APPENDIX IP – INTEGRATED IP OPTION

Last Revised: 25 July 2017

This appendix describes the additional functions provided by the RC4500's Integrated IP option.

1　Theory of Operation

1.1　User Interface Overview

The integrated IP option allows control of the ACU by using a web browser. A built-in HTTP server communicates with the antenna controller 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. 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 ACU 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 options or IO board. The connection from the target PC or other web-enabled device to the antenna controller should be done with a suitable CAT-5e cable. Depending on other equipment in the network, a cross-over cable may be required.

2.2　Network Settings

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

All antenna controllers are factory configured to have an IP address of 192.168.1.1 with 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 PC to 192.168.1.2 with a subnet mask of 255.255.255.0 will usually allow a quick connection to the ACU.

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 labeled "IP RESET" for approximately 8 seconds. The location of the IP Reset pins is circled in the following pictures:
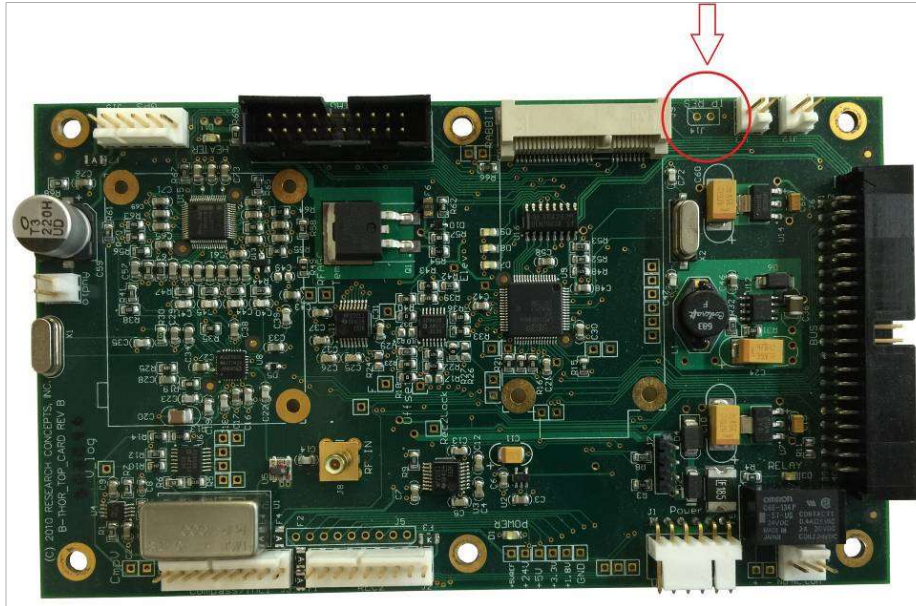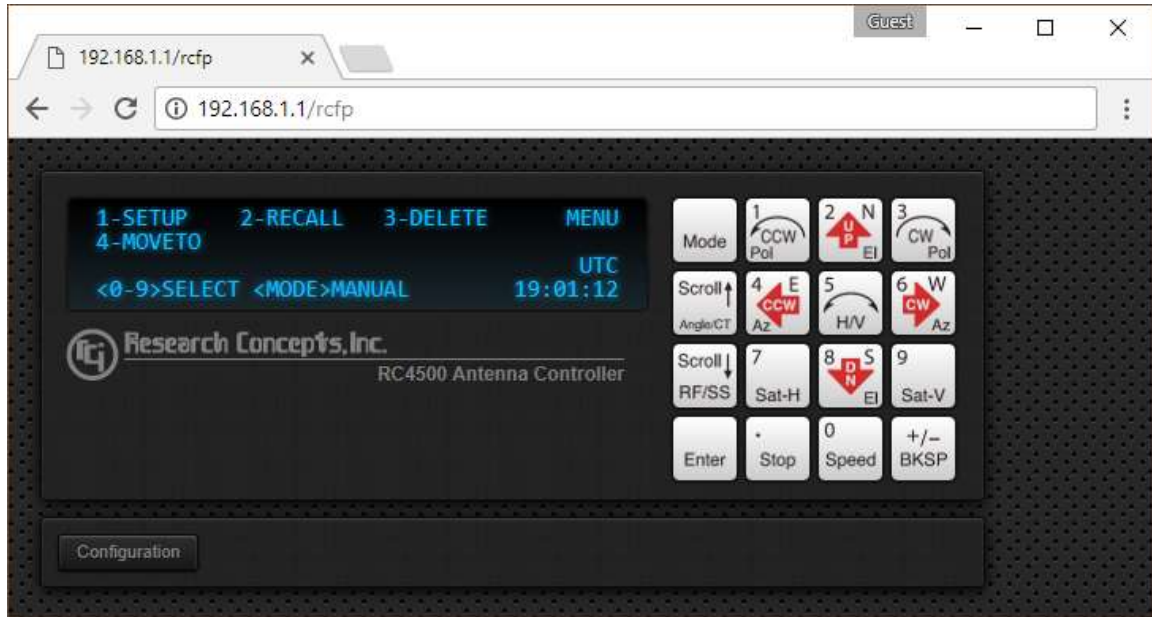

