Radio Telescope User Interface Reference Guide

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Section One Introduction

The User interface for the radio telescope primarily operates with the following three Pages:

- Main Page - Initial settings for the radio telescope are set here. In addition to this the user can start or stop the radio telescope from here.

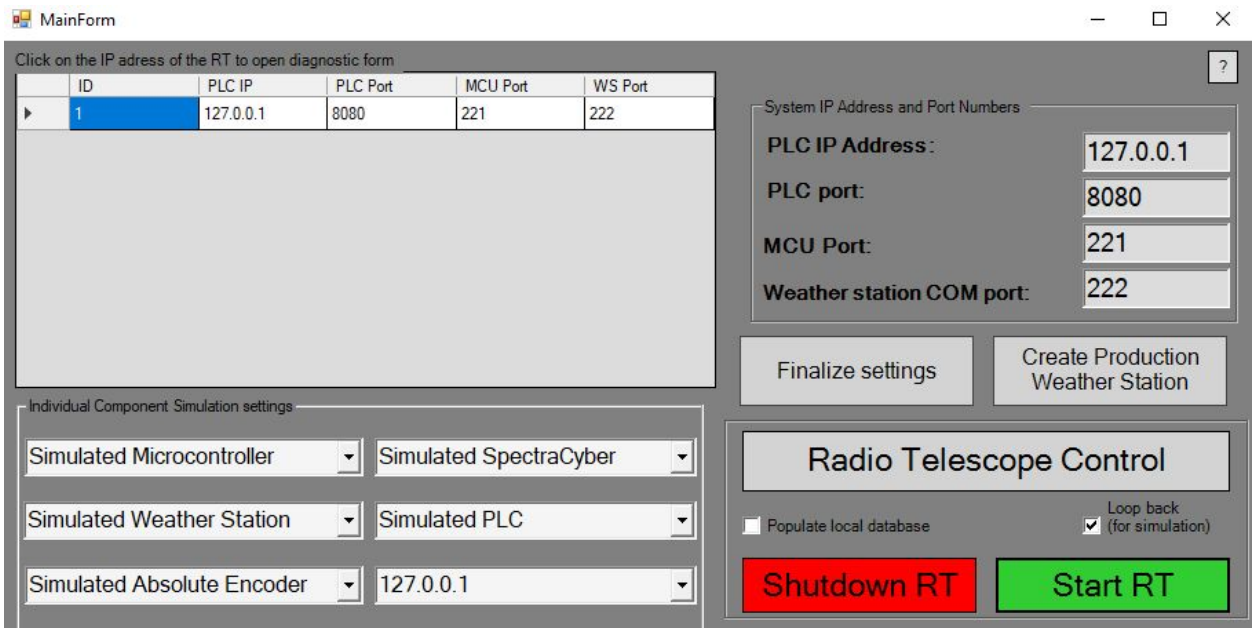
- Radio Telescope Control Page - This Page is the main method of control for the user to control the movement of the radio telescope in any capacity. This Page allows the user to directly enter desired coordinates of their observation , direct manual control of the telescope, and control scripts the user may need to run.

- Diagnostics Page-The diagnostics Page consists of the following three tabs:
    A- Appointment Control Tab
    B- Sensor Data Tab
    C-Sensor Override Tab

When the control room software is run the main page is is the first one to be displayed for the user. The main Page allows the operator to set the conditions for the telescope they want to view (mostly just simulated vs. real sensor data). When the start telescope button is pressed the ip address of the Radio telescope you want to control should appear in the gray box at the top left corner of the Page. From here you can reach the diagnostics Page by double clicking the desired IP address. In order to reach the Page to control the radio telescope you click on the radio telescope control button. When testing the telescope it is often necessary to run the control room software as a simulation, In order to do this, the checkbox for loop back (for simulation) should be checked before the start telescope button is pressed

Section Two Main Page

2.1. Main Page Overview



Features:

Radio Telescope Data Grid display box- Once the radio telescope has been started the IP and PLC IP addresses will appear here as well as the Port numbers set by the user which the PLC, MCU, and Weather Station are operating on. Double clicking on one of these will open up the diagnostics Page for that telescope.

