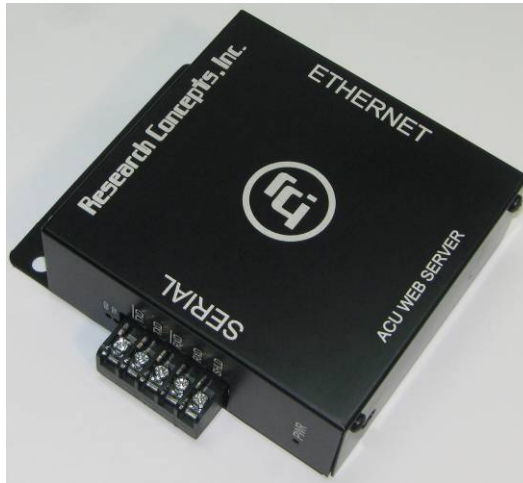


RCI Web Server User's Manual



Content Subject to Change
4 August 2016

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1 THEORY OF OPERATION

1.1 User Interface Overview

The RCI Web Server allows control of an ACU (RC1500, RC2000, RC2500, or RC3000) by using a web browser. A built-in HTTP server communicates with the ACU 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 of this document.

1.2 Ethernet-to-Serial Overview

The RCI Web Server also provides an Ethernet-to-serial connection. The entire 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

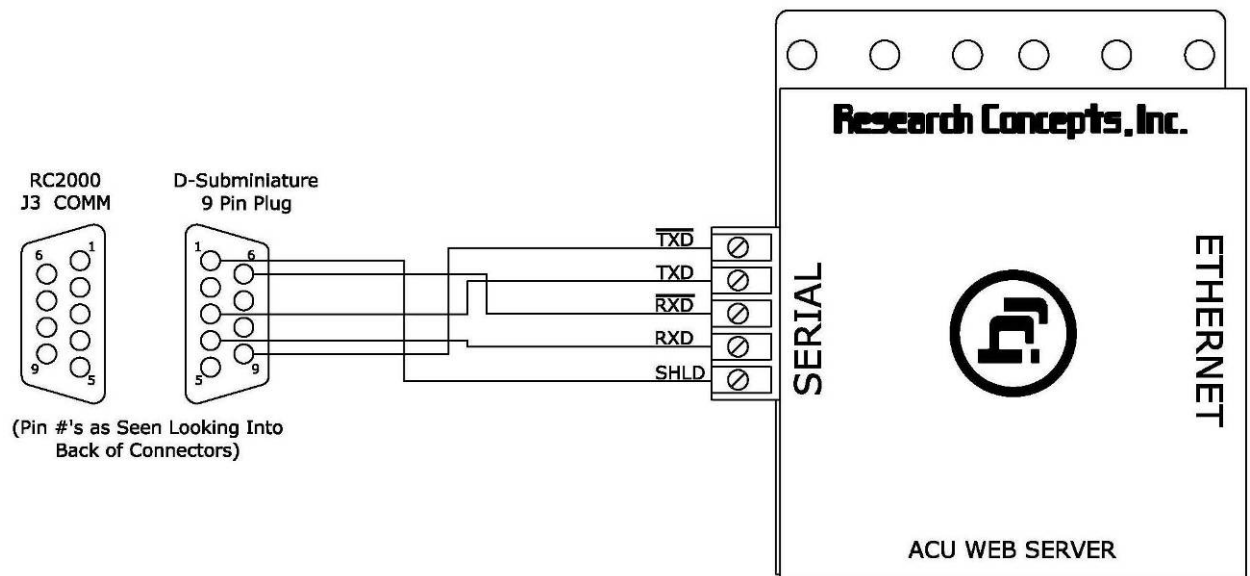
2.1 Physical Interface

The RCI Web Server comes in a 4.25" x 3.5" box that mounts using standard rack holes. The box has four indicators to show network and serial port status and activity.

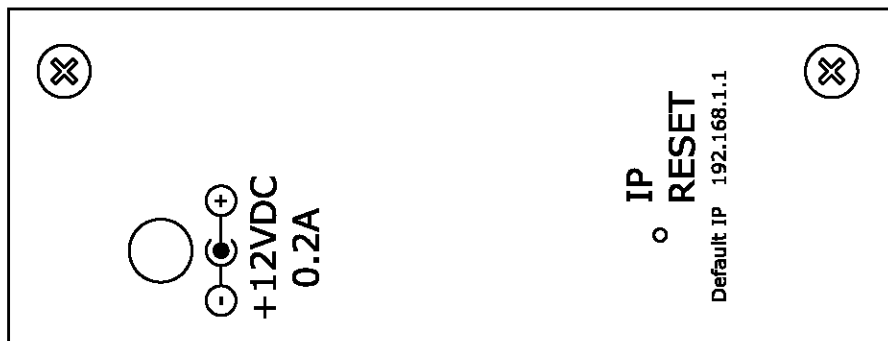
The connection from the target PC or other web-enabled device to the web server should be done with a suitable CAT-5e cable. Depending on other equipment in the network, a cross-over cable may be required. The Ethernet connection is 10/100Base-T.

Input power required: 12VDC at 200mA.