Rev B Options Board
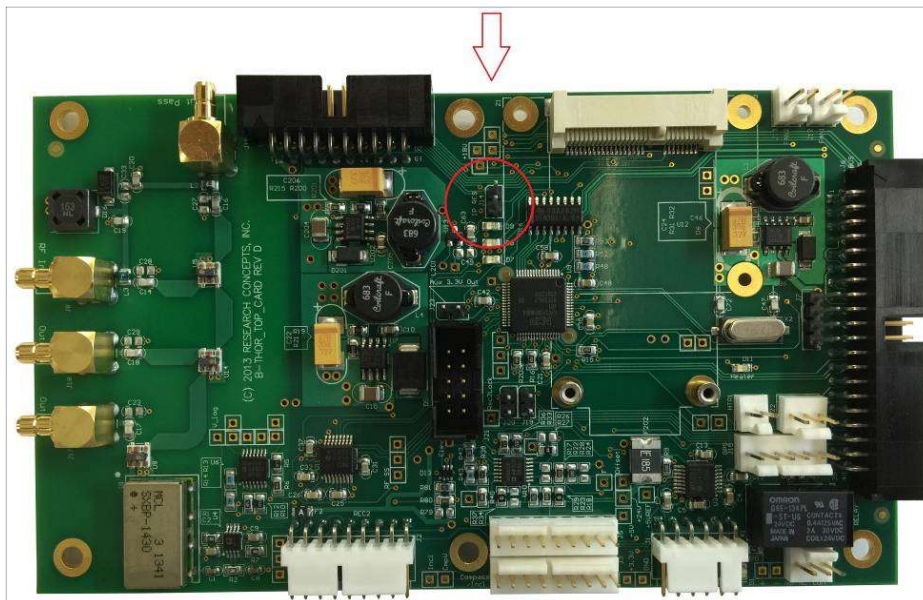
Rev D Option Board

3   Detailed Operation

3.1   Remote Front Panel

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 antenna controller.


Clicking the keys performs the same action as pressing keys on the front panel. The current content of the display is periodically reflected. All functions described in the baseline manual can be completed via the remote front panel.

Clicking the "Configuration" button will go to the Configuration Interface.

