

APPENDIX IP – INTEGRATED IP OPTION

Last Revised: 18 August 2015

This appendix describes the additional functions provided by the RC4000's Integrated IP option.

1 Theory of Operation

1.1 User interface Overview

The integrated IP option allows control of the RC4000 by using a web browser. A built-in HTTP server communicates with the RC4000 using an internal serial port. The server allows control and feedback of the current controller operation using a web-based user interface. Detailed information on the use of the main user interface is given in section 3.1 of this document.

1.2 Configuration Interface Overview

The integrated IP option also contains a web-based configuration interface for the RC4000 antenna controller. This provides a convenient method for end-users to modify IP settings and commonly-changed controller settings. Detailed information on the user of the configuration interface is given in section 3.2 of this document.

1.3 Ethernet to Serial Overview

The integrated IP option also provides an Ethernet-to-serial connection. The entire RC4000 remote control protocol can be used by encapsulating regular serial messages within UDP datagrams. The corresponding replies are returned in similar fashion. Detailed information on the use of UDP encapsulation is given in section 3.3 of this document.

2 Configuration

2.1 Physical Interface

The integrated IP option adds an additional daughter card to the RC4000 options board. Refer to section 2.1.2.3.9 of the baseline RC4000 manual for location and description of J9, a standard RJ-45 connector. The connection from the target PC or other web-enabled device to the antenna controller should be done with a suitable CAT-5e cable with environmental connectors. Depending on other equipment in the network, a cross-over cable may be required.

2.2 Network Settings

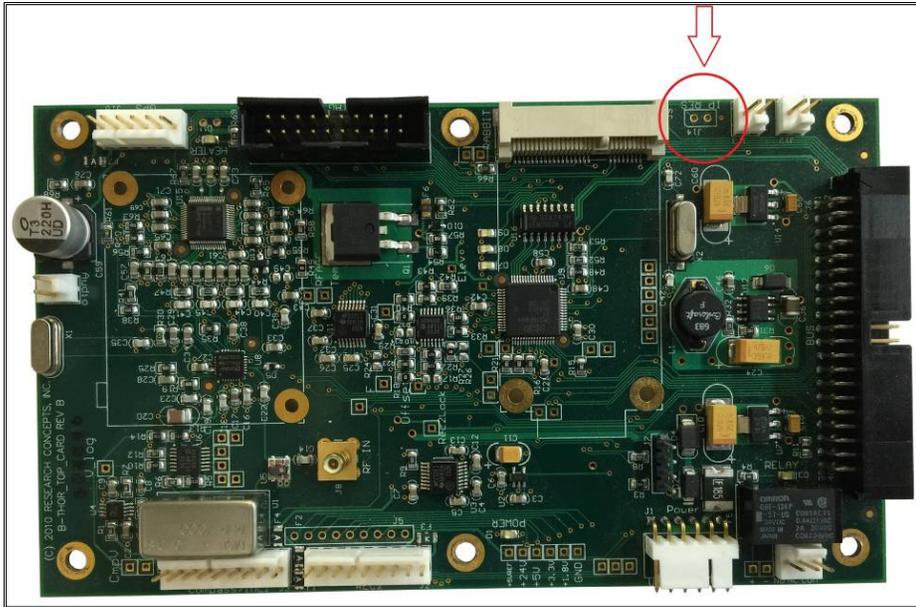
The PC or other web-enabled device and the RC4000 must be properly configured to exist in the same subnet in order to communicate with each other. Specifics on what IP addresses exist within any given subnet and/or how to configure a particular device is outside the focus of this document.

All RC4000 antenna controllers are factory configured to have an IP address of 192.168.1.1 and a subnet mask of 255.255.0.0. Changes to the IP address or subnet mask can be made from within the configuration interface. Setting the IP address of the target device to 192.168.1.2 with a subnet mask of 255.255.255.0 will usually allow a quick connection to the RC4000.