The connection from the web server to the ACU is illustrated in the following drawing:



The Power Input and the IP Reset are located on the side of the enclosure underneath the text “ACU WEB SERVER” as illustrated in the following drawing:



2.2 Network Settings

The PC or other web-enabled device and the web server must be properly configured to exist in the same subnet in order to communicate with each other. Ask your system administrator for the subnet mask and a unique IP address, and then configure the web server to that subnet and IP address before connecting it to your network. Specifics on what IP addresses exist within any given subnet and/or how to configure a particular device is outside the scope of this document.

All web servers 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 web server.

3 DETAILED OPERATION

3.1 Configuration Interface

This section describes the various screens available through the web-based configuration interface. The configuration interface can be reached by adding “/config” to the end of the IP address of the unit. For example, with the default IP address the configuration interface can be loaded by entering “192.168.1.1/config” into the address bar of your browser.

Depending on the controller being used, the main configuration interface panel will have between two and five 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.

Each page has 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.

3.1.1 Configuration Items

3.1.1.1 TCP/IP Settings

The available TCP/IP settings and default values are shown below.

The screenshot displays a web-based configuration interface with a dark theme. At the top, there is a 'Configuration' header. Below it are two tabs: 'Configuration Items' (which is active and highlighted in blue) and 'Firmware Update'. Under the 'Configuration Items' tab, there is a section titled 'TCP/IP Settings' with a blue arrow icon to its left. This section contains four rows of input fields: 'IP Address' with values 192, 168, 1, 1; 'Subnet Mask' with values 255, 255, 0, 0; 'Gateway' with values 0, 0, 0, 0; and 'Applet Port' with the value 6767. Below these fields is a section titled 'Antenna Controller Settings' with a right-pointing arrow icon to its left. At the bottom of the interface are two buttons: 'Save' and 'Return'.

Field	Value
IP Address	192 . 168 . 1 . 1
Subnet Mask	255 . 255 . 0 . 0
Gateway	0 . 0 . 0 . 0
Applet Port	6767

Applet Port is the port on which the antenna controller will use to communicate with the Applet. This port must be open and not in use on the target web-enabled device.

The interface must be reset if a change is made to any of the settings. The following panel will be displayed during the reset. After the reset is complete, the web browser will reload the page at using the new settings.



3.1.1.2 Antenna Controller Settings

The available Antenna Controller Settings and default values are shown below.

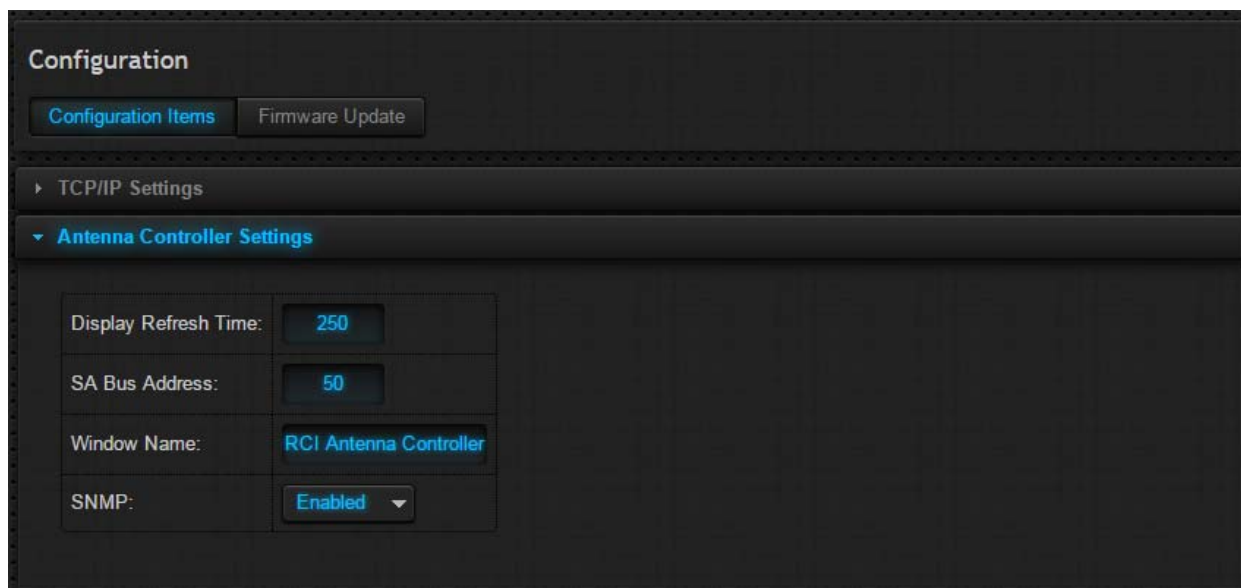
Display Refresh Time is the number of milliseconds between display updates. This item may be changed to overcome network latency issues. NOTE: The defaults setting should be used unless instructed by support personnel.

SA Bus Address is the address of the communications port used by the ACU. This setting must match the *Comm Port Address* setting found in the CONFIG Mode of the ACU.

Window Name is the name that will be displayed on the browser window. This can be changed to uniquely identify each controller when multiple ACUs are used at one location.

