE M22520/5-01 CRIMPER TOOL WITH M22520/5-57 DIE FOR CENTER CONDUCTOR AND M22529/5-47 DIE FOR FERRULE
- 14 MAXIMUM LENGTH 25 FEET.
- 15 USE CRIMP TOOL: DANIELS M22520/2-01 AND DANIELS SK2/2 POSITIONER
- 16 SELECT CIRCUIT BREAKER STYLE DEPENDING ON SPECIFIC BUS CONFIGURATION.
- 17 SELECT A NON-ESSENTIAL 28VDC POWER BUS CONFIRM ADEQUACY OF POWER BY ELECTRICAL LOAD ANALYSIS.

QTY	CAGE CODE	PART OR IDENTIFYING NO.	NOMENCLATURE OR DESCRIPTION	MATERIAL SPECIFICATION	ITEM NO.
			PARTS LIST		
1		MS26574-1	CIRCUIT BREAKER (ALTERNATE)		12
1		MS22073-1	CIRCUIT BREAKER		12
1	023K3	CONKALL 23280-31SG-350	CONNECTOR (PART OF S200 KIT)		10
AR	66197	ECS 311201	LOW LOSS SATCOM COAXIAL CABLE		9
2	66197	ECS CTR122	90° TNC CONNECTOR (ALTERNATE)		8
2	66197	ECS CTS122	STRAIGHT TNC CONNECTOR		8
AR		MIL-C-17/128 RG 400	COAXIAL CABLE		7
2		M3901226-0503 (KING'S KA59-296 or AMPHENOL 31-2381)	90° TNC CONNECTOR (ALTERNATE)		6
2		M3901230-0503 (KING'S KA59-292 or AMPHENOL 31-4452)	STRAIGHT TNC CONNECTOR		6
1	3CVE1	ANTCOM SGG IR1516RR-AP-XIT-1	COMBINED GPS AND SATCOM ANTENNA.		5
1	3CVE1	ANTCOM S31R16RR-P-XTB-1	IRIDIUM SATCOM ANTENNA		4
1	3CVE1	ANTCOM 3G1215R2XT	GPS ANTENNA		3
1	L1370	LATITUDE TECHNOLOGIES S200-001	SKYNODE SATCOM TRANSCIVER/TRACKER		1
REQ	CAGE CODE	PART OR IDENTIFYING NO.	NOMENCLATURE OR DESCRIPTION	MATERIAL SPECIFICATION	ITEM NO.

