

**International Communications Group**

**Application Note ICS-200-01**

**Introduction to ACARS  
Messaging Services**

As implemented via Iridium satellite link

**2006 April 17, Preliminary Release**

## Table of Contents

1.0	Acronyms and Abbreviations.....	3
2.0	Additional References.....	3
3.0	System Overview.....	4
4.0	Transceiver Provisioning.....	7
5.0	Supported Services.....	7
6.0	Tested Systems.....	8
7.0	ICS-200 Unit Configurations.....	8
8.0	ICG Contact Info.....	15

Some details contained in this document are preliminary. ICG will make every effort to keep concerned parties informed of applicable processes and system implementations.

## 1.0 Acronyms and Abbreviations

ACARS	Aircraft Communication Addressing and Reporting System
ARINC	Aeronautical Radio, Inc.
ATIS	Automatic Terminal Information Services
CDU	Control Display Unit
DMU	Data Management Unit
ICG	International Communications Group, Inc.
ICS	Iridium Communication System
IMEI	International Mobile Equipment Identity
IP	Internet Protocol
LBT	L-Band Transceiver
RIU	Radio Interface Unit
SATCOM	Satellite Communication
SBD	Short Burst Data
TCP/IP	Transmission Control Protocol/Internet Protocol
TWIP	Terminal Weather Information for Pilots
VHF	Very High Frequency

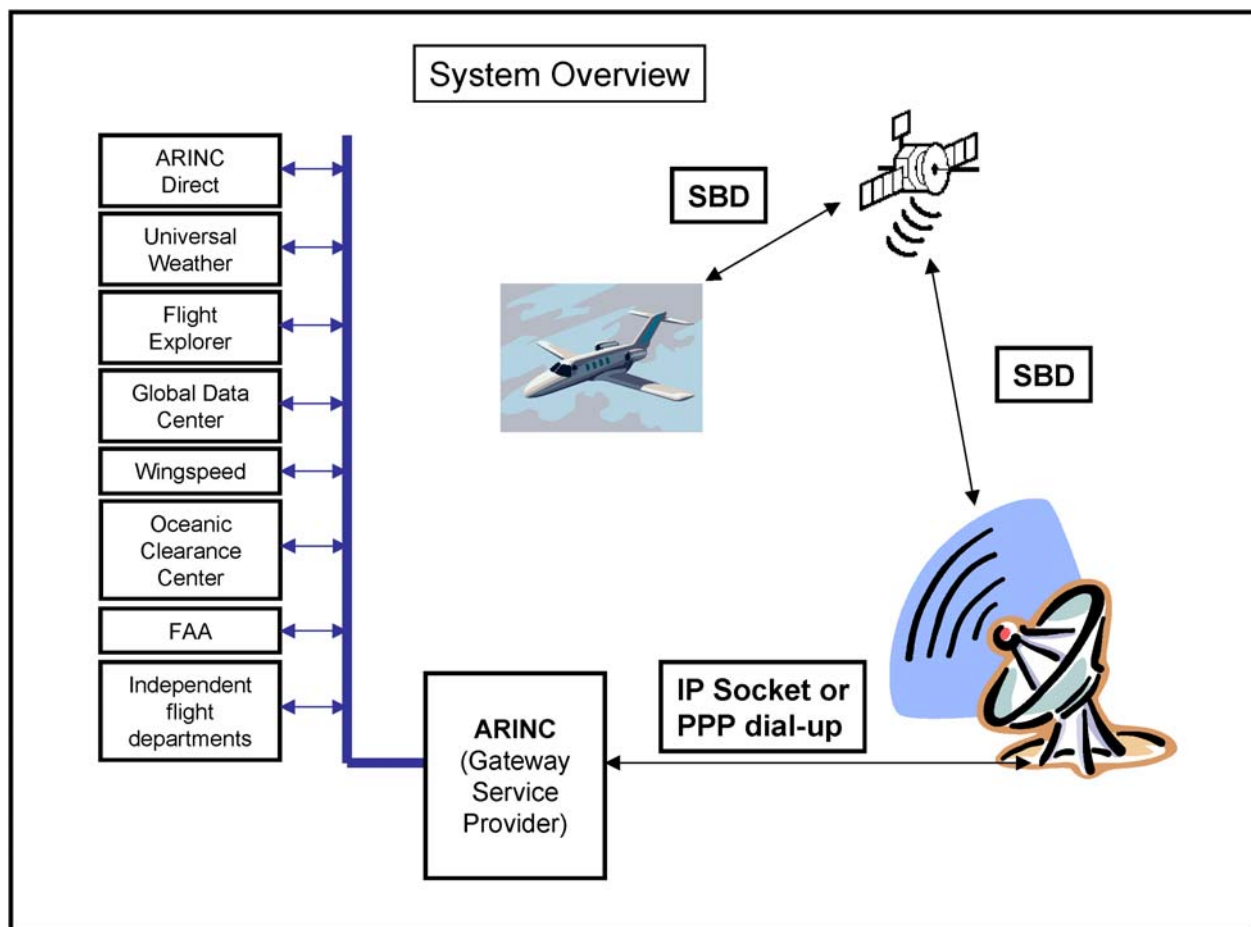
## 2.0 Additional References

ICG ICS 100/200 User's Guide (501330-UG)