Telescope control button- This button brings the user to the Radio Telescope Control Page. This Page provides the user with access to the control scripts in addition to allowing the user control over the RT both manually and by inputting coordinates. This button remains inactive until the user clicks on the Start Radio telescope button.

Simulation settings groupbox- This group box contains several spinboxes that allow the user to choose which sensors they would would like to simulate and which they would like to run the real version. After the finalize settings button has been pressed this group box will be deactivated temporarily(until the radio telescope has been started). The initialization options in this group box include :

- Microcontroller group box-
- Weather Station group box-
- Absolute Encoder group box-
- Spectra Cyber group box-
- PLC group box-
- IP group box-This group box includes the recurring IP addresses used by the control room for different instances of radio telescope. If a different IP is required the IP can be input directly from the IP addresses and Port numbers groupbox

System IP Addresses and Port Numbers groupbox- This group box contains several text boxes that allow the user to manually input several important IP addresses and port numbers. The initialization options in this group box include :

- PLC IP address text box-
- PLC Port number text box-
- MCU Port text box-
- Weather Station COM Port text box-

Finalize Settings Button- This button finalizes the settings input by the user in the Simulation settings group box as well as the system IP addresses and port numbers groupbox. Once this button has been pressed those groupboxes will be deactivated and the remaining functionality on the main Page will be activated to allow the user to finish creating the current radio telescope instance.

Create Production Weather Station Button- This button is only necessary if the user chooses a setting other than simulated weather station in the weatherstation spinbox.

Start telescope-This button starts the telescope. If the user desires to run the control room software as a simulation the loopback (for simulation) checkbox needs to be checked before the start telescope button is pressed. No other functionality on this Page will be active until this button has been pressed.This button will not be enabled until the Finalize settings button has been pressed (if using a test or production weather station the user must also click the create weather station before start button will activate).

Shut down telescope button- This button shuts down the telescope as well as the control room software.This button will remain disabled until the start radio telescope button has been pressed.

Initialization of the Main Page

2.2. User Interface Operation

After clicking on the executable the first page the user will encounter is the Main page. The purpose of this page is to set all of the initial conditions necessary to activate an instance of the radio telescope. The start button for the radio telescope will only activate after these steps have been completed.

Step 1- Locate the simulation settings groupbox in the bottom left corner of the main Page.This group box contains 6 dropdown boxes that each pertain to a different component of the radio telescope. The user must select between between simulation, test , and production for each of the components in this groupbox (with the exception of the ip spinbox).

Step 2- Locate the system IP and Port number groupbox in the top right corner of the main Page.This group box contains 4 text boxes that each pertain to a different component of the radio telescope. The user can enter specific Ip addresses and port numbers for each component. If the user is running a simulation telescope these text boxes will populate automatically.

Step 3- After the user has finished inputting the settings they must click on the finalize settings button. This button disables all of the functionality in the settings groupboxes and enables the simulation checkbox and start button.

> ***Step 3.A-*** If the user has selected simulation weather station this step is unnecessary. However if the user chooses the test or production weather station they must press the create production weather station button before the start radio telescope button will be enabled.

Step 4- If the user is running a simulation radio telescope then they must check the simulation checkbox located above the start button prior to pressing the start button.