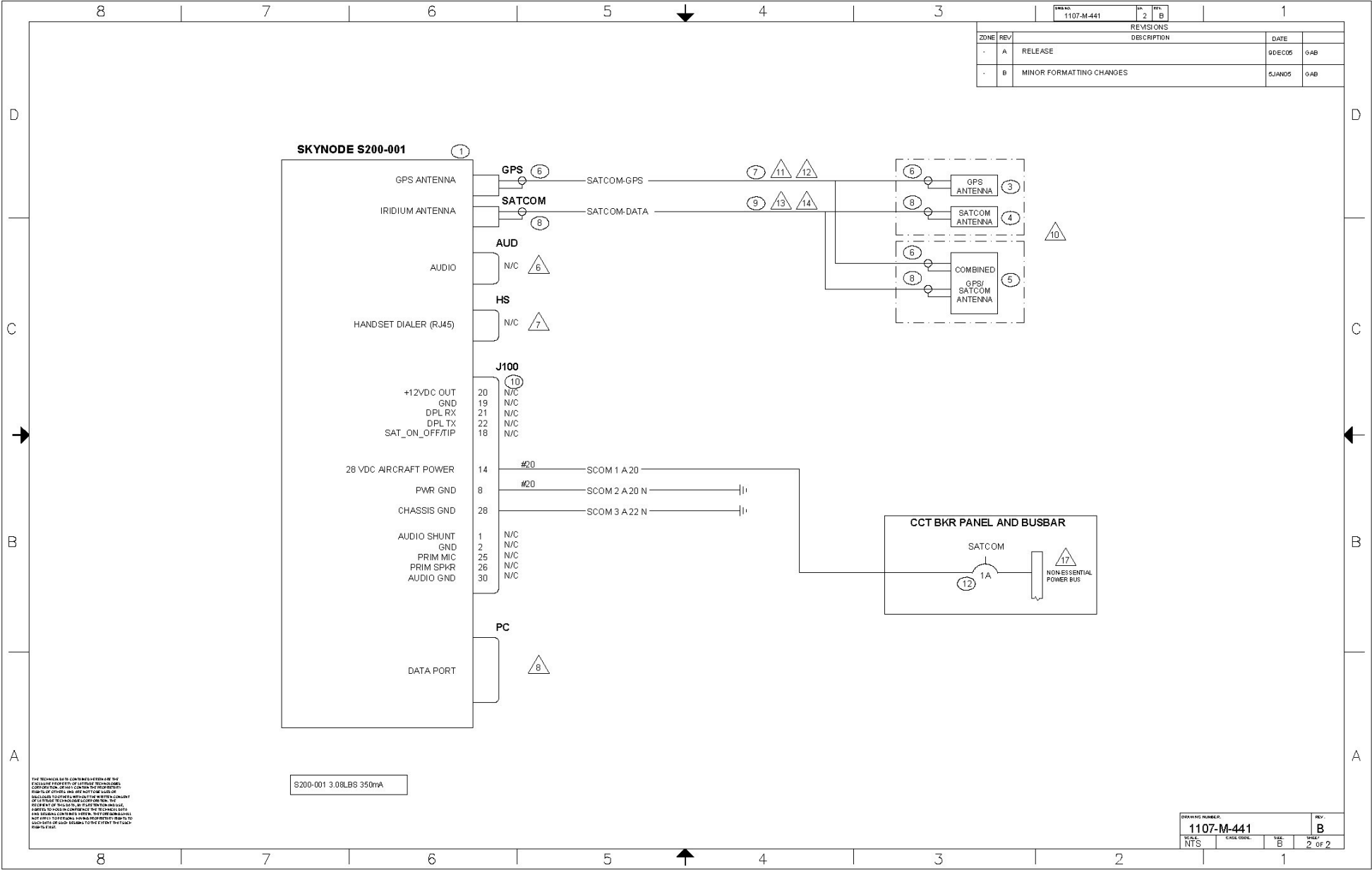
B	B	REVISION	REV STATUS OF SHEETS
2	1	SHEET	

NO CHANGES MAY BE MADE TO THIS DRAWING EXCEPT BY INPUT TO CAD FILE

CONTRACT NO. <b>1107</b>	200-2025 HWY OFFICE AVE. LITTLE ROCK, AR 72611 TEL: (501) 261-6223 FAX: (501) 474-8224
APPROVALS	DATE
DRAWN G.A.B.	10/05/05
CHECKED M.L.	10/05/05
DESIGN M.L.	10/05/05
DESIGN AUTHORITY	REV. DATE
B L1370	1107-M-441
SHEET NTS	SHEET 1 OF 2

# Skynode S200 Installation and Operation Manual

## S200-001 System Interconnect - SHT 2



REV. NO.		REV.		
1107-M-441		2	B	
ZONE	REV.	REVISIONS	DATE	BY
-	A	RELEASE	9DEC05	oAB
-	B	MINOR FORMATTING CHANGES	5JAN05	oAB

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S200-001 3.08LBS 350mA

DRAWING NUMBER:		REV.	
1107-M-441		B	
SCALE:	CHECK DATE:	TITLE:	SHEET:
NTS		B	2 OF 2

# Skynode S200 Installation and Operation Manual

## APPENDIX C: S200-003 System Interconnect

8	7	6	5	4	3	2	1
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ZONE		REV	DESCRIPTION	DATE	BY
-	A	RELEASE		06E005	GAB
-	B	AMPLIFIED NOTE 5, CHANGED S200-002 TO S200-003. MINOR FORMATTING CHANGES		05JAN05	GAB