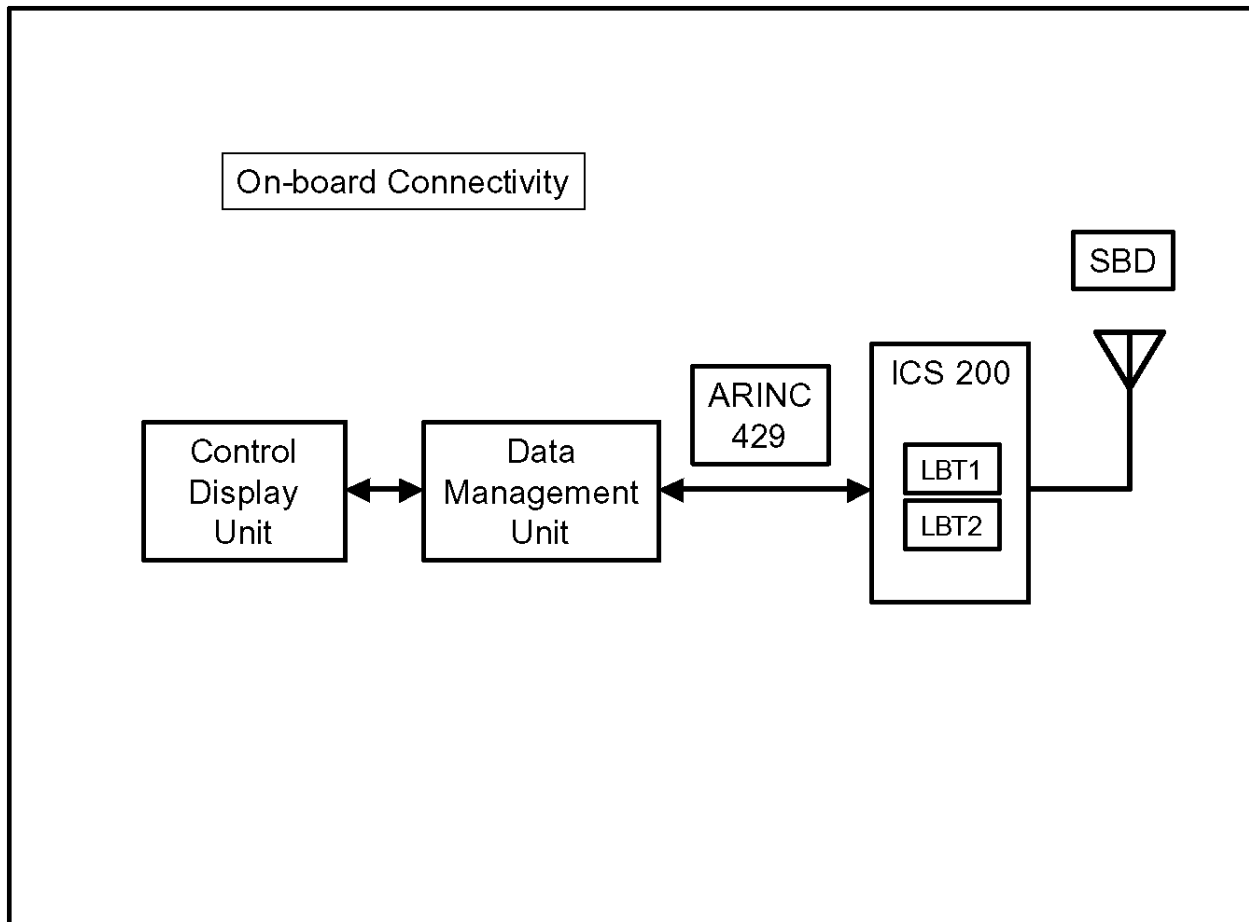
### 3.0 System Overview

ACARS is an acronym for Aircraft Communication Addressing and Reporting System. It is a data protocol defined in ARINC Specification 618, published and administered by Aeronautical Radio, Inc. The function of the protocol is to provide character-based data connectivity between an aircraft and any number of ground-based service providers with whom the aircraft operator has subscription relationships. (To avoid confusion, we will refer to these data service providers as “data providers” throughout this application note.) Example data services include TWIP, ATIS, text and graphical weather reports, and text messaging. Both VHF and SATCOM versions of ACARS exist. A SATCOM implementation is of concern here; specifically, SATCOM via Iridium satellites and using the SBD message format.