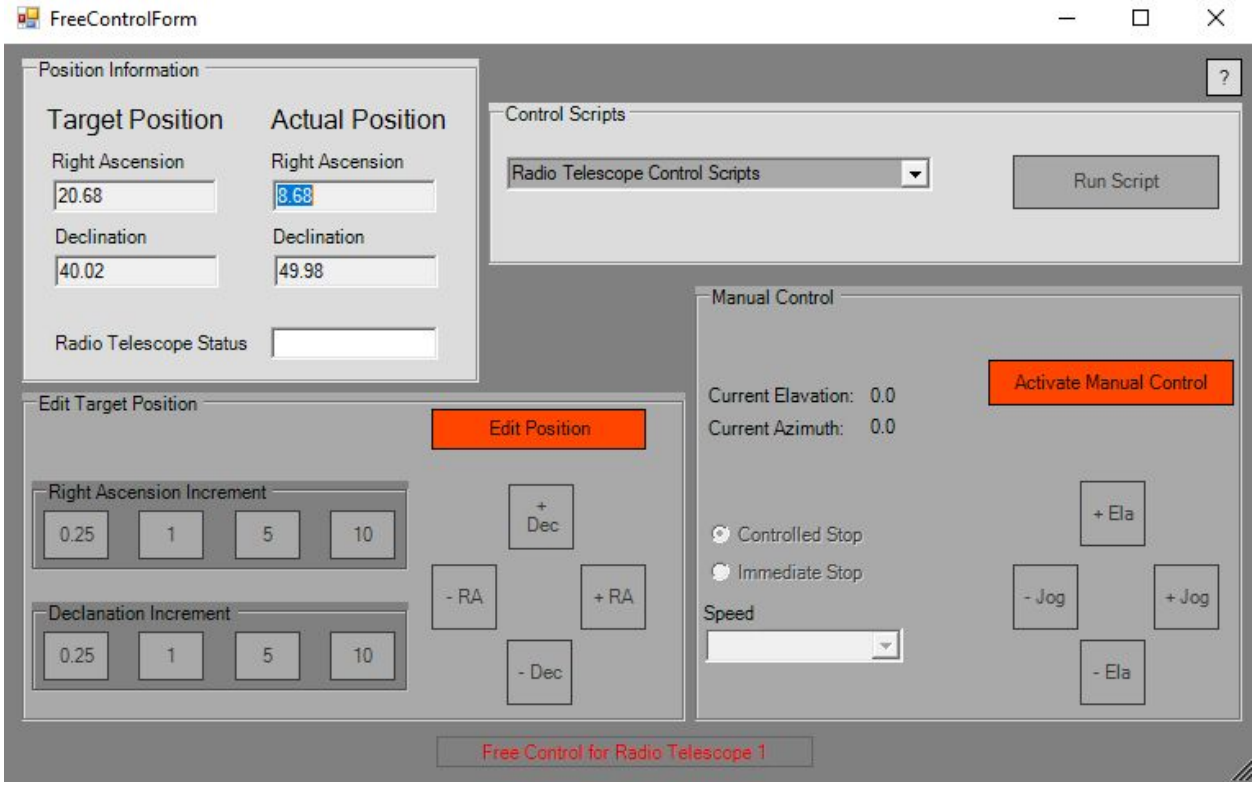
Step 5- If steps 1-4 have been completed correctly then the radio telescope button should be enabled. The last step to creating and starting an instance of the radio telescope is to hit the start button. Once the start button is pressed the user should several changes happen to the page. The first change that will be evident is that the settings group boxes re-enable. The Data grid display box on the top left corner of the Page should populate with the inPageation from the port and IP number group box , and the radio telescope control button and shut down button will now be enabled as well.

Step 6- The Radio telescope Control Button should be enabled once the radio telescope has been created and started. The user can navigate to the radio telescope control page by clicking on Radio telescope control button located above the start button.

Step 7- Once the radio telescope has been started the user can navigate to the Diagnostics Page by double clicking on the desired radio telescope IP address displayed in the Data Grid display box in the top right corner of the main Page.

Section Three Radio Telescope Control Page

3.1. Radio Telescope Control Page Overview



Features:

Position inPageation groupbox:

Target position information- These boxes display the current value for the target position of the Radio telescope.

Actual Position Information-These boxes display the current value for the actual position that the Radio telescope is pointed at.

Edit target position groupbox:

Edit Position Button- This button allows the user to edit the target position information for the RT. None of the functionality within the Edit target position groupbox will be accessible to the user until this button has been pressed.