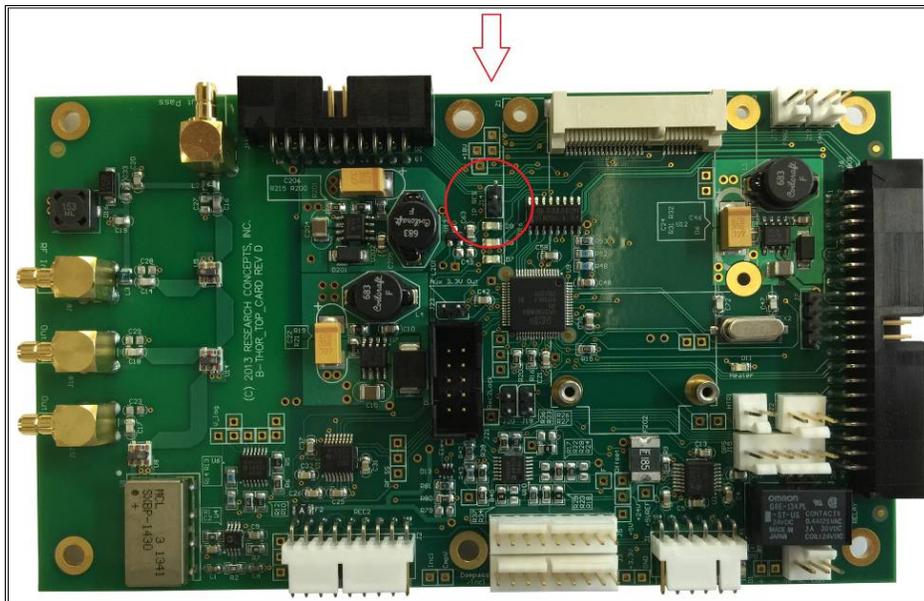
If you have changed the IP address and no longer have any record of it, please consult section 2.3 in this document for instructions on how to reset the IP address to the default (192.168.1.1).

2.3 Resetting the IP Address

The IP address may be reset back to the default address of 192.168.1.1 by placing a short circuit across two pins on the options board for approximately 8 seconds. The location of the IP Reset pins is circled in the following pictures:



Rev B Options Board



Rev D Option Board

3 Detailed Operation

3.1 Graphical User Interface (GUI)

The main page of the user interface contains a remote front panel with a 4x40 character display and a 16-button keypad. This provides basic interaction with the RC4000 antenna controller. Pressing keys on the panel performs the same action as if keys were actually pressed on the front panel. The current content of the RC4000 display is periodically reflected. All functions described in the baseline RC4000 manual can be completed via the remote front panel.



Below the remote front panel is a button labeled configuration. Clicking this will take the user to the Configuration Interface described in section 3.2 of this document.

3.2 Configuration Interface

This section describes the various screens available through the web-based configuration interface. The basic features are discussed in this appendix. Any additional options that may be available will be described in the corresponding appendix.

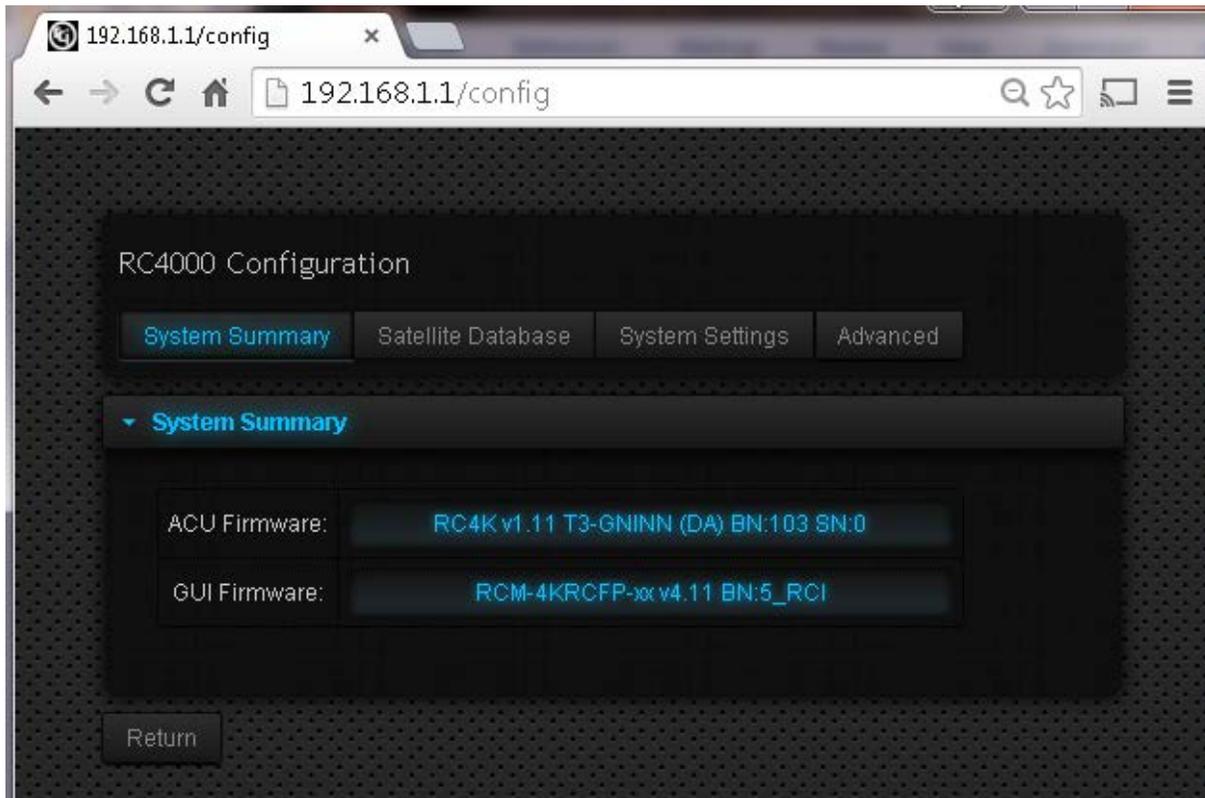
The main configuration interface panel has several navigation buttons. Clicking on these buttons will switch between the available pages. Any changes made to the current page must be saved by clicking the “Save” button before switching to a different page. The “Save” button will become enabled anytime a change has been detected.