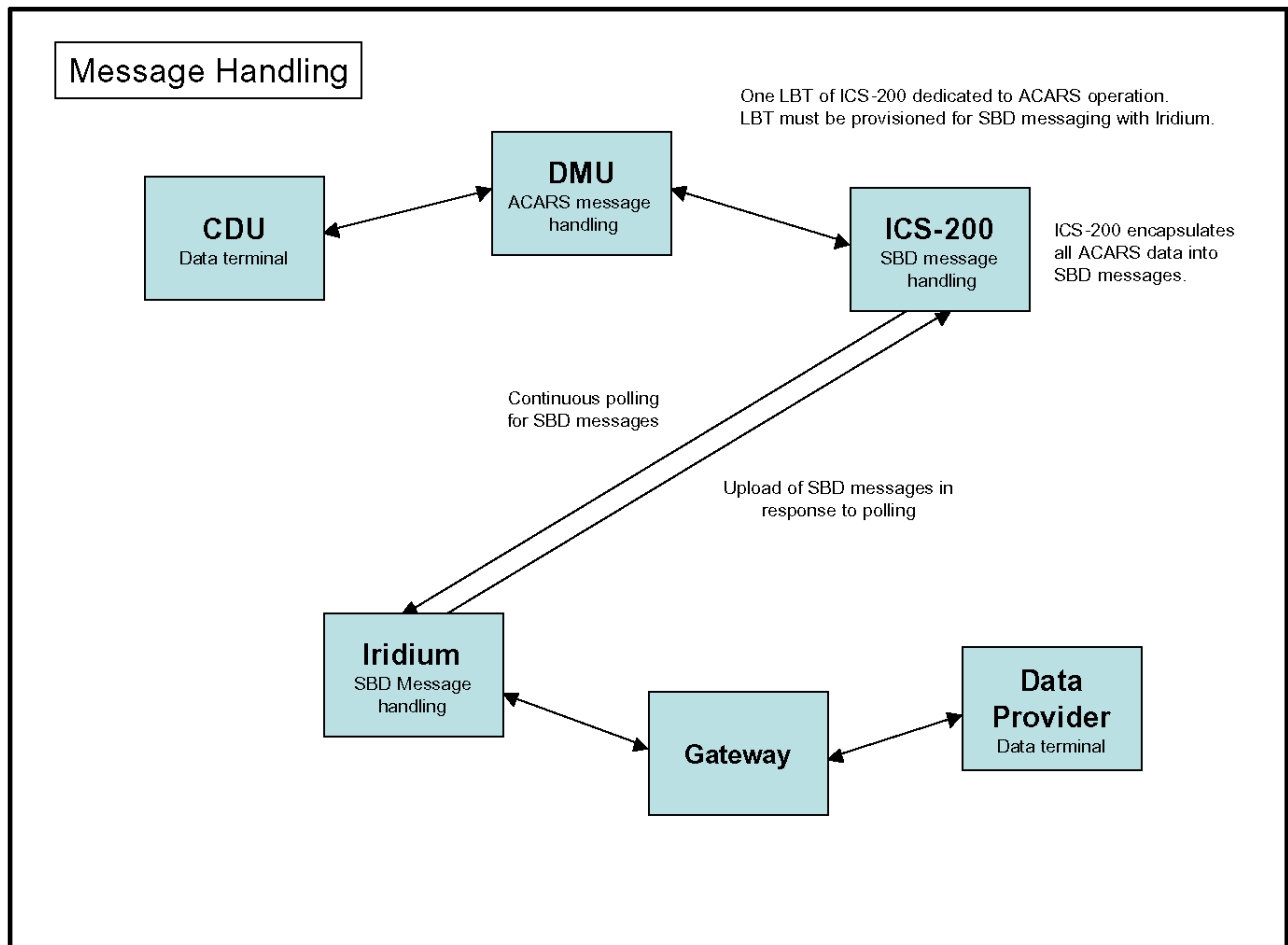
SBD stands for Short Burst Data, a format that uses data packets (“messages”) of no greater than 1,960 bytes in length. The figure “System Overview” depicts the end-to-end connectivity relationship that exists between an aircraft and several ACARS data providers. Note that the gateway service provider may also be a data provider in its own right.



This figure, "On-board Connectivity," shows the on-board aircraft hardware necessary for ACARS messaging. These include an ICG ICS-200 Iridium transceiver, and a third-party Control Display Unit (CDU) and Data Management Unit (DMU) combination. The CDU is the user interface, typically featuring pushbutton/keypad inputs, and an LCD screen for output. The DMU provides the interface to the ICS-200 satellite transceiver unit, via ARINC 429 bus. The DMU may be referred to as a Radio Interface Unit (RIU) by various manufacturers. Regardless of the differing names and possible differences in the division of labor among the modules from various manufacturers, the data presented to the ICS-200 over the 429 bus remains standardized. This allows the ICS-200 to provide a SATCOM link to a wide variety of ACARS-capable hardware, regardless of the manufacturer.



Typical air-to-ground traffic includes requests for weather updates, requests for terminal conditions, requests for clearances, text messaging, and the like. Ground-to-air traffic may include text messaging, regularly scheduled weather updates, and responses to any requests which may have originated from on board the aircraft. Refer to the figure “Message Handling.” Here we see that the ICS-200 unit and Iridium system are actually transparent to the operation of the ACARS system. Any ACARS messages or requests originating from on board the aircraft, for instance, are formatted as ACARS blocks in the CDU/DMU combination and passed to the ICS-200. The ICS-200 encapsulates each ACARS block into an SBD message, and sends the SBD messages into the Iridium system. The SBD messages received by the Iridium system are dismantled and converted back into ACARS blocks, and are then passed on to data providers through the gateway. Conversely, messages from data providers are passed through the gateway as ACARS blocks, which are encapsulated as SBD messages once received by the Iridium system, and are then queued up to await polling by the aircraft. Once the ICS-200 has possession of an uploaded SBD message, it removes SBD-specific information and passes the remaining data to the DMU as an ACARS block. The CDU/DMU combination then interprets the ACARS data and displays it to the end user. Notice that in these processes, the ICS-200 unit is oblivious to the fact that it is passing ACARS data; it is a transparent link in the ACARS system.



Since ACARS blocks are 238 bytes maximum, segmenting them and distributing them across multiple SBD messages is not necessary. And even though a single SBD message has the capacity to accommodate multiple ACARS blocks, the system is not implemented in that fashion; each ACARS block is encapsulated in a unique SBD message.

The ICS-200 unit always acts as a bus master when interfacing with the Iridium system. This means that any inbound SBD messages will be uploaded on the ICS-200 polling schedule. During idle periods, the ICS-200 will poll the Iridium system every minute for any inbound messages. These may include weather updates or text messages that have not been specifically requested. Following the transmission of an air-to-ground message or the receipt of any ground-to-air messages, the ICS-200 will begin polling every 30 seconds. Any time it finds that there are no messages waiting to be uploaded, it will revert back to the one-minute idle polling rate.

The LBT selected for ACARS is made available for voice or ACARS traffic on a first-come/first-served basis. If a voice call is in progress, ACARS polling will be delayed until the LBT becomes available. Conversely, if ACARS polling is in progress, a voice call cannot be initiated using that particular LBT until the ACARS message transfer is complete. The time that the LBT will be busy during any particular ACARS poll is dependent upon the number of messages (if any) that are waiting to be uploaded, and overall network communications conditions. A typical complete poll/upload transaction may take between 5 and 20 seconds.

Data calls may not be placed using the LBT configured for ACARS traffic. It is necessary to configure both serial data ports to use the other LBT when ACARS is enabled.

The polling scheme outlined here is temporary; work is underway to replace it with a system where the aircraft contacts the ground for ACARS messages only after receiving a notification that there are messages waiting.