3.2   Configuration Interface

The main configuration interface panel has several navigation buttons. Clicking on these buttons will switch between the available pages. Individual pages can have several expandable panels which can be expanded and collapsed to show or hide their contents.
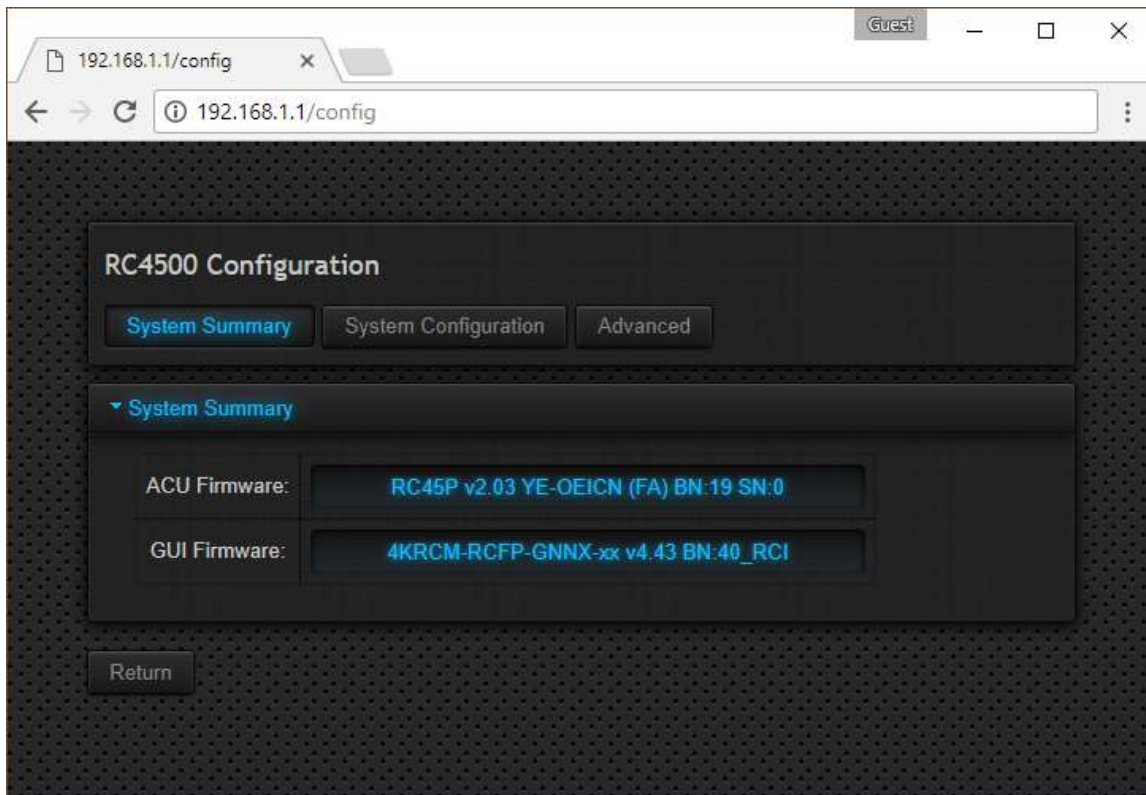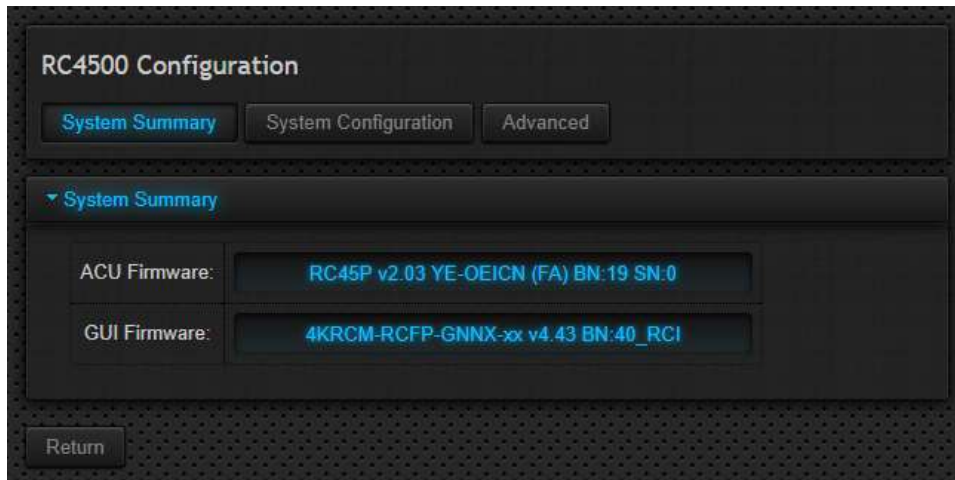

Several pages have a "Save" button. This button will become enabled when a change has been detected, indicating that a save is required before switching to a different page.