Individual pages can have several expandable panels. These panels can be expanded and collapsed to show or hide various items. There is no need to save when switching between panels.

The “Return” button will return to the main user interface.

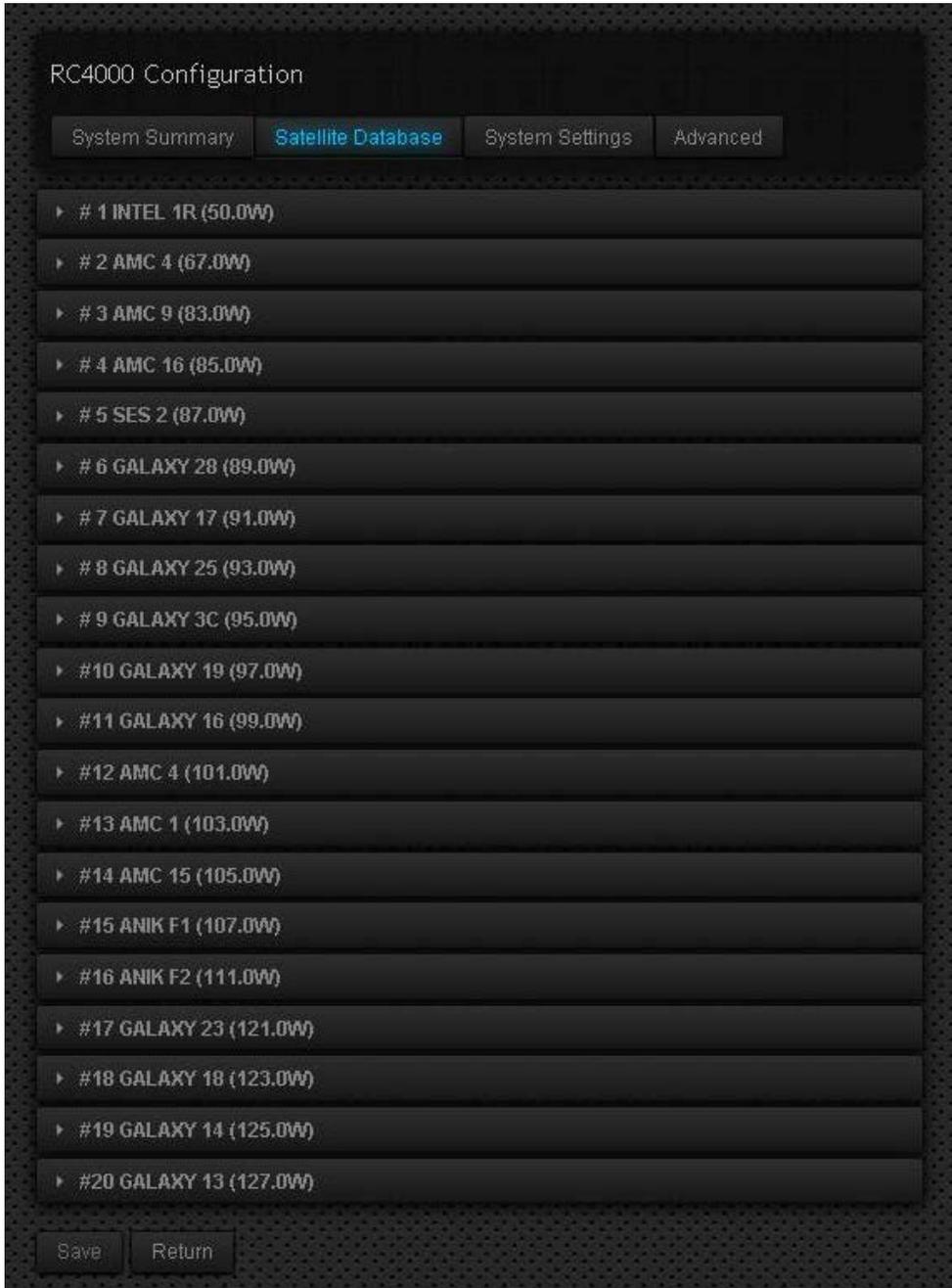
3.2.1 System Summary Page

The following image shows the System Summary page. Information about the current ACU and GUI firmware are listed in their corresponding boxes. Note the ACU serial number is also shown in the ACU Firmware box.