If desired, ACARS messaging can be disabled entirely. See Section 6.0, "ICS-200 Unit Configurations," for details.

## **4.0 Transceiver Provisioning**

Transceivers used for ACARS data must be provisioned for SBD operation with Iridium. Subscriptions to various ACARS data providers may then be pursued with individual data providers at the customer's discretion.

## **5.0 Supported Services**

The following message types are supported:

- Free Text
- ATIS/TWIP
- Flight Plan
- Flight Plan Winds Update
- On/Off Out/In Report
- Pre-Departure Clearance
- Oceanic Clearance
- Position/Time Update Report
- Text Weather
- Graphical Weather

## 6.0 Tested Systems

The following hardware types have been tested with ARINC Direct as the ACARS data provider:

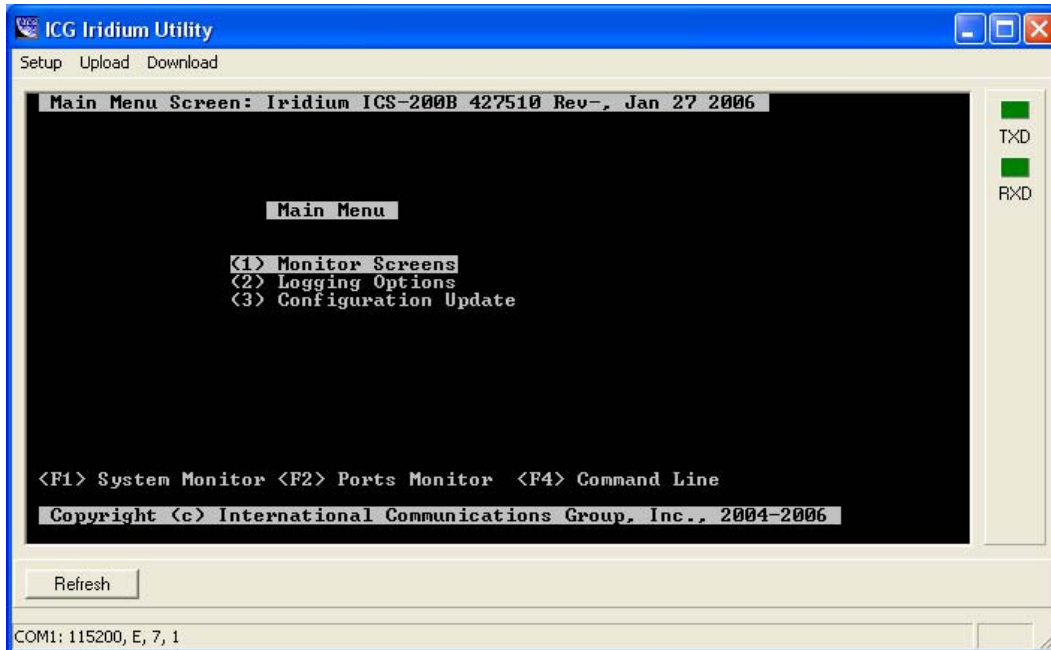
Honeywell AFIS 400-045500-2011  
Rockwell RIU-4000

Future testing of Rockwell CMU-4000 hardware, and the Honeywell Global Data Center and other 3<sup>rd</sup> party data providers is anticipated.

## 7.0 ICS-200 Unit Configurations

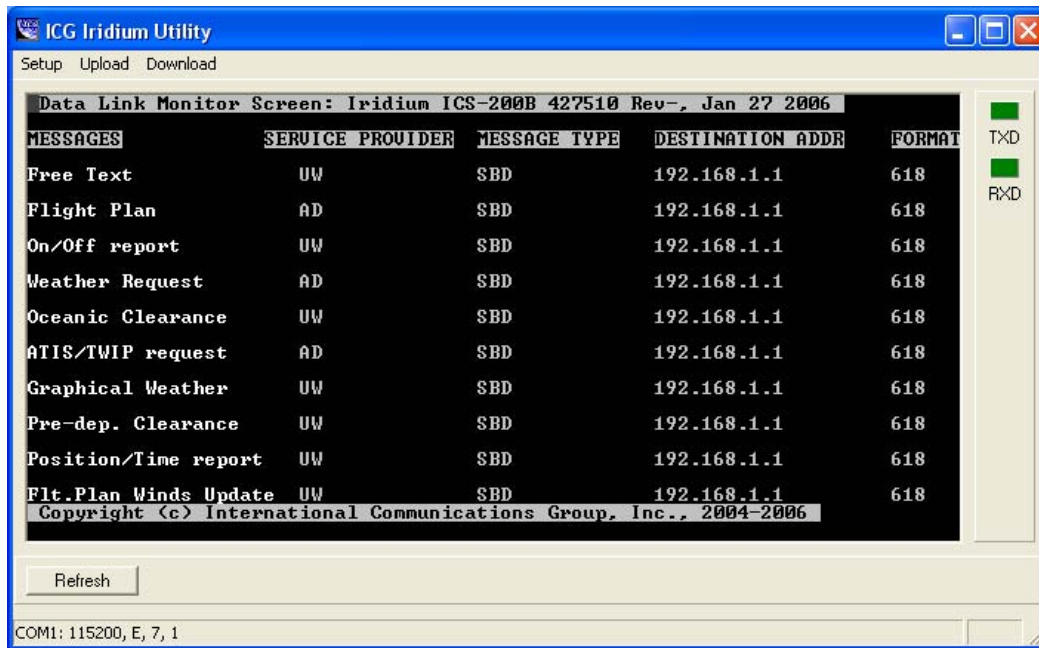
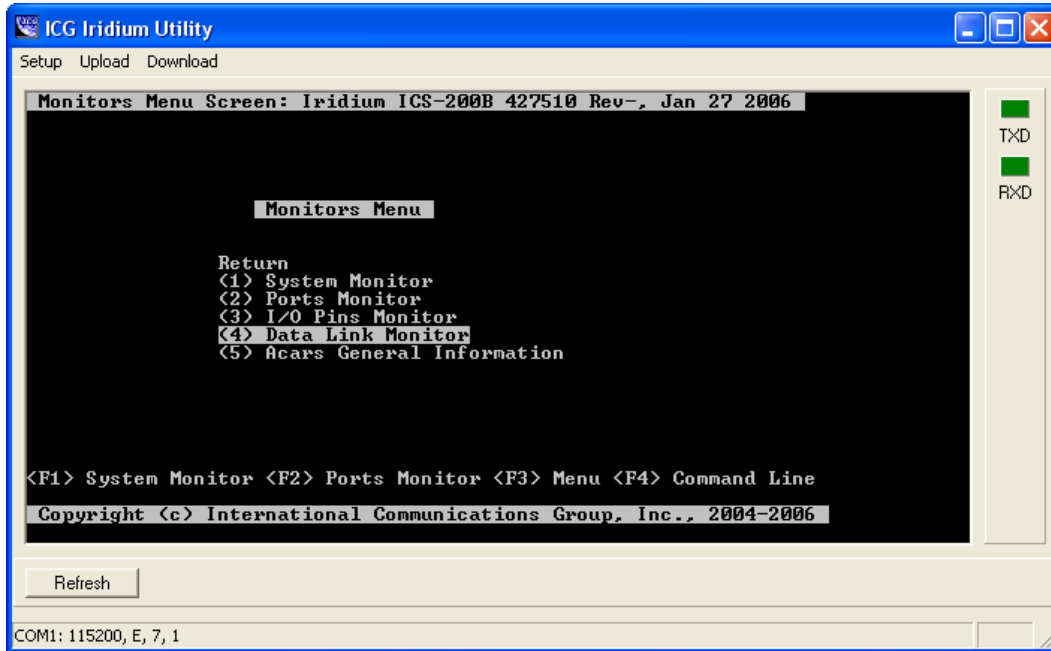
The ICG Iridium Utility provides an interactive RS-232 connection to an ICS-200 through the unit's front-panel PROGRAM port. The necessary port settings are shown in the lower left-hand corner of the screenshot below. While this example shows a connection using COM1, any COM port may be used. After launching the utility and powering on the ICS-200 unit, press F3 to bring up the main menu as shown below.