Clicking the "Return" button will go back to the main user interface.

3.2.1 System Summary

The System Summary panel gives information about the current ACU and GUI software.

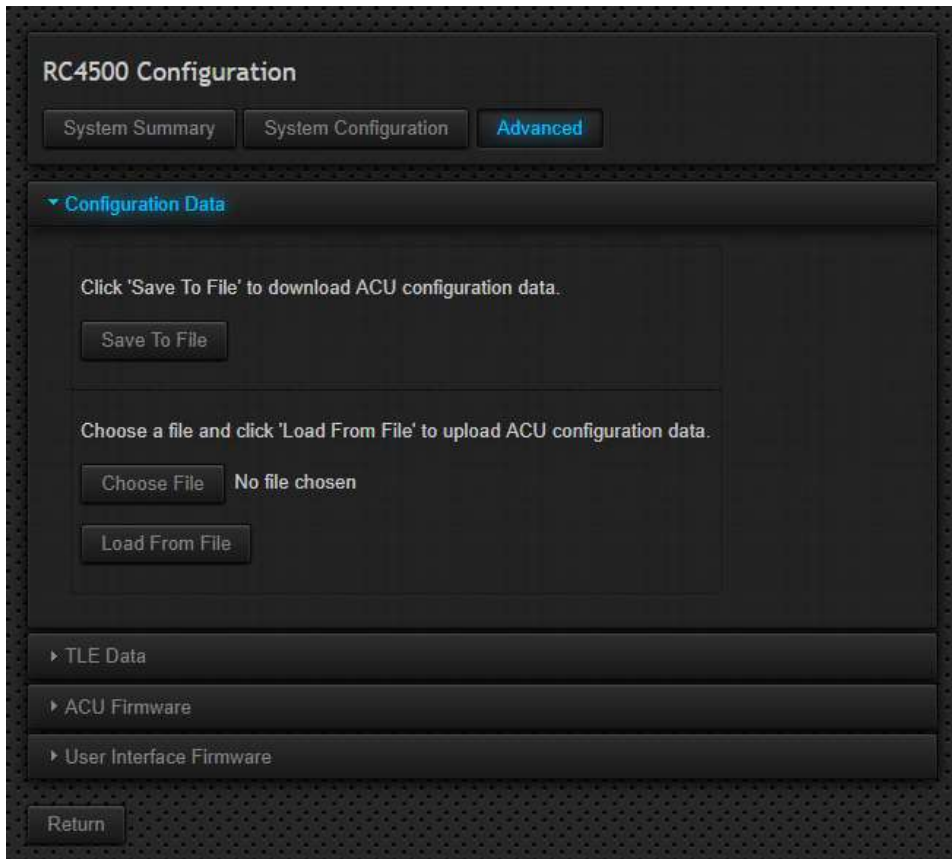

3.2.2 GUI Configuration

The System Configuration > GUI Configuration panel allows the user to set the IP Address, Subnet Mask, Gateway, and Applet Port. 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.
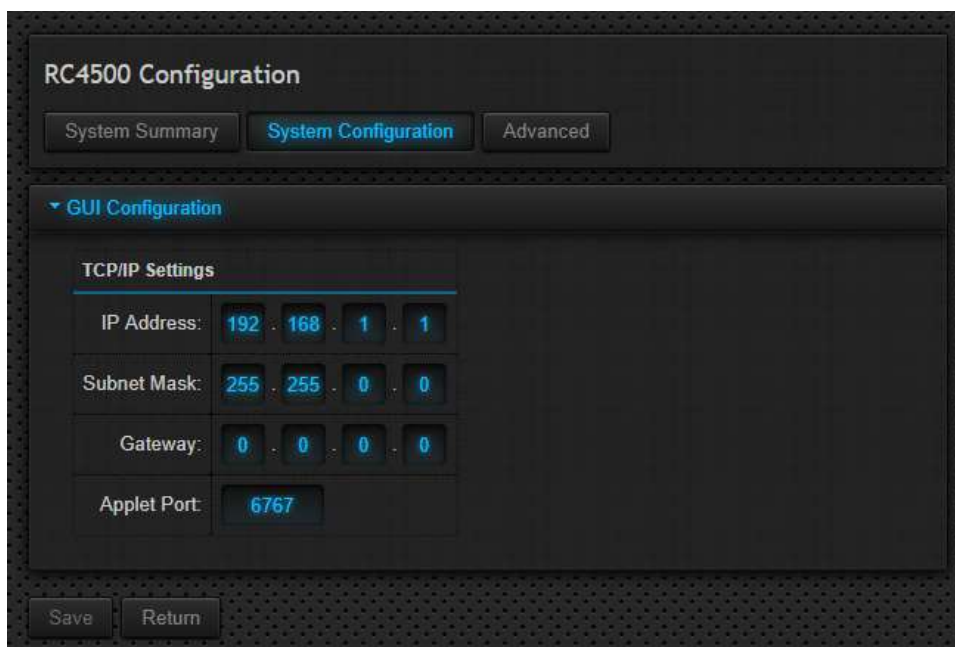

NOTE: Any change made to these settings requires the interface to be reset. After the reset is complete, the web browser will reload this page using the new settings.