**NOTES:**

- 1 REFER TO SKYNODE SATCOM INSTALLATION INSTRUCTIONS, DOCUMENT # 1107-400
- 2 INTERFACE/INSTALL EQUIPMENT ACCORDING TO THE FOLLOWING SECTIONS OF AC43131B CHAPTER 11:  
SECTION 11 - INSPECTION AND CARE OF ELECTRICAL SYSTEMS 11-1, 11-2, 11-4, 11-7  
SECTION 3 - INSPECTION OF EQUIPMENT INSTALLATION 11-30, 11-31, 11-32, 11-33, 11-37  
SECTION 4 - INSPECTION OF CIRCUIT PROTECTION DEVICES 11-47, 11-48, 11-53, 11-54, 11-55  
SECTION 5 - ELECTRICAL WIRE RATING 11-66  
SECTION 6 - AIRCRAFT ELECTRICAL WIRE SELECTION 11-76, 11-77  
SECTION 8 - WIRING INSTALLATION INSPECTION REQUIREMENT 11-86, 11-98, 11-100, 11-102, 11-105, 11-106, 11-107  
SECTION 9 - ENVIRONMENTAL PROTECTION AND INSPECTION 11-115 TO 11-128  
SECTION 10 - SERVICE LOOP HARNESSSES (PLASTIC TIES STRAPS) 11-135 TO 11-139  
SECTION 11 - CLAMPING 11-146  
SECTION 12 - WIRE INSULATION AND LACING STRING TIE 11-155, 11-156, 11-157, 11-158, 11-159,  
SECTION 14 - TERMINAL REPAIRS 11-174 TO 11-179  
SECTION 15 - GROUNDING AND BONDING 11-186  
SECTION 16 - WIRE MARKING 11-205 TO 11-210, 11-214, 11-217, 11-222
- 3 ALL WIRING UNLESS NOTED:  
MIL 22759/41-XX-9 (XX=WIRE GAUGE)  
M27500-XXSM#114 (XX=WIRE GAUGE, #=NUMBER OF CONDUCTORS)
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- 6 AUDIO MONITOR JACK FOR GROUND TEST OPERATION ONLY
- 7 HANDSET JACK FOR GROUND TEST OPERATION ONLY
- 8 DATA PORT FOR TEST/PROGRAMMING
- 13 SELECT EITHER STRAIGHT OR 90° TNC PLUG CONNECTOR AS REQUIRED. FOLLOW ECS ASSEMBLY INSTRUCTIONS CTR122. USE M22520/5-01 CRIMPER TOOL WITH M22520/5-57 DIE FOR CENTER CONDUCTOR AND M22529/5-47 DIE FOR FERRULE.
- 14 MAXIMUM LENGTH 25 FEET.
- 15 USE CRIMP TOOL: DANIELS M22520/2-01 AND DANIELS SK2/2 POSITIONER
- 16 SELECT CIRCUIT BREAKER STYLE DEPENDING ON SPECIFIC BUS CONFIGURATION.
- 17 SELECT A NON-ESSENTIAL 28VDC POWER BUS CONFIRM ADEQUACY OF POWER BY ELECTRICAL LOAD ANALYSIS.
- 18 REFER TO LATITUDE TECHNOLOGIES CORPORATION DOCUMENT S200-402-001 PARAGRAPH 2 FOR INTERFACE CHARACTERISTICS.