To review the unit's configuration, highlight the "Monitor Screens" option and press ENTER.

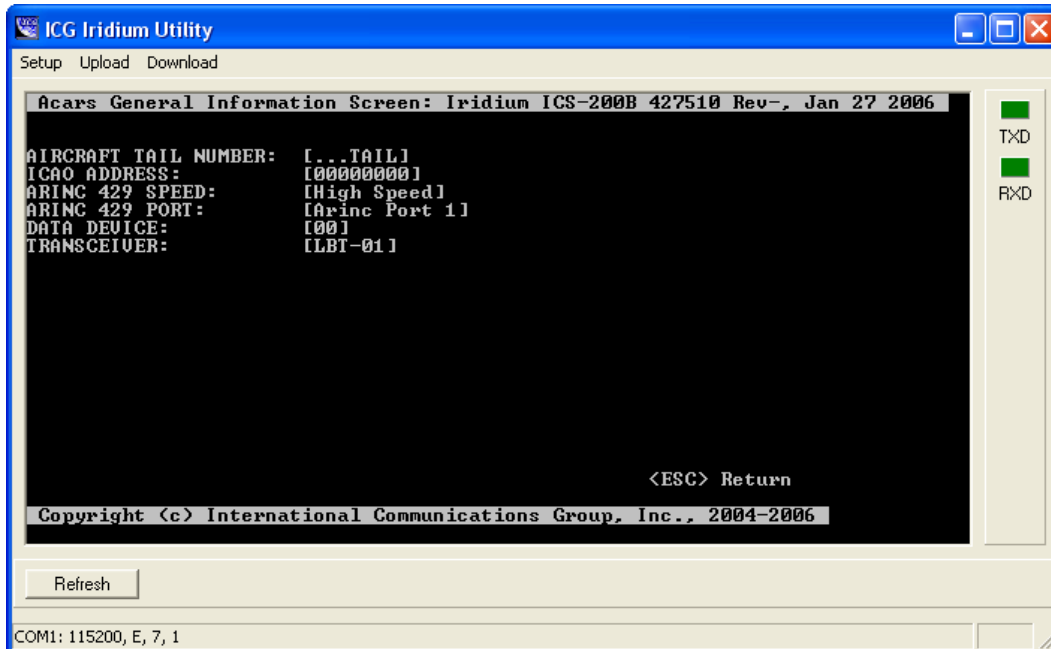
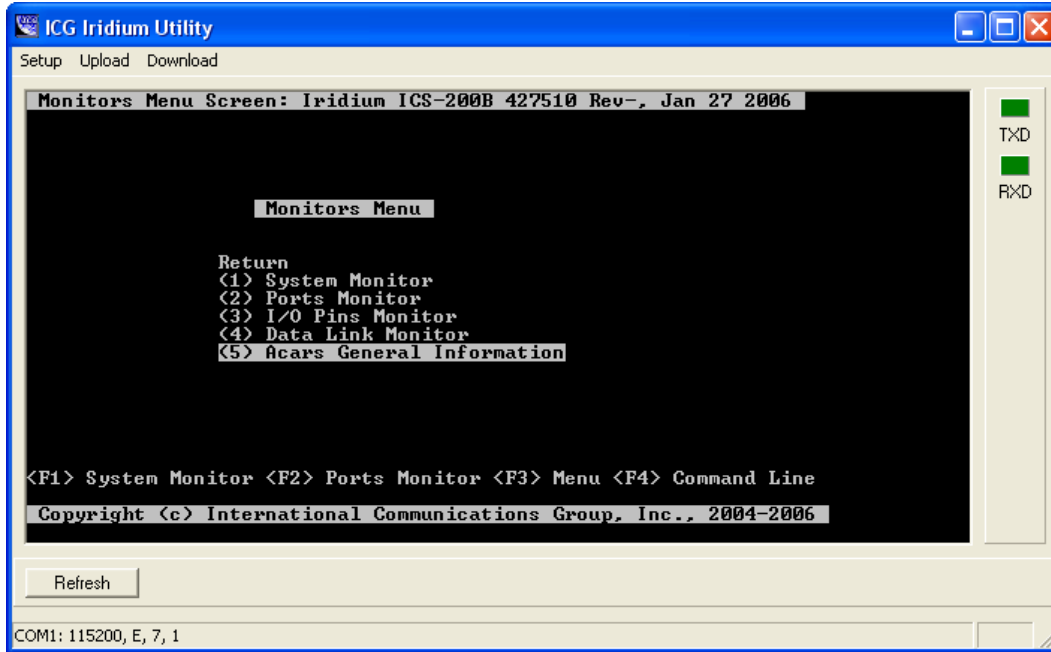