3.2.3 Configuration Data

The Advanced > Configuration Data panel allows the user to backup and restore the antenna controller configuration and stored satellite data.


When restoring a configuration, all items are individually verified and any items with invalid data are not changed. The number of items sent and number found as valid is reported as shown below. Clicking the "Done" button returns to the System Summary panel.
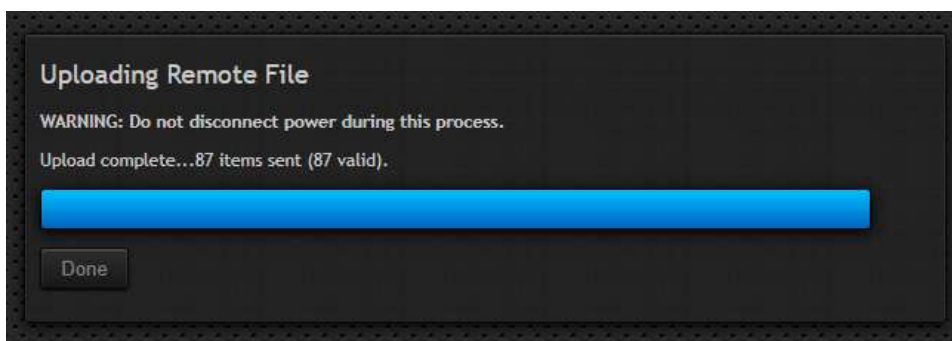
3.2.4 TLE Data

NOTE: This panel is only available on ACUs that were purchased with the TLE Tracking option.