QTY REQ	CAD E CODE	PART OR IDENTIFYING NO.	NO. Nomenclature OR DESCRIPTION	MATERIAL SPECIFICATION	ITEM NO.
			PARTS LIST		
		MS26574-1	CIRCUIT BREAKER (ALTERNATE)		12
		MS22073-1	CIRCUIT BREAKER		12
		023K3	CORXALL 23280-31SQ-350		10
	AR	66197 ECS 311201	LOW LOSS SATCOM COAXIAL CABLE		9
		66197 ECS CTR122	90° TNC CONNECTOR (ALTERNATE)		8
		66197 ECS CTS1/22	STRAIGHT TNC CONNECTOR		8
		3CVE1 ANTICOM S31R16RR-P.XTB-1	IRIDIUM SATCOM ANTENNA		4
		L1370 LATITUDE TECHNOLOGIES S200-003	SKYNODE SATCOM TRANSCIVER/TRACKER		1

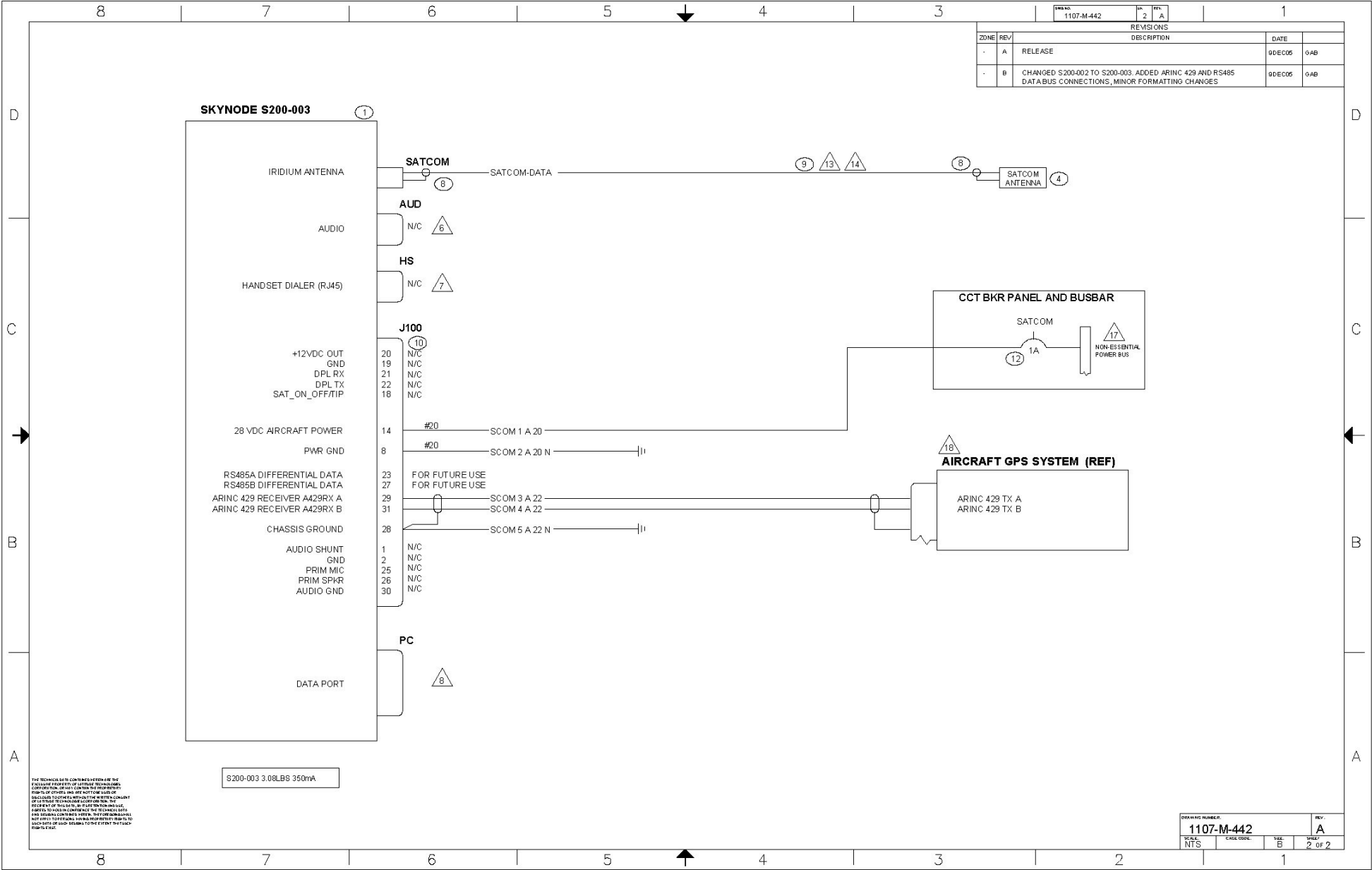
B	B	REVISION	REV STATUS OF SHEETS
2	1	SHEET	