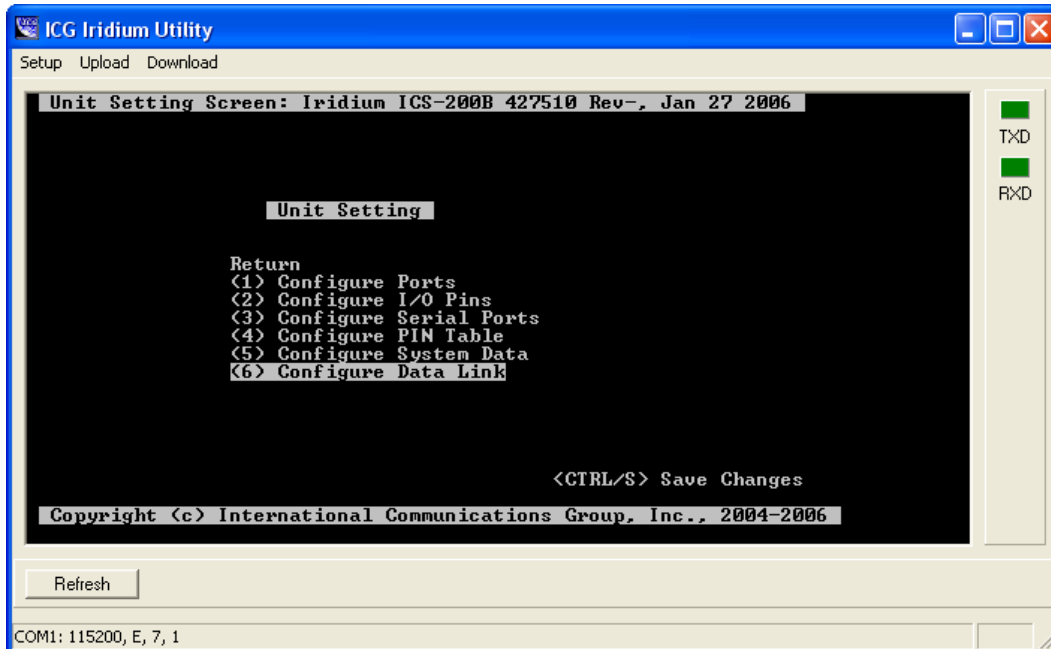
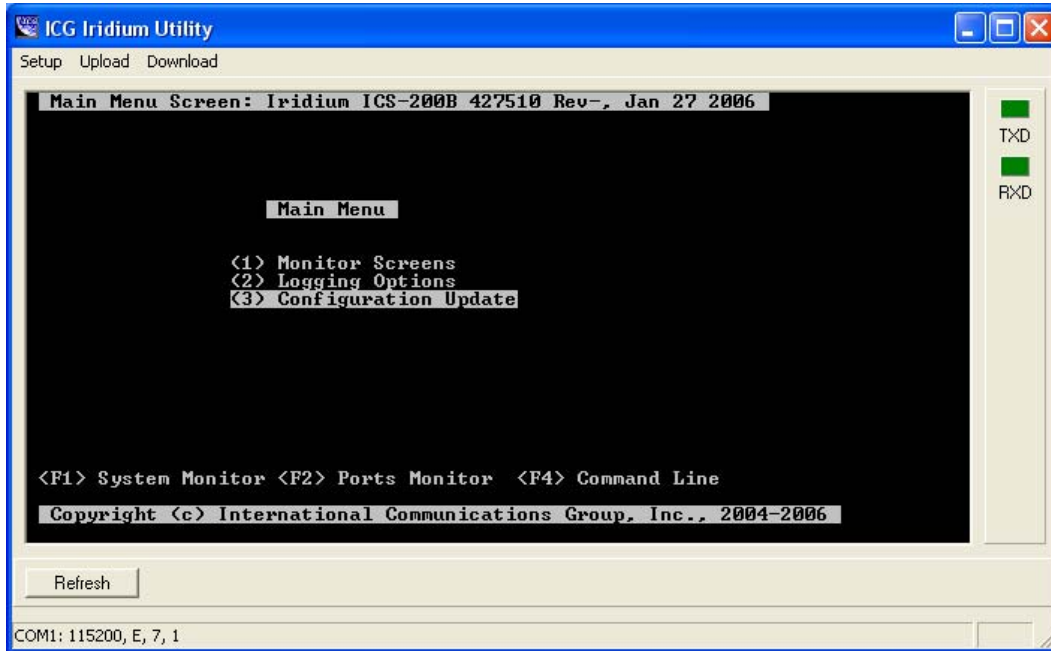
From within the Monitors Menu, highlight "Data Link Monitor" and press ENTER. A screen presenting the unit's data services and their configurations will appear. The screen shown below is for demonstration purposes only. Not all services are yet supported as of this release.