Increment Right Ascension Buttons- These buttons allow the user to control the amount each button click of the plus or minus Right ascension buttons increments onto the target value for the telescope

Increment Declination Buttons-These buttons allow the user to control the amount each button click of the plus or minus Descension buttons increments onto the target value for the telescope

Apply Changes- This button finalizes and applies the changes to target position data made by the user. After this button is clicked the telescope will start moving towards the new target position

Control Scripts dropdown box-This dropdown contains scripts for common tasks the radio telescope will have to perPage. In order to activate one of these scripts the user must double click on their script of choice to select it. Once the script is selected the user must

- Snow Dump-This script is used to dump snow build up off of the RT
- Thermal Calibration-This script points the RT at a designated tree nearby in order to calibrate the telescope
- Stow-This script is used to orient the telescope directly upwards when it is not in operation

Manual control groupbox:

Activate manual control-This button allows the user to begin controlling the telescope manually. Until this button is pressed the rest of the functionality within this groupbox for manual manipulation of the radio telescope will be disabeled.

***Current azimuth labe*l**- displays the value for the radio telescopes current azimuth.

***Current elevation labe*l**- displays the value for the radio telescopes current elevation

Speed dropdown box- This drop down allows the user to change the speed at which the radio telescope moves.It provides the user with several options

-Jog -This allows the user to move the telescope counter clockwise

+Jog -This allows the user to move the telescope clockwise

+Ela - This allows the user to move the telescope upward

- Ela - this allows the user to move the telescope downward

Controlled stop -when this option is clicked the telescope will come to a controlled when it is no longer being told to move.

Immediate stop -when this option is clicked the telescope will come to an immediate when it is no longer being told to move.

Operation of the Radio Telescope Control Page

3.2. Control Page Description

After clicking the radio telescope control button the Control Page will be displayed for the user. This control Page provides several different options for the user. These options include control scripts , “free control” ,and manual control. The Free control and manual control however cannot be activated at the same time as that would send conflicting commands to the radio telescope and the scripts override both free and manual control.

When free control is activated the user may input their desired coordinates directly into the text boxes or they may use the buttons provided in the edit target position groupbox located in the bottom left corner of the control Page.

When manual control has been activated the user can control the telescope directly using the jog and elevation buttons located in the manual control groupbox located in the bottom right corner of the control Page. In addition to this functionality the user can also control the speed of movement and the type of stop executed by the radio telescope.

The control scripts the user has access to here consist actions the telescope will have to regularly perPage such as snow dump , calibrate,and stow. The user simply has to select their desired script then hit the run script button to execute that script. This overrides appointments and manual control however.

3.3. Free Control Operation

Step 1- In order to activate the free control functionality (appointment control using coordinates) the user must first press the the edit position button located in the edit target position groupbox. Once this button has been pressed the entire target position groupbox will be enabled for the user to operate.

1.a - If the manual control group box is currently active then the edit position button will be disabled because the radio telescope cannot operate with instructions from free and manual control simultaneously.

Step 2- The user can use the +,- Right ascension and declination buttons to edit their desired target position. The current position as well as the active target

position are displayed for the user in the top left corner of the Page in the position information group box.

2.a - If the user desires a different increment for the right ascension and declination buttons then they may choose a new increment in the section provided to the left of the right ascension and declination buttons

Step 3 **-** if the user has a specific coordinate already picked out then they may skip the tedious process of clicking to it using the right ascension and declination buttons and instead simply enter the desired coordinates in the target position fields located in the position inPageation groupbox.