The Advanced > TLE Data panel allows the user to update one or more TLE data sets. Browse to the appropriate ".txt" file and click the "Load From File" button to begin.
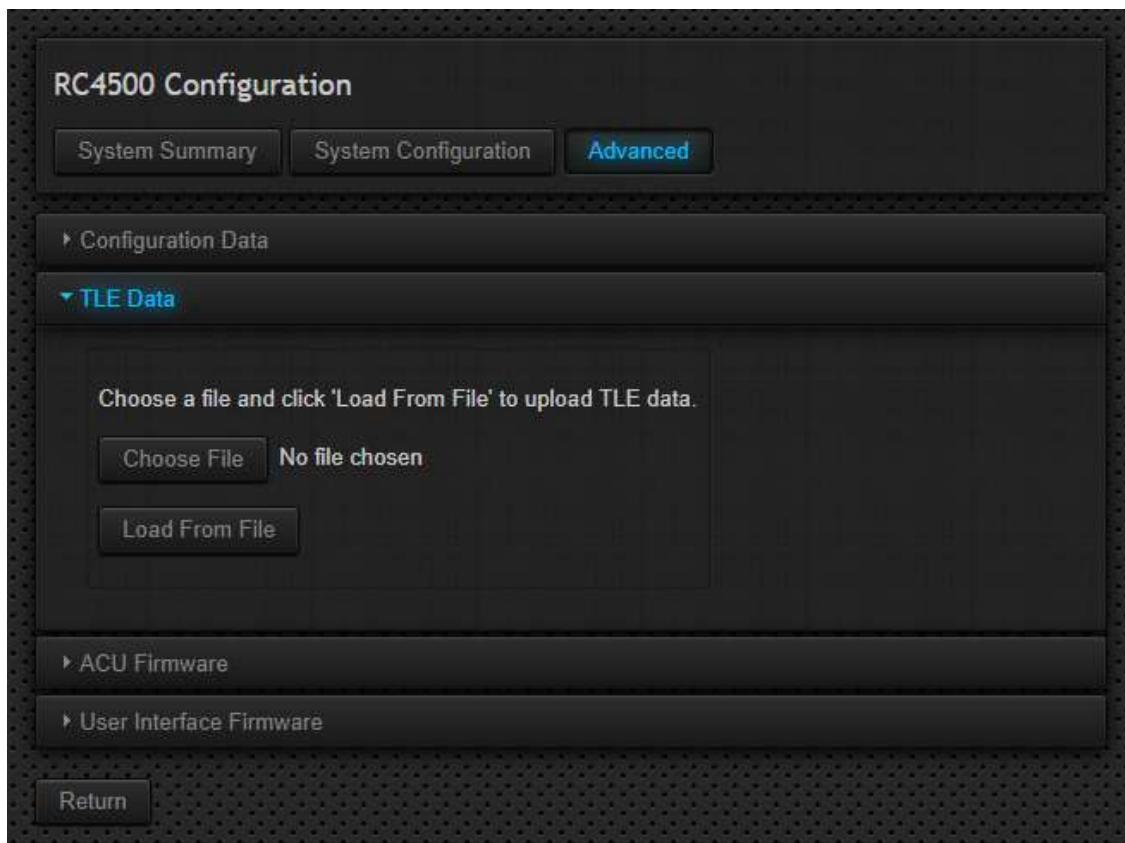
The specified file can contain any number of TLE data sets in the following format:

```
GALAXY 3C
1 27445U 02030A   16146.53207439  .00000000  00000-0  10000-3 0  9992
2 27445   0.0155  18.5746 0002070 336.8761 344.5323  1.00265907 51100
```

The ACU will scan the file and compare launch IDs with TLE data already in memory. When a match is found, the TLE data in the ACU is replaced with the file entry.

NOTE: Only the TLE data lines are updated. The satellite name is not changed.