SNMP can be enabled to have the ACU respond to SNMP manager requests. Contact support@researchconcepts.com to request the MIB file associated with your ACU. Please include the model of the ACU (RC1500, RC2000A, RC2000C, RC2000X, RC2500, or RC3000) in the email. A detailed discussion of SNMP is outside of the focus of this document.

Enabling SNMP may prevent the use of the front panel, depending on the model of ACU in use. Use of the Remote Front Panel will still be allowed on a compatible ACU when SNMP is enabled.



3.1.1.3 ACU Web Settings

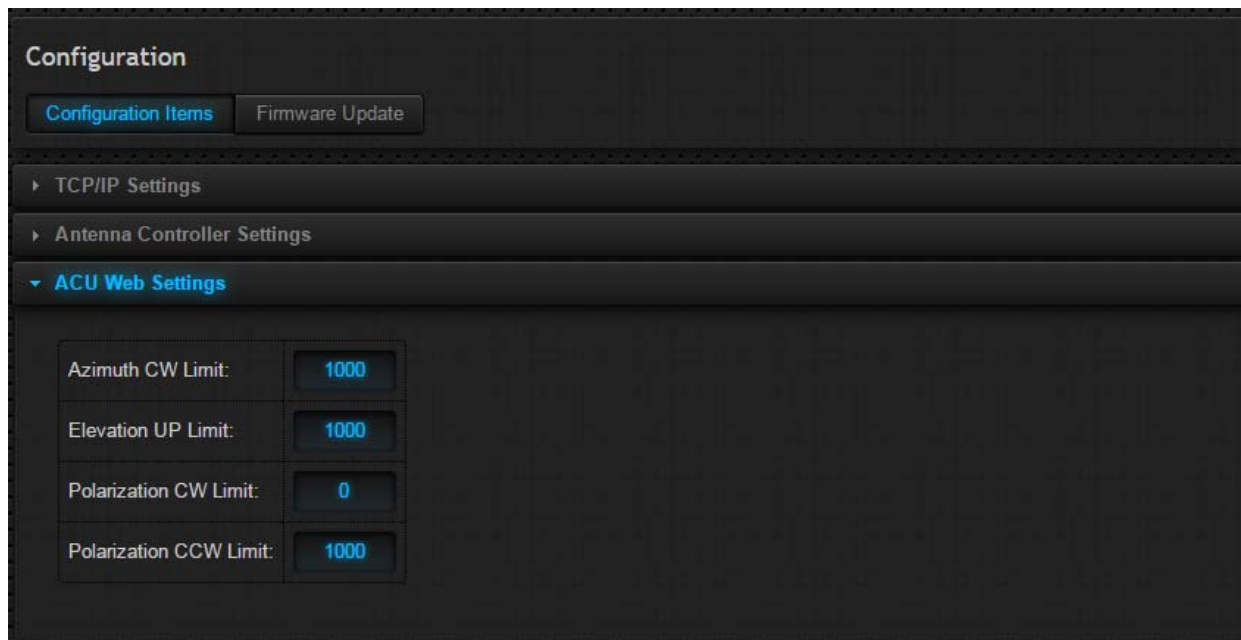
The RCI Web Server will automatically recognize which ACU it is connected to and the ACU Web Settings will vary by ACU. The RC2000A, RC2000X, and RC3000 do not have any ACU Web Settings that need to be configured.

The RC1500 has three ACU Web Settings. Position CW Limit is the azimuth clockwise limit count value. Polarization CCW Limit and Polarization CW limit are the clockwise and counter-clockwise limit count values for polarization. If these are not configured correctly, the gauges will not work correctly. (These settings do not modify the settings on the ACU.)

The screenshot shows a web interface with a dark theme. At the top, there is a 'Configuration' header. Below it are two buttons: 'Configuration Items' (highlighted in blue) and 'Firmware Update'. A list of settings categories follows: 'TCP/IP Settings', 'Antenna Controller Settings', and 'ACU Web Settings' (which is expanded, indicated by a downward arrow). Under 'ACU Web Settings', there is a table with three rows, each containing a label and a numeric input field.

Configuration	
Configuration Items Firmware Update	
▸ TCP/IP Settings	
▸ Antenna Controller Settings	
▾ ACU Web Settings	
Position CW Limit:	1000
Polarization CCW Limit:	1000
Polarization CW Limit:	0

The RC2000C and RC2000X have four ACU Web Settings. Azimuth CW Limit is the clockwise limit count value for azimuth. Elevation UP Limit is the up limit count value for elevation. Polarization CCW Limit and Polarization CW limit are the clockwise and counter-clockwise limit count values for polarization. If these are not configured correctly, the gauges will not work correctly. (These settings do not modify the settings on the ACU.)



The screenshot shows a web interface for configuration. At the top, there is a 'Configuration' header with two tabs: 'Configuration Items' (selected) and 'Firmware Update'. Below the tabs, there are three expandable sections: 'TCP/IP Settings', 'Antenna Controller Settings', and 'ACU Web Settings' (expanded). The 'ACU Web Settings' section contains a table with four rows, each with a label and a numeric input field.

Setting	Value
Azimuth CW Limit:	1000
Elevation UP Limit:	1000
Polarization CW Limit:	0
Polarization CCW Limit:	1000

If any limit settings are changed via the Configuration page or on the ACU for the RC2000A, RC2000C, or RC2000X it is recommended that the ACU be powered off for ten seconds and then powered back on for these settings to propagate.