NO CHANGES MAY BE MADE TO THIS DRAWING EXCEPT BY INPUT TO CAD FILE

CONTRACT NO. <b>1107</b>		TITLE <b>SKYNODE S200-003 SATCOM SYSTEM INTERCONNECT</b>	
APPROVALS DESIGNED: <b>G.A.B.</b> CHECKED: <b>M.L.</b> DRAWN: <b>M.L.</b>	DATE DESIGNED: <b>06E005</b> CHECKED: <b>06E005</b> DRAWN: <b>06E005</b>	PART OR IDENTIFYING NO. <b>B L1370</b>	DRAWING NO. <b>1107-M-442</b>
SHEET NO. OF SHEETS 1 OF 2		SHEET NO. OF SHEETS 1 OF 2	

# Skynode S200 Installation and Operation Manual

## S200-003 System Interconnect – SHT 2



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DRAWING NUMBER:		REV.	
1107-M-442		A	
FILE NTS	CAGE CODE	PAGE B	PAGE 2 OF 2

# Skynode S200 Installation and Operation Manual

## APPENDIX D: S200-011 System Interconnect

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C							C															
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1		MS22073-1	CIRCUIT BREAKER		12
1		MS3120F-10-6S	CONNECTOR		11
1	02K3	CONXALL 23280-31SG-350	CONNECTOR (PART OF S200 HIT)		10
AR	66197	ECS 311201	LOWLOSS SATCOM COAXIAL CABLE		9
2	66197	ECS CTR122	90° TNC CONNECTOR (ALTERNATE)		8
2	66197	ECS CTS122	STRAIGHT TNC CONNECTOR		8
AR		MIL-C-171/28 RG-400	COAXIAL CABLE		7
2		M39012/26-0503 (KINGS KA69-296 or AMPHENOL 31-2381)	90° TNC CONNECTOR (ALTERNATE)		6
2		M39012/26-0503 (KINGS KA69-292 or AMPHENOL 31-4452)	STRAIGHT TNC CONNECTOR		6
1	3CVE1	ANITCOM SSGR1516RR-AP.XTT-1	COMBINED GPS AND SATCOM ANTENNA		5
1	3CVE1	ANITCOM S3R16RR-P.XTB-1	IRIDIUM SATCOM ANTENNA		4
1	3CVE1	ANITCOM 3G121562-XT	GPS ANTENNA		3
1	L1370	LT-DPLL0401	SKYNODE HANDSET (LONG CORD) ALTERNATE		2
1	L1370	LT-DPLS0401	SKYNODE HANDSET (SHORT CORD)		2
1	L1370	LATITUDE TECHNOLOGIES S200-011	SKYNODE SATCOM TRANSMITTER/TRACKER		1
PARTS LIST					