3.2.5 ACU Firmware

The Advanced > ACU Firmware panel is used to update or change the ACU software. Browse to the appropriate ".hex" file and click the "Start Update" button to begin.
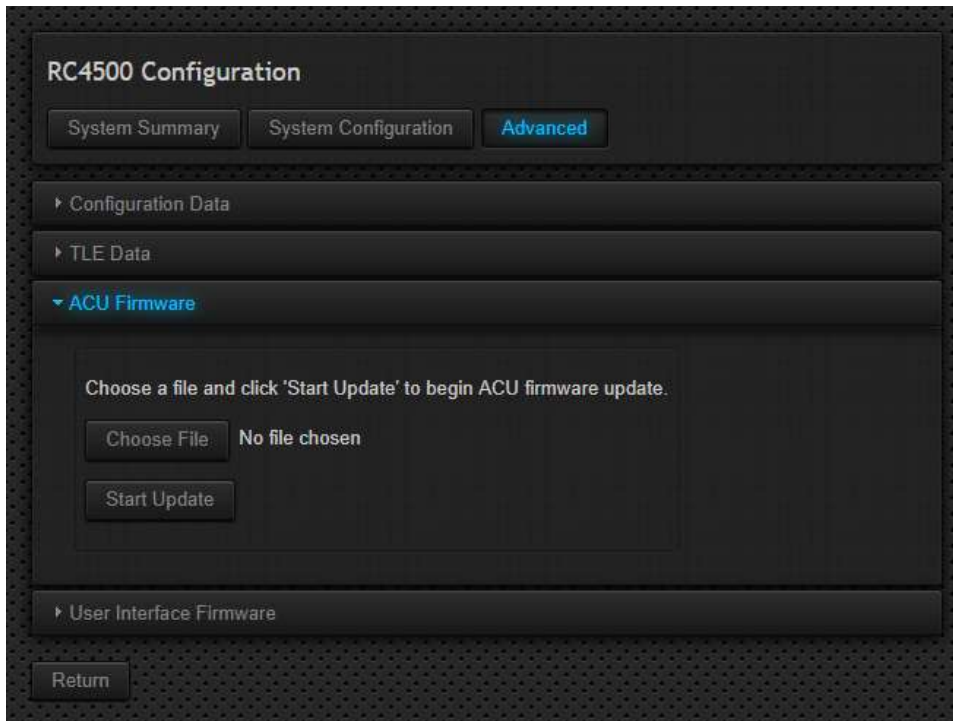
While the update is in progress the page will change as shown below. The "Done" button will be enabled when the process is finished. Clicking the "Done" button returns to the System Summary panel.
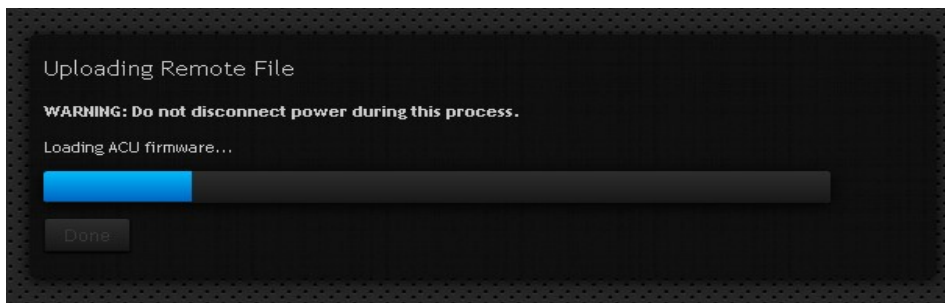
3.2.6   User Interface Firmware