The RC2500 has four ACU Web Settings. Azimuth Offset should be set to the Azim Display Offset value in the ACU. Elevation Offset should be set to the El Display Offset. Polarization Offset should be set to the Pol Display Offset. Polarization Degrees per Volt should be set to Pol Display Scale Factor. If these items are not configured properly, the Auto Move to specified angles will not work properly. (These settings do not modify the settings on the ACU.)

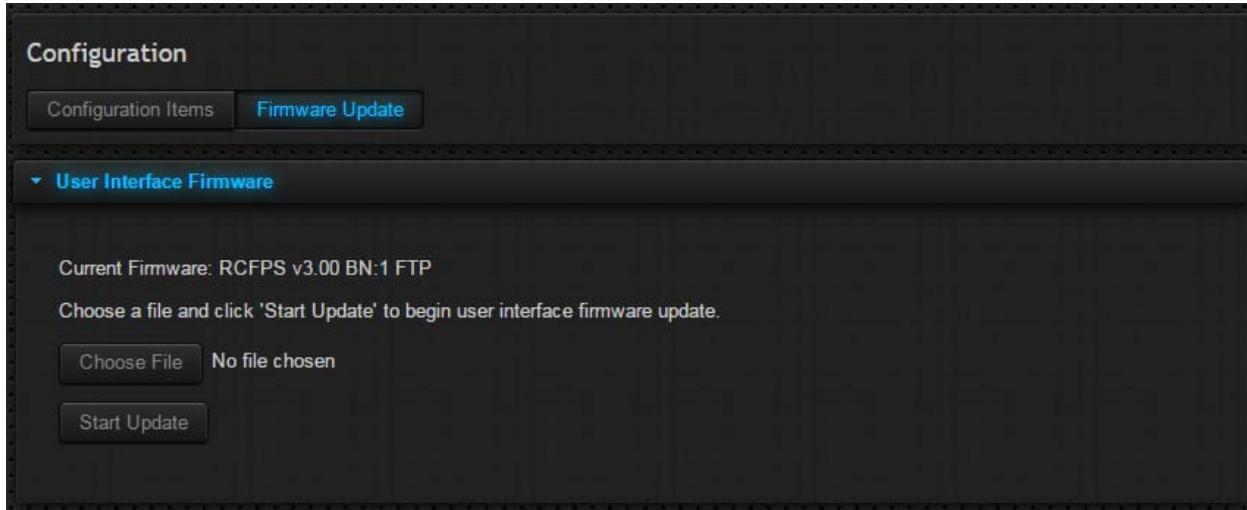
The screenshot shows a web interface for configuration. At the top, there's a 'Configuration' header with two tabs: 'Configuration Items' (selected) and 'Firmware Update'. Below the tabs, there are three expandable sections: 'TCP/IP Settings', 'Antenna Controller Settings', and 'ACU Web Settings' (which is expanded). Under 'ACU Web Settings', there is a table with four rows, each containing a label and a numeric input field.

Configuration	
Configuration Items Firmware Update	
▶ TCP/IP Settings	
▶ Antenna Controller Settings	
▼ ACU Web Settings	
Azimuth Offset:	0.00
Elevation Offset:	0.00
Polarization Offset:	0.00
Polarization Degrees per Volt:	20

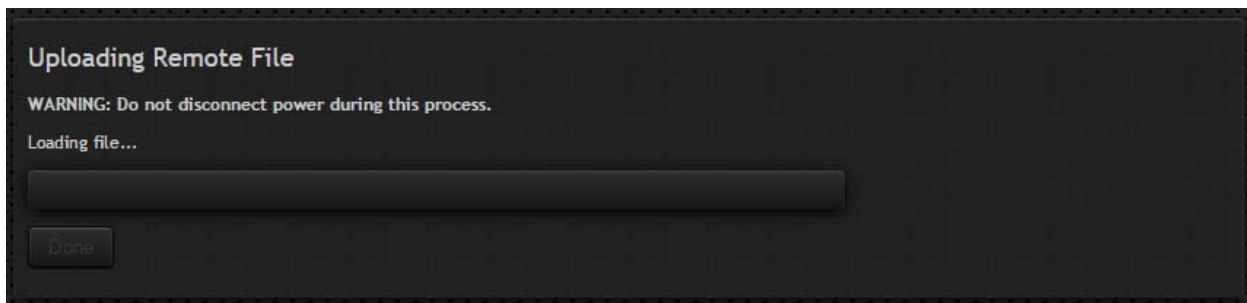
3.1.2 Firmware Update

3.1.2.1 User Interface Firmware

The User Interface Firmware panel is shown below. Choose a file and click the Start Update button to start the user interface firmware update process.