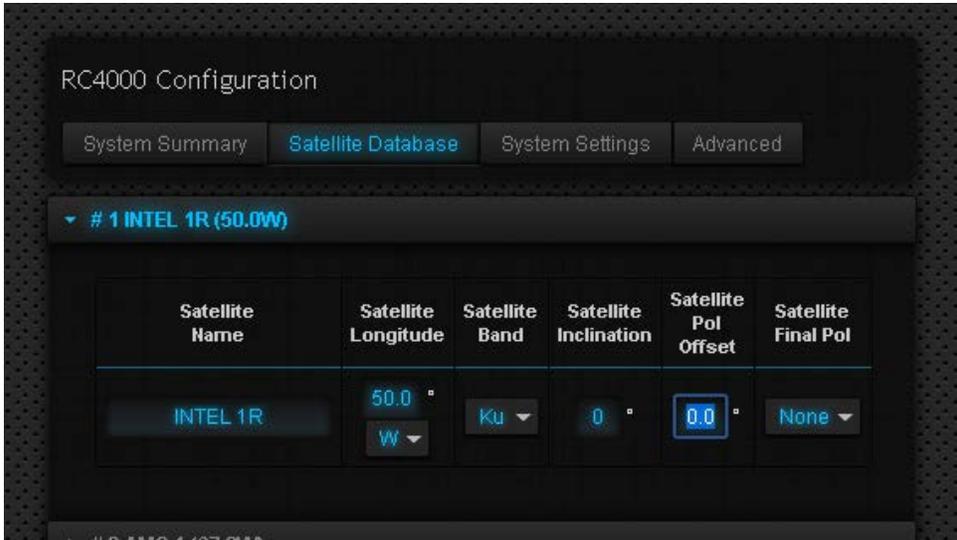
3.2.2 Satellite Database Page

A listing of the full satellite database is displayed on the Satellite Database page. Each satellite entry can be expanded individually. The following image shows an example of the full satellite database list.



3.2.2.1 Satellite Entry Panel

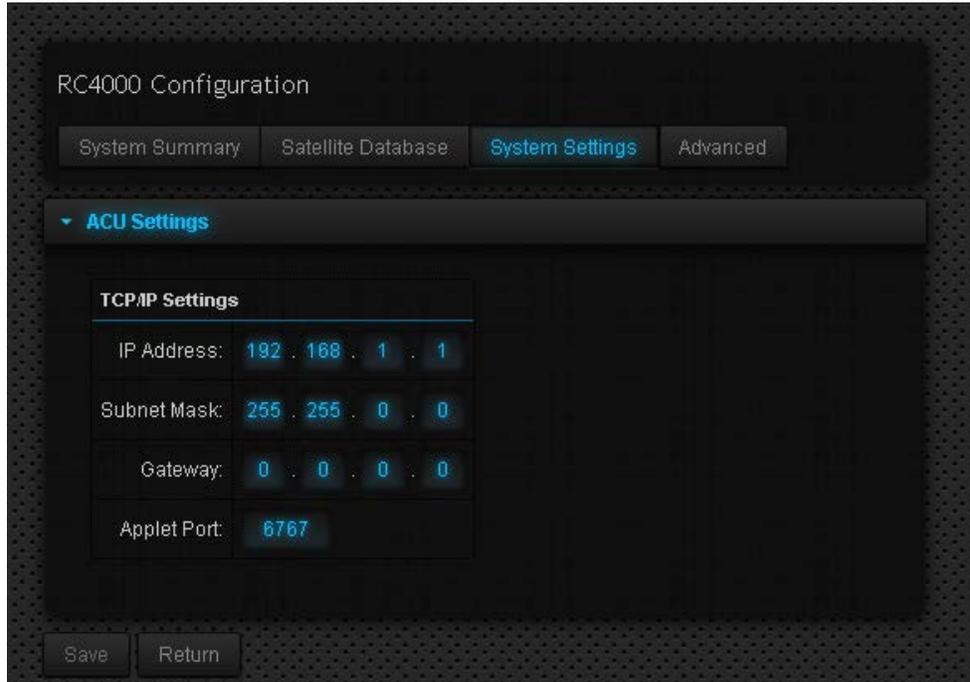
Once expanded, each panel allows the user to easily edit the properties of a particular satellite. Additional fields will appear for DVB signposts, beacon frequencies, and TLE data if those options are available. Allowable values for each field can be found in section 3.3.1.1.3 of the RC4000 baseline manual or within the appropriate optional appendix.



If any value is changed the “Save” button at the bottom of the page will become active. Select this button to commit the changes to flash memory.

3.2.3 System Settings Page

The IP Address, Subnet Mask, Gateway, and Applet port are all displayed on the system settings page.