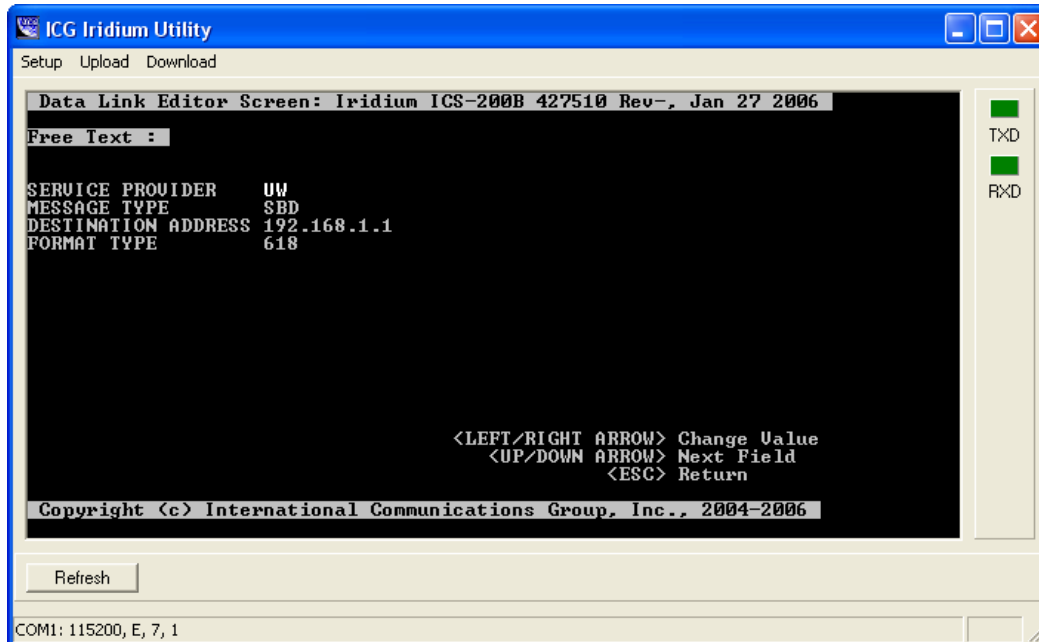
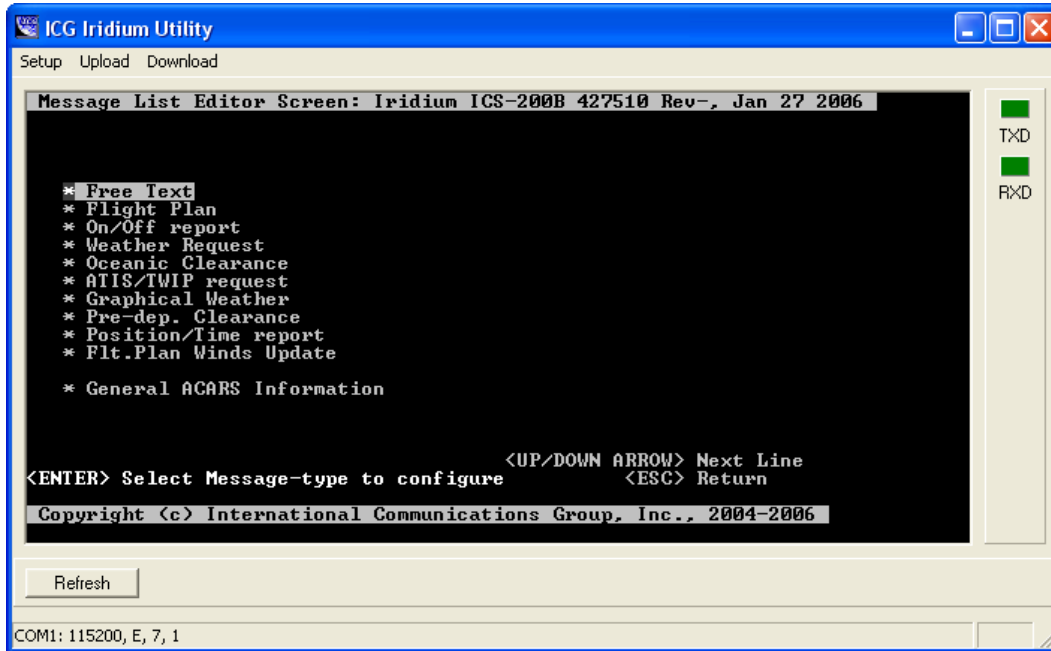
Press ESC to return up one level, highlight “Acars General Information,” and press ENTER. A summary of the unit’s transceiver configuration will appear. The screen shown below is for demonstration purposes only. Not all parameters are yet supported as of this release.