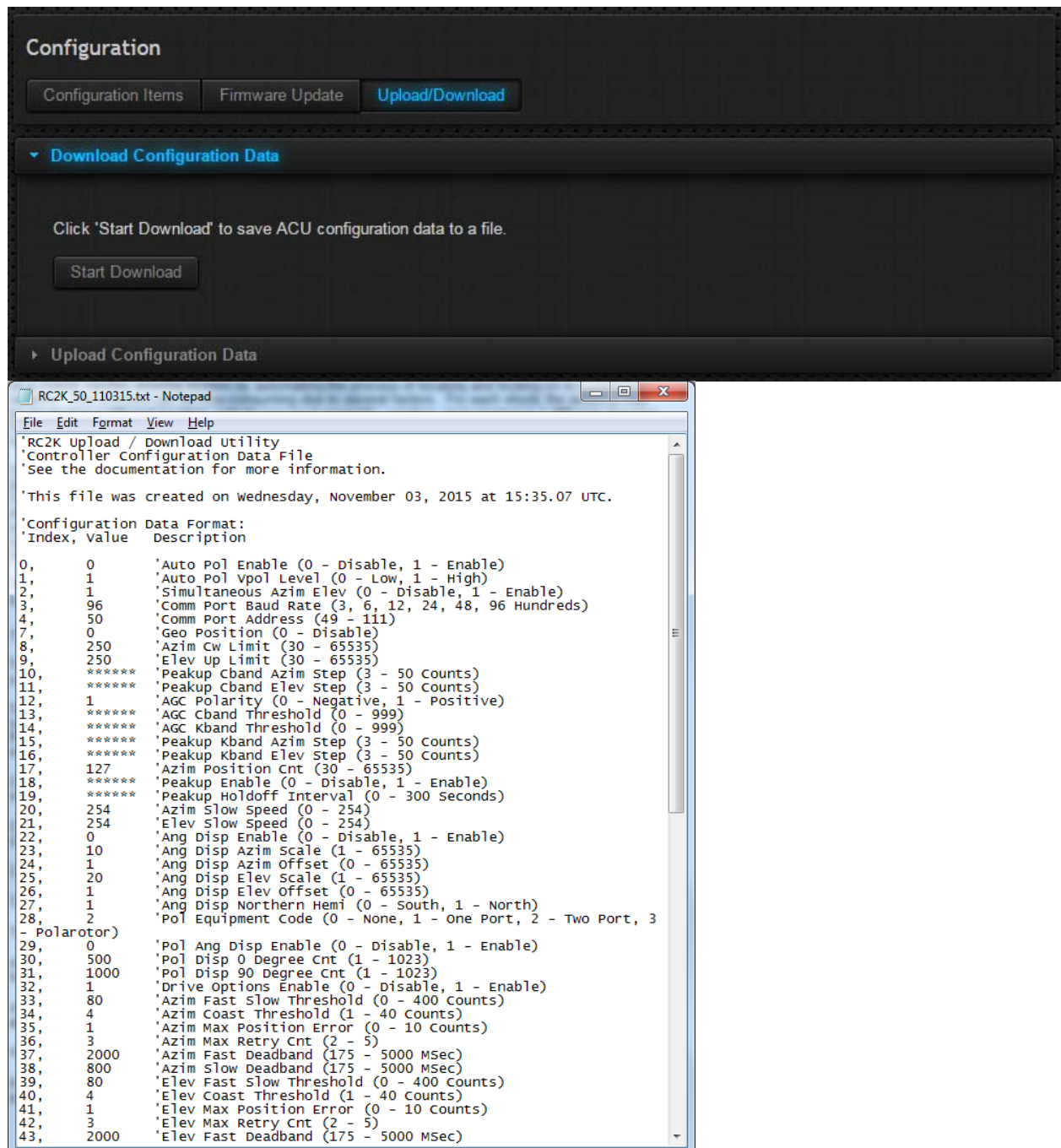
The following panel displays the current progress of the firmware update. Click the Done button to return to the configuration interface.