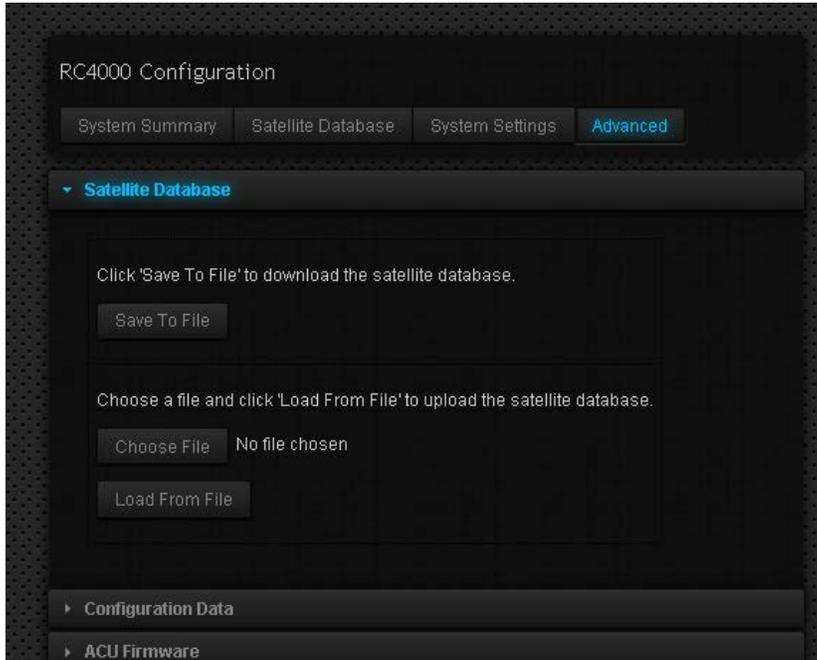
If any value is changed the “Save” button at the bottom of the page will become active. Select this button to commit the changes to flash memory. NOTE: any change made to these settings requires the interface to be reset. After the reset is complete, the web browser will reload this page using the new settings.

The Applet Port is the port on which the ACU will communicate with the user interface. This port must be open and not in use for the GUI to operate correctly.

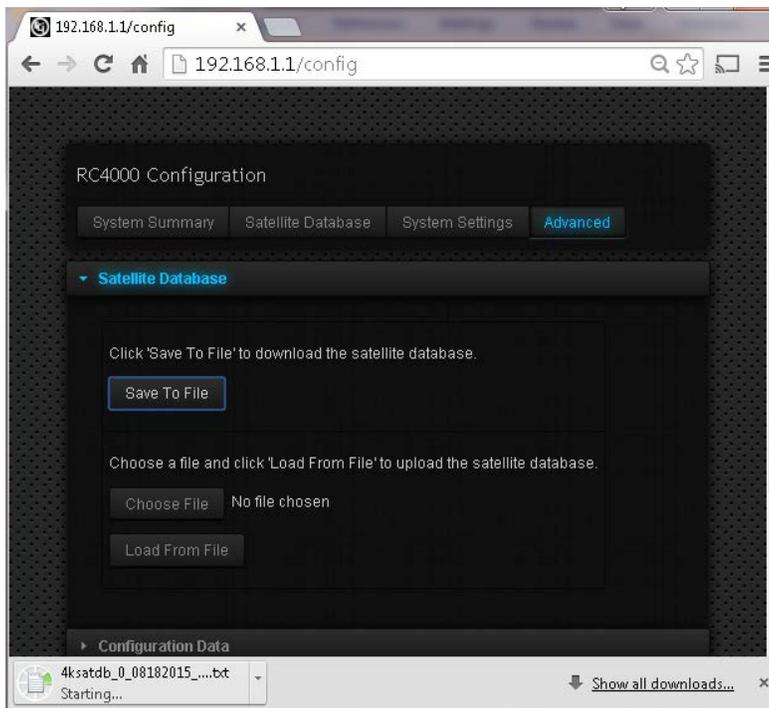
3.2.4 Advanced Page

3.2.4.1 Satellite Database Data Panels

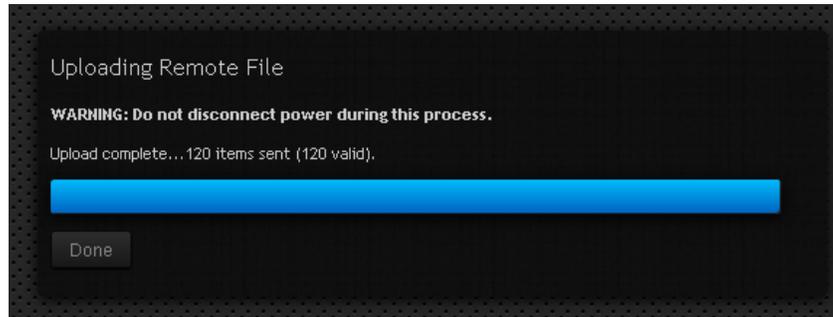
The Satellite Database panel allows the user to download and upload a file that contains the satellite database contents. This feature can be used to quickly change the satellite database without manually entering all necessary data.