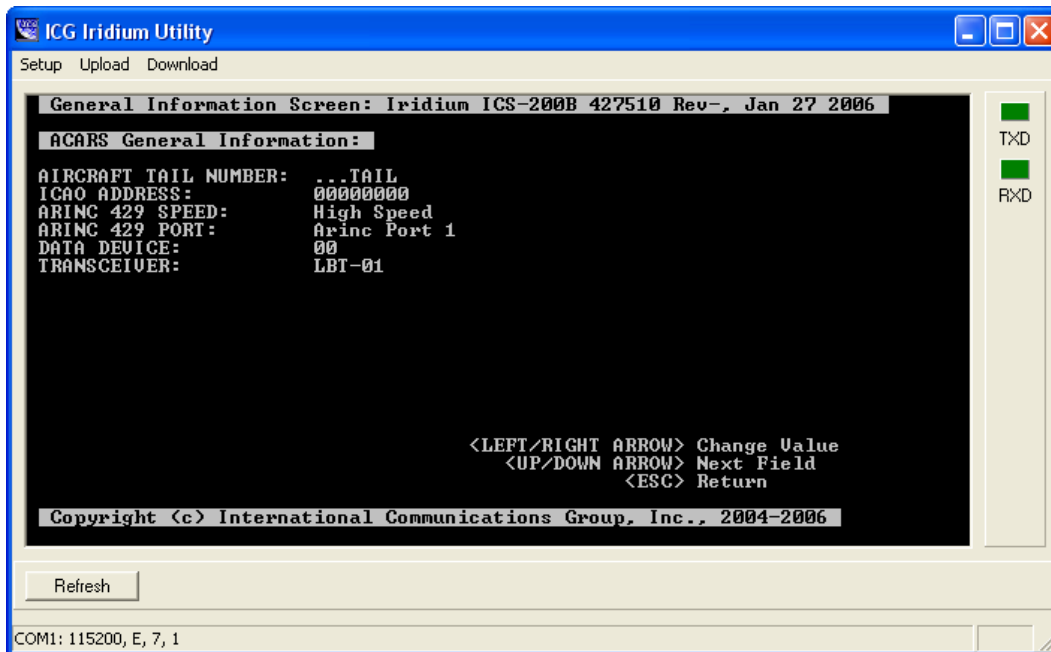
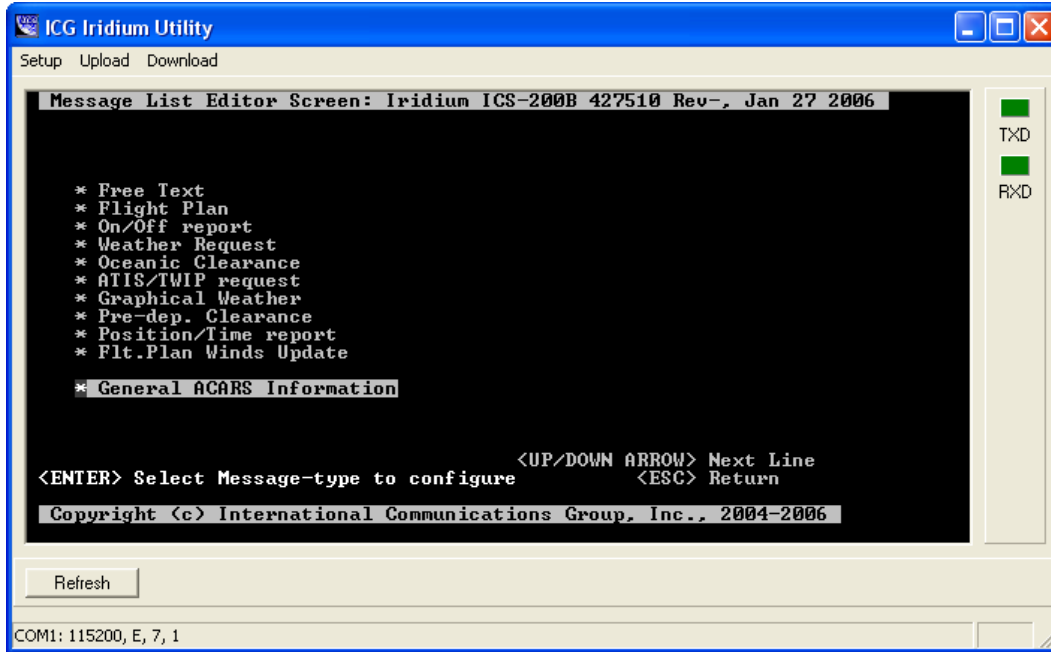
To alter the unit's configuration, ESC up to the main menu, highlight "Configuration Update," and press ENTER. From the Unit Setting screen which appears, select "Configure Data Link" and press ENTER.



The menu that appears allows the user to browse through and configure each data service. In this example, "Free Text" is selected and displayed. On-screen instructions in the lower right-hand side are present to guide the user through the process of making changes to the displayed configurations.



Pressing ESC returns to the Message List Editor Screen. Highlighting "General ACARS Information" and pressing RETURN will bring up the configuration options for the interface between the ICS-200 and third-party ACARS hardware. Currently supported parameters are the bus speed and port, and the transceiver selection. If disabling ACARS traffic is desired, select "DISABLED" rather than "LBT-01" or "LBT-02" as the transceiver.



Any configuration changes made are held in temporary buffers and not implemented until they are collectively saved. To save any configuration changes, return up to the Unit Settings menu by pressing ESC successively as required, and then press CTRL/S. The unit will re-boot, and the new configurations will be in effect. If, however, saving the changes is not desired, exiting the Unit Settings menu will discard any changes without implementing them. Pressing F3 to return to the Main Menu is one way to do this.

## 8.0 ICG Contact Info

### General

230 Pickett's Line  
Newport News, VA 23603  
1-757-947-1030  
1-757-947-1035 (Fax)  
www.intcomgrp.com

### Sales (North America - Central America - South America)

Jeff Saucedo  
Vice President, Sales & Marketing  
1-800-787-2089  
1-757-947-1030 (x129)  
1-817-368-0155 (Cell)  
jeffs@intcomgrp.com

### Military/Government

Ray Larkin  
Government and Military Programs  
1-757-947-1030 (x124)  
1-757-897-2755 (Cell)  
rlarkin@intcomgrp.com

### Technical Support

techsupport@intcomgrp.com  
Monday - Friday, 8:30AM - 5:00PM EST  
1-800-279-1991 (Press "0" for Operator and ask for Technical Support)  
1-757-947-1030 (Press "0" for Operator and ask for Technical Support)  
Monday - Friday, 5:00PM - 9:00PM EST; Saturday - Sunday, 8:30AM - 9:00PM EST  
1-757-291-9413