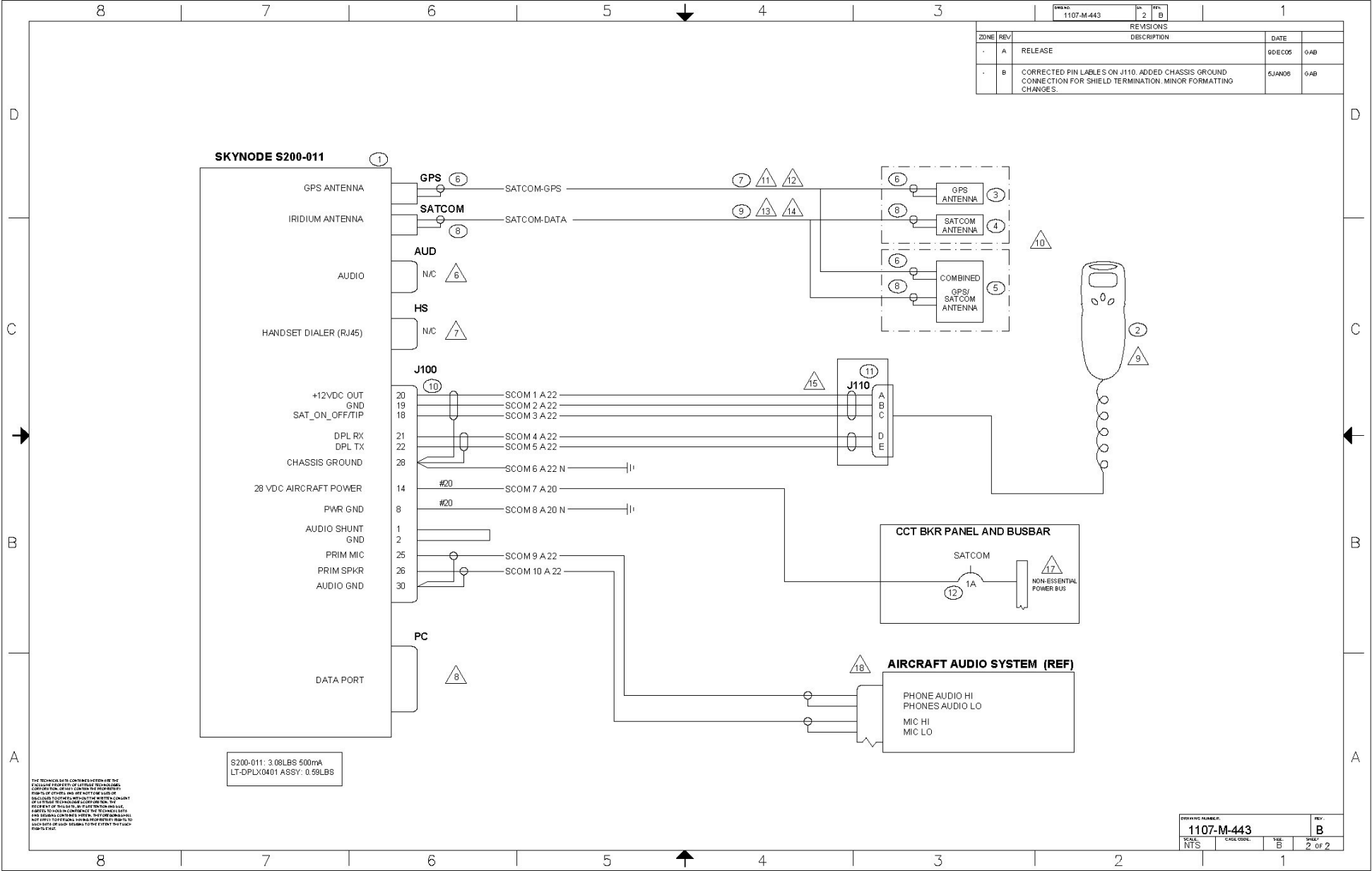
B	B	REVISION	REV STATUS
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CONTRACT NO. <b>1107</b>		30-22520/5-01-001 30-22520/5-01-001 30-22520/5-01-001	
APPROVALS		DATE	
DESIGNED <b>G.A.B.</b>	DESIGNED <b>IDECON</b>		
CHECKED <b>M.L.</b>	CHECKED <b>IDECON</b>		
DESIGN AUTHORITY	SCALE	DATE	REV
	<b>B L1370</b>	<b>1107-M-443</b>	<b>B</b>
	SCALE NTS	RELEASE DATE	SHEET 1 OF 2

# Skynode S200 Installation and Operation Manual

## S200-011 System Interconnect – SHT 2



# Skynode S200 Installation and Operation Manual

## APPENDIX E: S200-012 System Interconnect

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# Skynode S200 Installation and Operation Manual

## S200-012 System Interconnect – SHT 2