When the “Save To File” button is selected, a file will automatically be saved in the web browser download location.



A satellite database file can be uploaded to the controller by browsing to the appropriate file and selecting the “Load From File” button. While the upload is in progress the page will change as shown below. The “Done” button will be enabled when the process is finished. Pressing the “Done” button returns to the System Summary page.

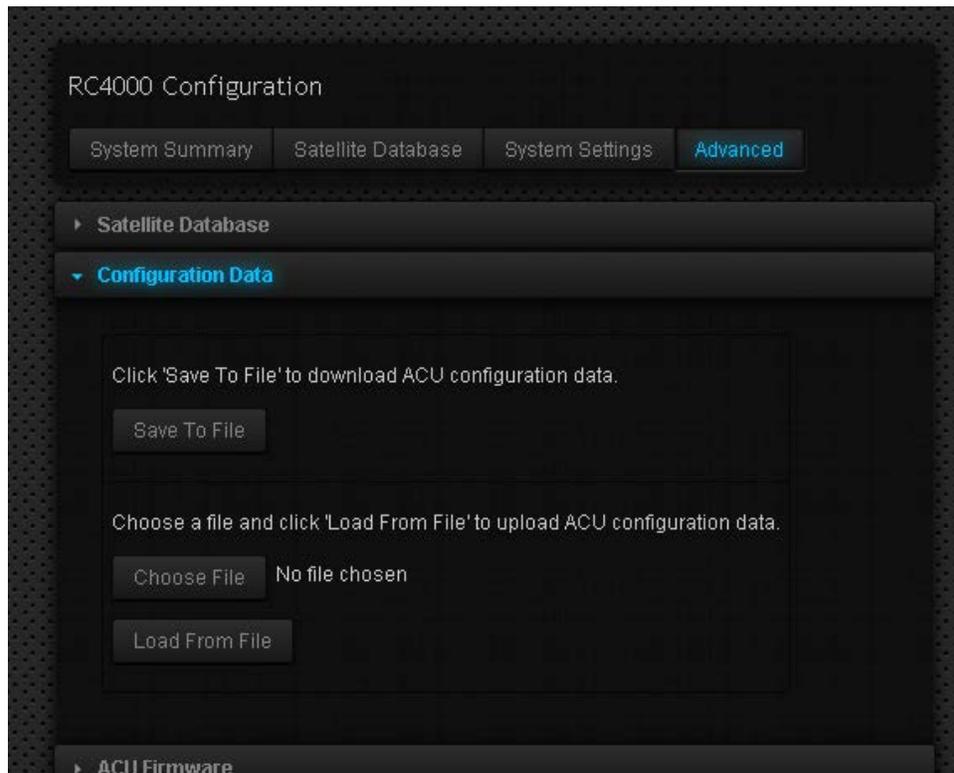


NOTE: Items in the file with invalid data will not be saved.

3.2.4.2 Configuration Data Panel

The Configuration Data panel allows the user to download and upload a file that contains the entire antenna controller configuration. This feature can be used to backup and restore the entire antenna controller configuration (including the satellite database).

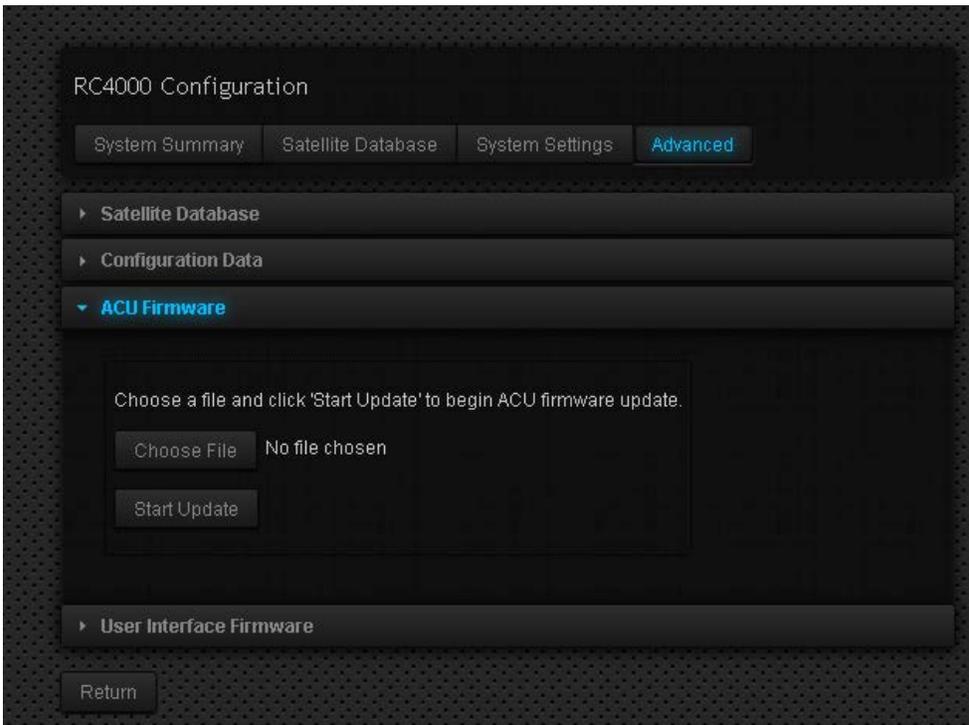
The configuration data panel operates exactly like the satellite database panel.