3.1.3 Upload/Download

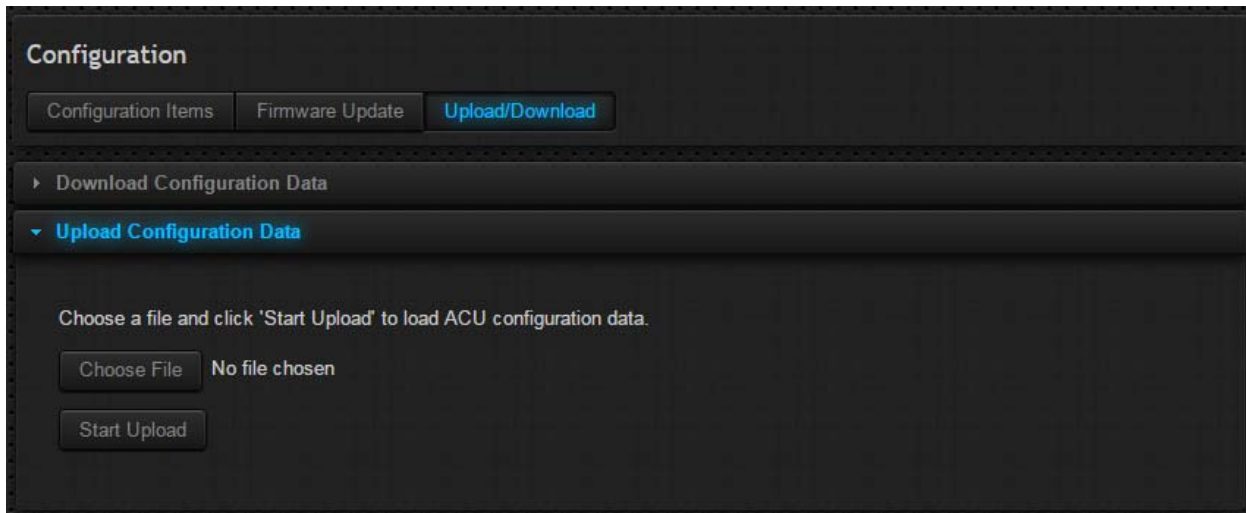
3.1.3.1 Download Configuration Data

The RC2000A supports downloading all of the configuration items to a text file. The interface is shown below. To download the text file filled with all of the configuration items and satellites, click the Start Download button. A text file is created with a default filename of RC2K_(address)_(date). Within the file, every data item (configuration data or satellite data) is listed on its own line in comma-delimited format along with a description. All characters on a line after a single quotation mark (') are considered comments.



3.1.3.2 Upload Configuration Items

The RC2000A supports uploading configuration items and satellite data via text file. The upload interface is shown below. To upload items properly, they need to be in an identical format of the items seen in the downloaded configuration text file. Every item does not have to be entered and the order of items and satellites are interchangeable, as long as they are entered in proper format.



The screenshot shows a web interface titled "Configuration". At the top, there are three tabs: "Configuration Items", "Firmware Update", and "Upload/Download", with the latter being the active tab. Below the tabs, there are two expandable sections. The first section, "Download Configuration Data", is collapsed. The second section, "Upload Configuration Data", is expanded and contains the following text: "Choose a file and click 'Start Upload' to load ACU configuration data." Below this text, there is a "Choose File" button and a label "No file chosen". At the bottom of the section, there is a "Start Upload" button.

3.1.4 Satellite Database

The RC3000 supports modifying the data stored in the Satellite Presets and TLE Data (if the ACU is TLE compatible) configuration screens from the Satellite Database tab shown below. For further explanation of the individual data fields, please refer to the RC3000 User Manual.

Configuration

Configuration Items

Firmware Update

Satellite Database

DVB Detection Points

CI Record

▼ # 1 106.5W (106.5W)

Satellite Name	Satellite Longitude	Satellite Band	Satellite Inclination	Satellite Pol Offset
106.5W	106.5 ° W ▼	Ku ▼	2 °	0.0 °

Two-Line Element Data

Enabled ▼

1 23846U 96022A 11165.84349559 -.00000092 00000-0 10000-3 0 9887

2 23846 3.6112 69.6484 0005147 16.6722 13.6141 1.00271503 55494

▶ # 2 95W (95.0W)

▶ # 3 IPSTAR (119.5E)

▶ # 4 SAT K2 (81.0W)

▶ # 5 GE-5 (79.0W)

3.1.5 DVB Detection Points

The RC3000 supports modifying the data stored in the DVB Detection Points configuration screen (if the ACU is DVB compatible) from the DVB Detection Points tab shown below. For further explanation of the individual data fields, please refer to the RC3000 Appendix DVB.

Configuration

Configuration Items

Firmware Update

Satellite Database

DVB Detection Points

CI Record

1 (148.0W)

DVB Longitude	DVB Polarization	DVB Frequency	DVB Symbol Rate	DVB FEC	Priority
148.0 ° W	RHCP	12224 MHz	20000 kS/sec	5/6	1

2 (99.0W)

3 (110.0W)

4 (105.0W)

5 (95.0W)

6 (79.0W)

7 (72.0W)