The Advanced > User interface Firmware panel is used to update or change the GUI software. Browse to the appropriate ".rfi" file and click the "Start Update" button to begin.
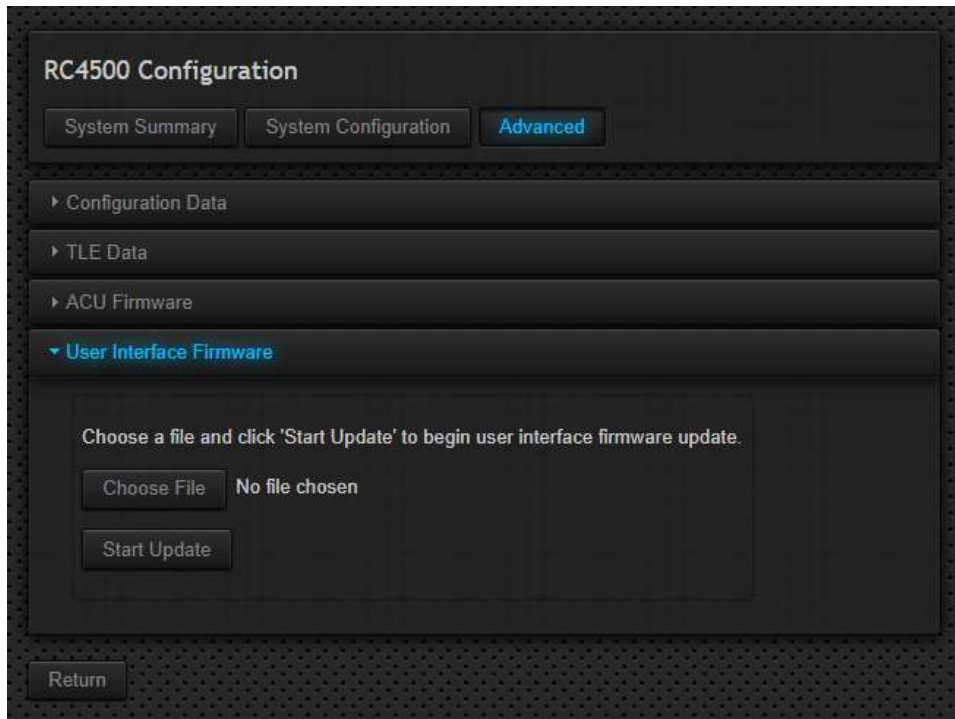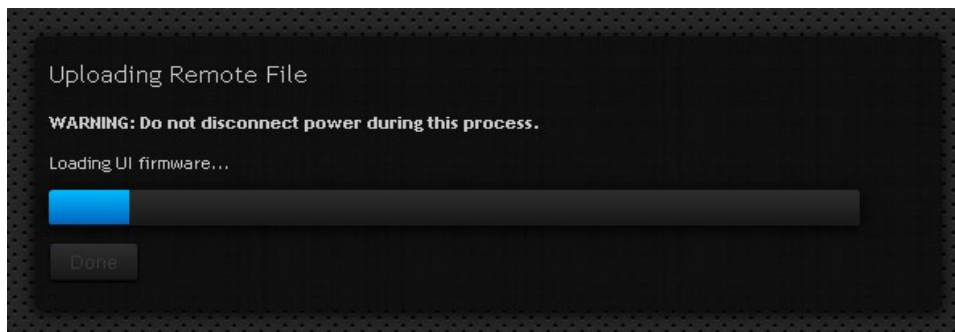

While the update is in progress the page will change as shown below. The "Done" button will be enabled when the process is finished. Clicking the "Done" button returns to the System Summary panel.

3.3   Ethernet to Serial

This section describes how the ACU 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 ACU remote system fills these roles, making UDP the natural choice for monitor and control over an Ethernet connection.

The ACU 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 controller internal serial port. The 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:

UDP Packet Header	UDP Packet Data

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

UDP Packet Header	STX	Address	Command Code	Message Body	ETX	Checksum

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

UDP Packet Header	ACK/NAK	Address	Command Code	Message Body	ETX	Checksum

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

UDP Packet Header	TO

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 software 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 Configuration page (http://192.168.1.1/config).
2. Download the configuration data by following the steps in Section 3.2.3 of this appendix.
3. Upload a new ACU Firmware file by following the steps in Section 3.2.5 of this appendix.
4. Perform an ACU Reset to Factory Defaults. See the baseline manual for more information.
5. Return to the configuration page from Step 1 of this procedure.
6. Upload the configuration data downloaded in Step 2 of this procedure by following the steps in Section 3.2.3 of this appendix.
7. The software update is now complete.