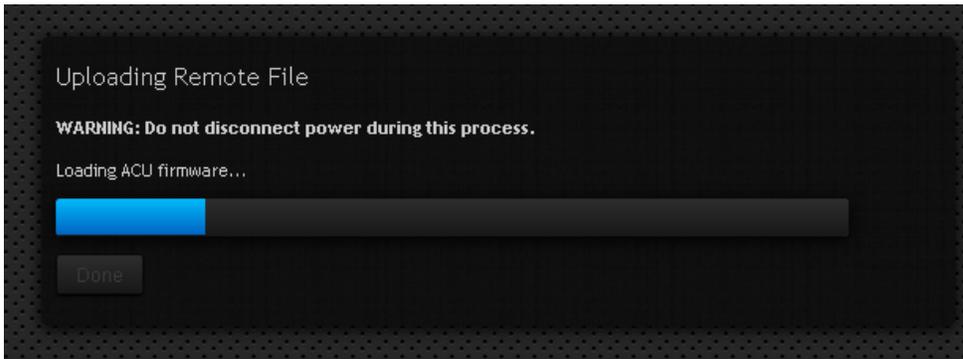
NOTE: Again, items in the file with invalid data will not be saved. This includes items that are downloaded to the configuration data file for reference, but that can't be changed by the user.

3.2.4.3 ACU Firmware Panel

ACU Firmware can be updated using the ACU Firmware panel. Browser to the appropriate “.hex” file and click the “Start Update” button to begin.

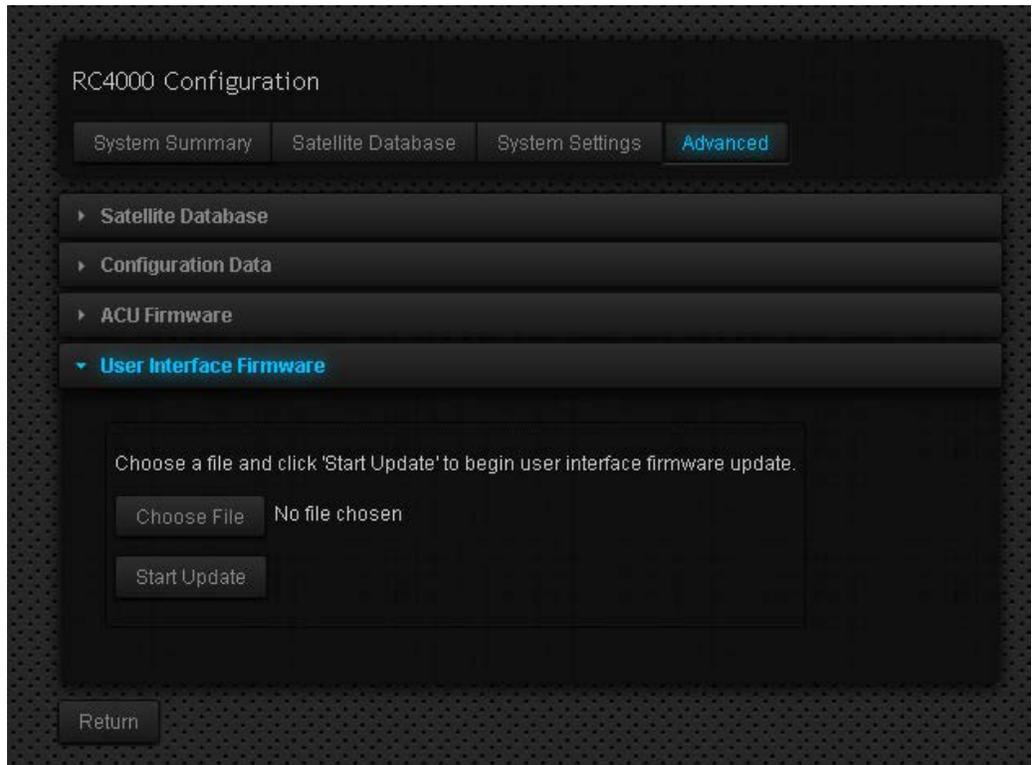


While the update is in progress the page will change as shown below. The “Done” button will be enabled when the process is finished. Pressing the “Done” button returns to the System Summary page.