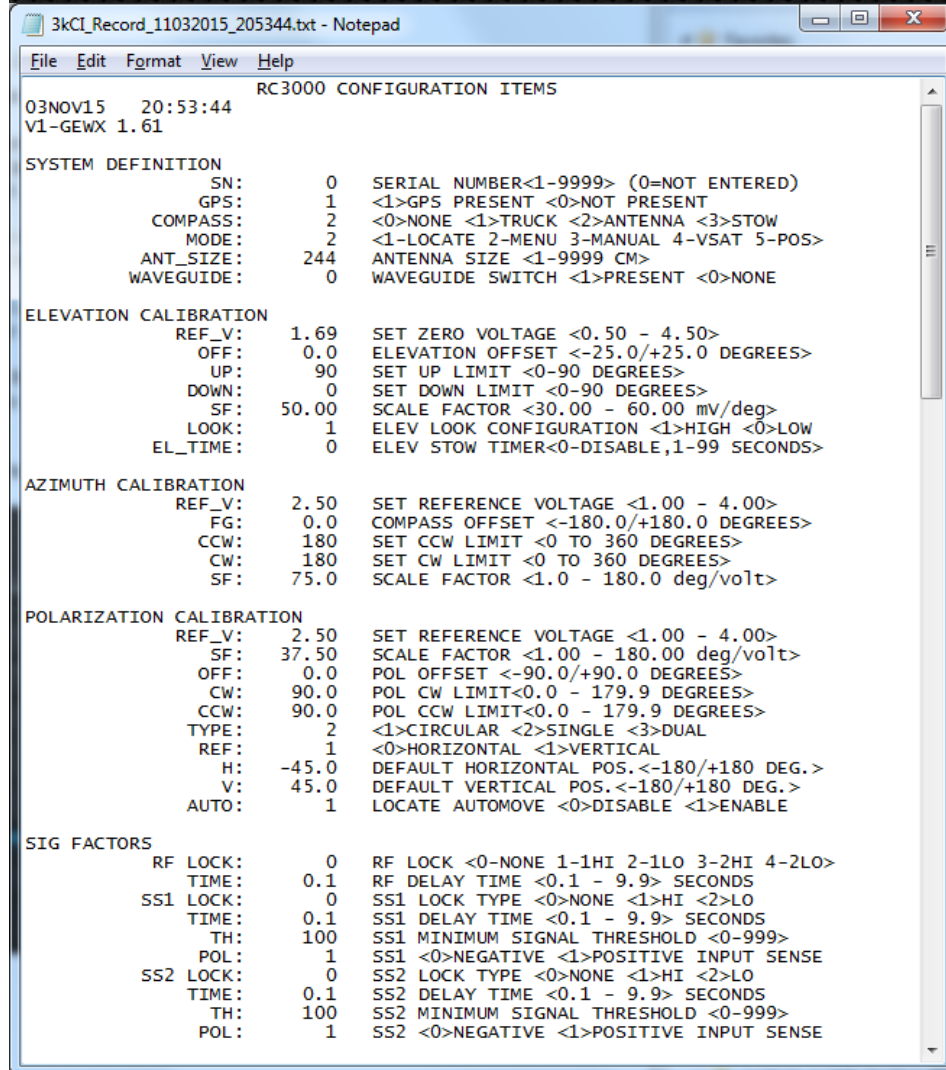
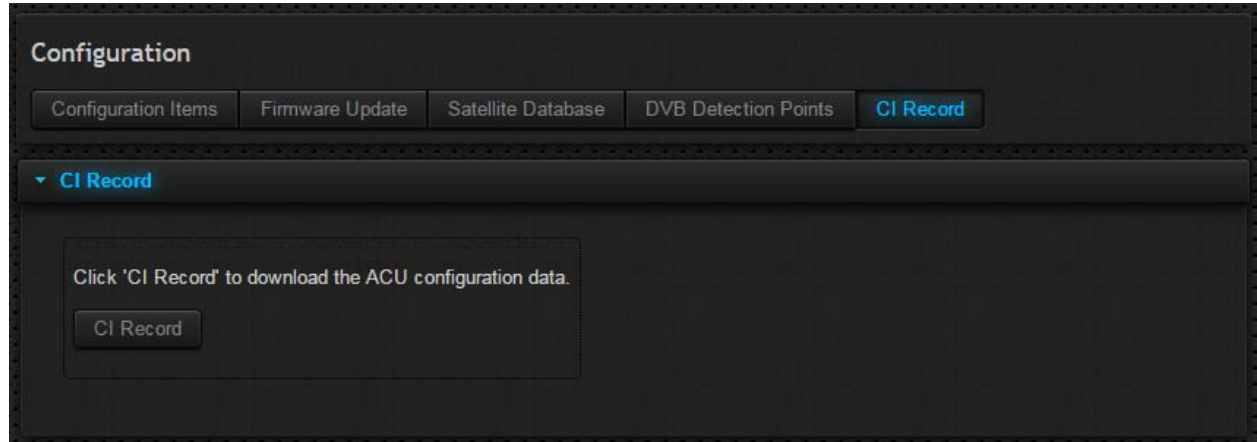
8 (87.0W)

9 (95.0W)

10 (101.0W)

3.1.6 CI Record

The RC3000 supports downloading all of the ACU configuration items to a text file. The interface is shown below. To download the text file filled with all of the configuration items and satellites, click the CI Record button. A text file is created with a default filename 3kCI_Record_(date)_(time).



3.2 User Interface

The User Interface that is displayed depends on the ACU that is connected to the RCI Web Server.

3.2.1 RC1500 User Interface

The RC1500 User Interface contains two gauges for displaying Azimuth and Polarization position, a jog panel, AGC output as well as a Satellite List. The Satellite List is automatically populated using the data previously setup in the RC1500. Selecting a satellite name from the Satellite List will begin an Auto Move to that saved satellite.



3.2.2 RC2500 User Interface

The RC2500 User Interface contains three gauges for displaying Azimuth, Elevation and Polarization position, a jog panel, two AGC outputs as well as a Satellite List. The Satellite List is automatically populated using the data previously setup in the RC2500. Selecting a satellite name from the Satellite List will begin an Auto Move to that saved satellite.