3.4. Manual Control Operation

Step 1-

Step 2-

Step 3-

3.5. Control Script Operation

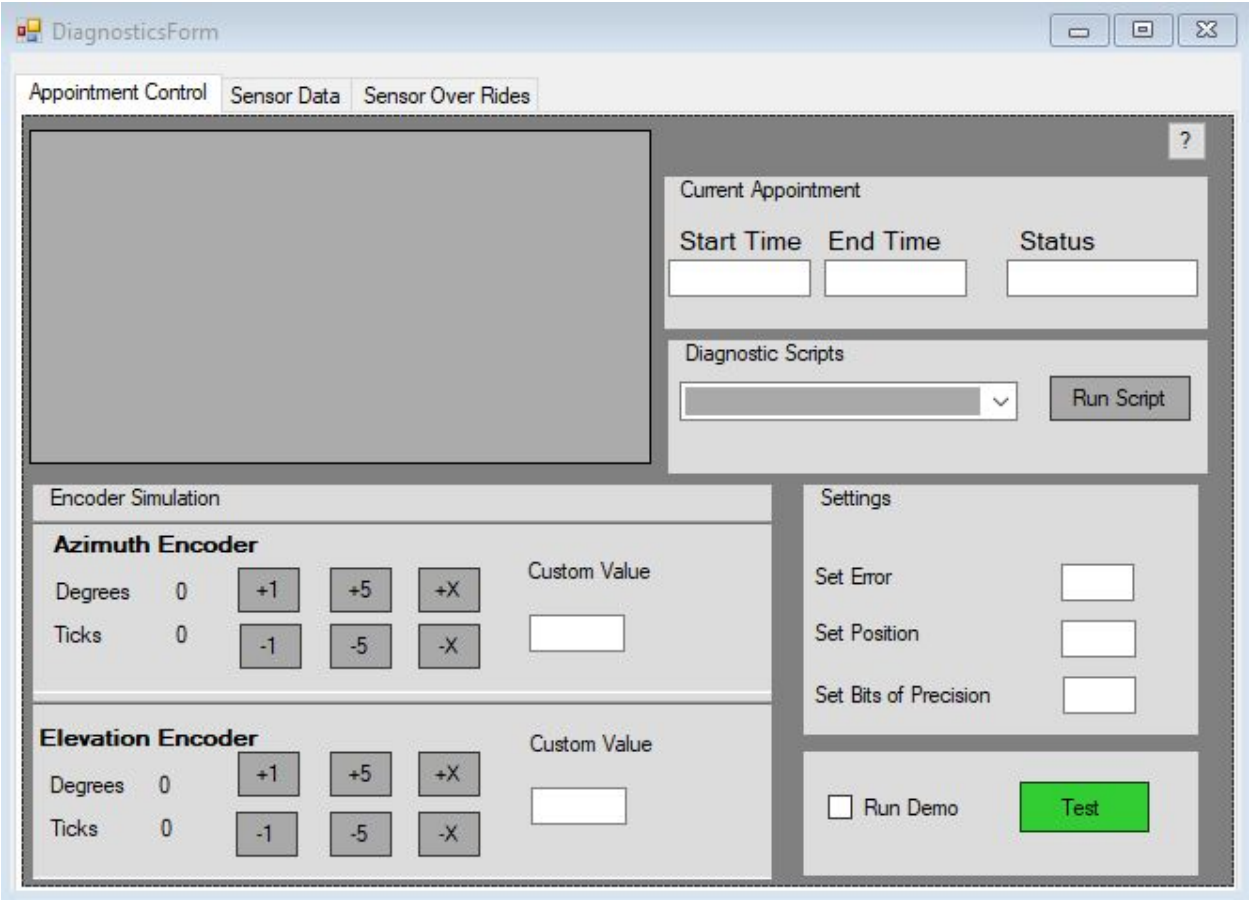
Step 1-

Step 2-

Step 3-

Section Four Diagnostics Pages

Appointment Control Page:



Features:

Hardware status box- this box displays different hardware components for the radio telescope and the current status of these pieces of hardware