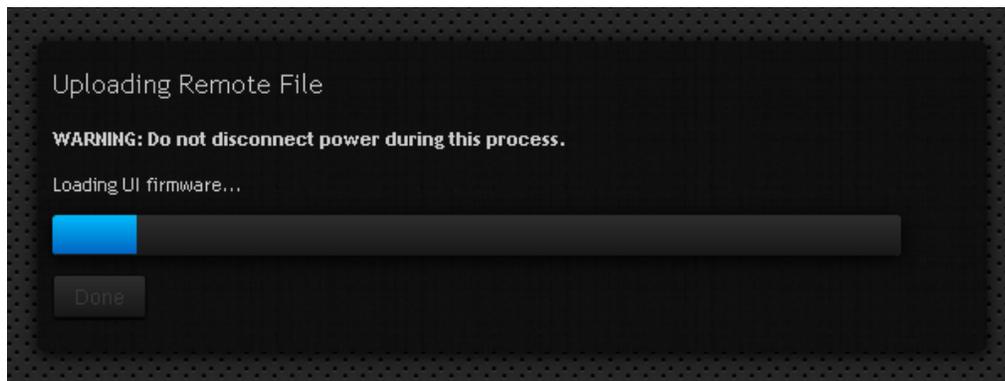


3.2.4.4 User Interface Firmware Panel

User Interface Firmware (GUI Firmware) can be updated using the User Interface Firmware panel. Browser to the appropriate “.rfi” file and click the “Start Update” button to begin.



While the update is in progress the page will change as shown below. The “Done” button will be enabled when the process is finished. Pressing the “Done” button returns to the System Summary page.



3.3 Ethernet to Serial

This section describes how the RC4000 antenna controller can be controlled remotely over an Ethernet connection using the User Datagram Protocol (UDP).

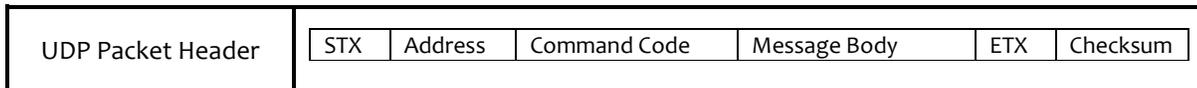
UDP is a simple connectionless protocol where datagrams are sent from a host IP and port to a target IP and port. No acknowledgement, retransmission, or timeout is built in. The SA-Bus protocol used by the RC4000 remote system fills these roles, making UDP the natural choice for monitor and control over an Ethernet connection.

The RC4000 maintains an open IP connection for UDP datagrams on the user-defined Applet Port. By default, this port number is 6767. The packet data of an incoming datagram is relayed directly to the RC4000 internal serial port. The RC4000 response is returned to the host in a similar fashion.

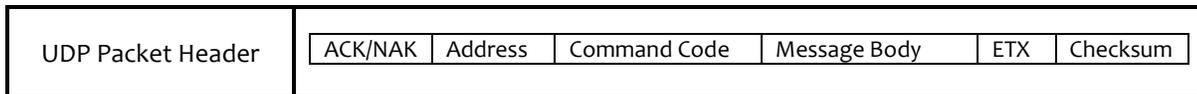
The packet structure of a UDP datagram is beyond the scope of this document. For the following examples, a datagram will consist of a packet header and packet data as illustrated below:



To send a command to the RC4000, make the packet data equal to the full SA-Bus compliant command including the STX, ETX, and trailing checksum as shown below:



The reply from the RC4000 will be in a similar fashion as shown below:



If no response is received from the RC4000, the reply datagram will be the ASCII string "TO", indicating a timeout occurred while waiting for a reply:



Research Concepts, Inc. has prepared a demo program written in C#, to assist individuals interested in developing monitor and control software for an antenna controller with the integrated IP option.

4 ACU Software Update Walk-through

This walk-through describes the steps that should be taken when performing a typical ACU firmware update. Skipping or performing steps out of sequence may result in an unsuccessful update or may present problems later when using the ACU with an antenna.

1. Go to the RC4000 Configuration page (for example, type 192.168.1.1/config into the web browser's address bar).
2. Download the configuration data by following the steps in section 3.2.4.2 of this appendix.
3. Upload a new ACU Firmware file by following the steps in section 3.2.4.3 of this appendix.
4. Using the RC4000 Remote Front Panel, perform a reset defaults as described in section 3.3.1.3.1 of the RC4000 manual.
5. Return to the RC4000 configuration page from Step 1.
6. Upload the configuration data downloaded in Step 2 of this procedure by following the steps in section 3.2.4.2 of this appendix.