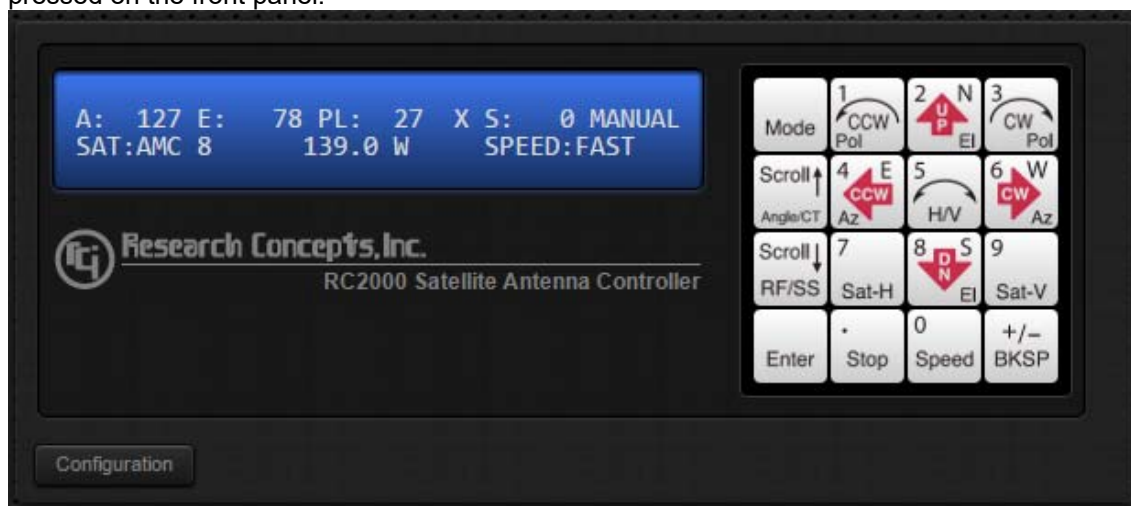


3.2.3 RC2000 User Interface

The RC2000A, RC2000C and RC2000X User Interfaces contain three gauges for displaying Azimuth, Elevation and Polarization position, a jog panel, an AGC output as well as a Satellite List. The Satellite List is automatically populated using the data previously setup in the RC2000. Selecting a satellite name from the Satellite List will begin an Auto Move to that saved satellite.



The RC2000A (version 2.70 and up) and the RC2000X (version 1.70 and up) can also access the Remote Front Panel. Pressing keys on the panel performs the same action as if keys were actually pressed on the front panel.

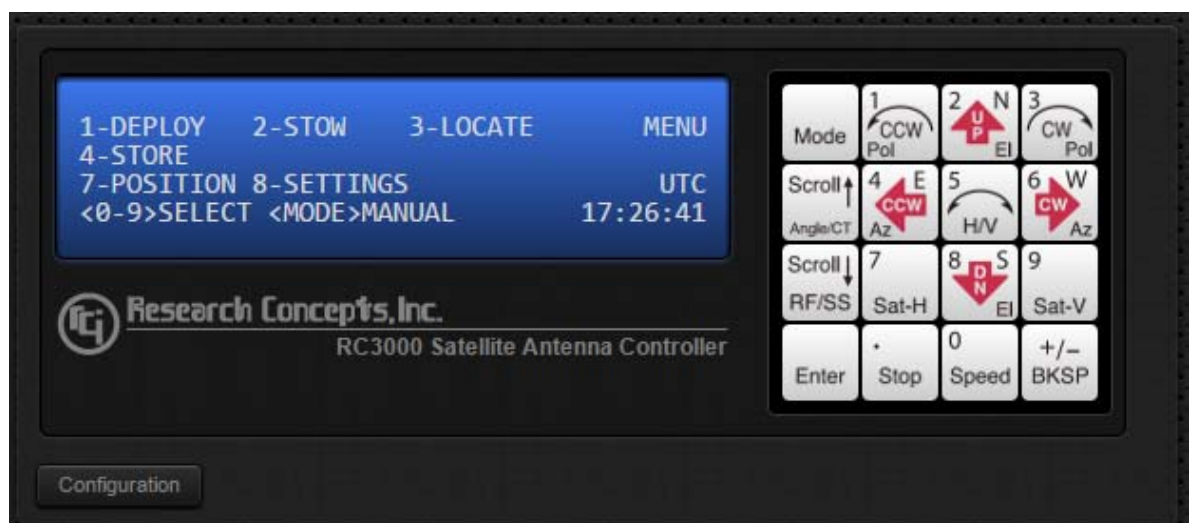


3.2.4 RC3000 User Interface

The RC3000 User Interface contains three gauges for displaying Azimuth, Elevation and Polarization position, a jog panel, an AGC output as well as a Satellite List. The Satellite List is automatically populated using the data previously setup in the RC3000. Selecting a satellite name from the Satellite List will begin an Auto Move to that preset satellite.



The RC3000 can also access the Remote Front Panel. Pressing keys on the panel performs the same action as if keys were actually pressed on the front 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 ACU internal serial port. The ACU 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
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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
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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
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If no response is received from the ACU, the reply datagram will be:

UDP Packet Header	TO
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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 TROUBLESHOOTING

4.1 Web Browser Will Not Load Main Web Page

Problem	Solution(s)
Web browser will not load main web page	<ol style="list-style-type: none">1. PC or device assigned invalid address.2. Ethernet cable not connected or bad.
Stuck at "Searching For ACU..."	<ol style="list-style-type: none">1. Software firewall blocking Applet port (6767).2. Enable remote mode in the ACU Config menu items.3. Make sure the SA Bus Address match on the ACU and RCI Web Server Config.4. Browser Cache needs cleared.

5 Revision History

Revision Date	By	Description
9/5/13	RC	Initial release.
11/21/13	JDK	Replace wiring diagram and update description of electrical connections in section 2.1 (page 1)
11/5/15	RC	Added RC3000, updated configuration images.
8/5/26	RC	Upload/Download section updated to reflect that RC2000X does not support upload/download of configuration items.