Encoder simulation groupbox-

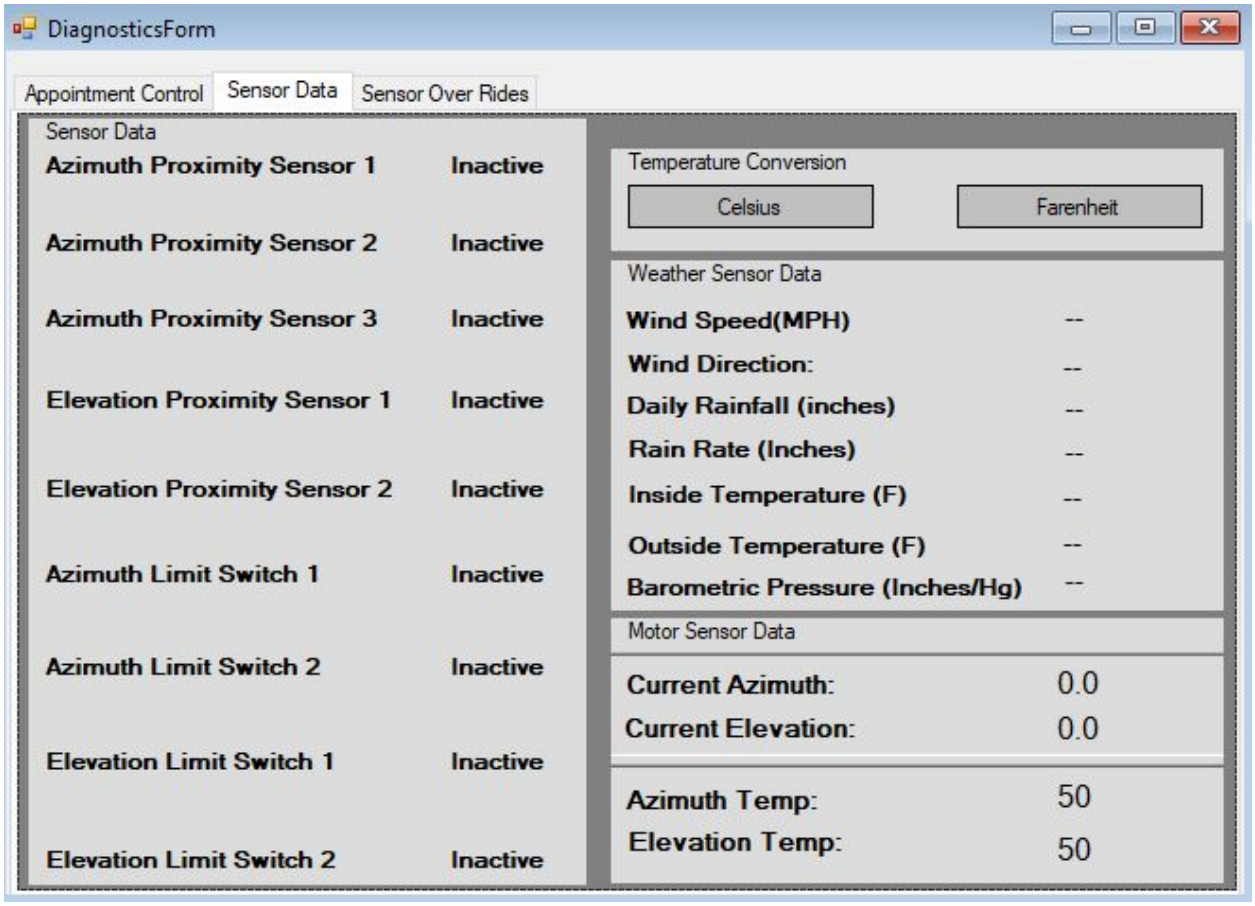
Current appointment group box-this displays the current appointment information as well as its status

Diagnostic Scripts Dropdown- This dropdown box contains a list of the diagnostic scripts that the user may want to run.In order to run this

Settings groupbox- allows the user to set error, position, and bits of position %This Functionality has yet to be implemented in the code%

T*est button-* This button allows the user to test the changes made

Sensor Data Page:



Features:

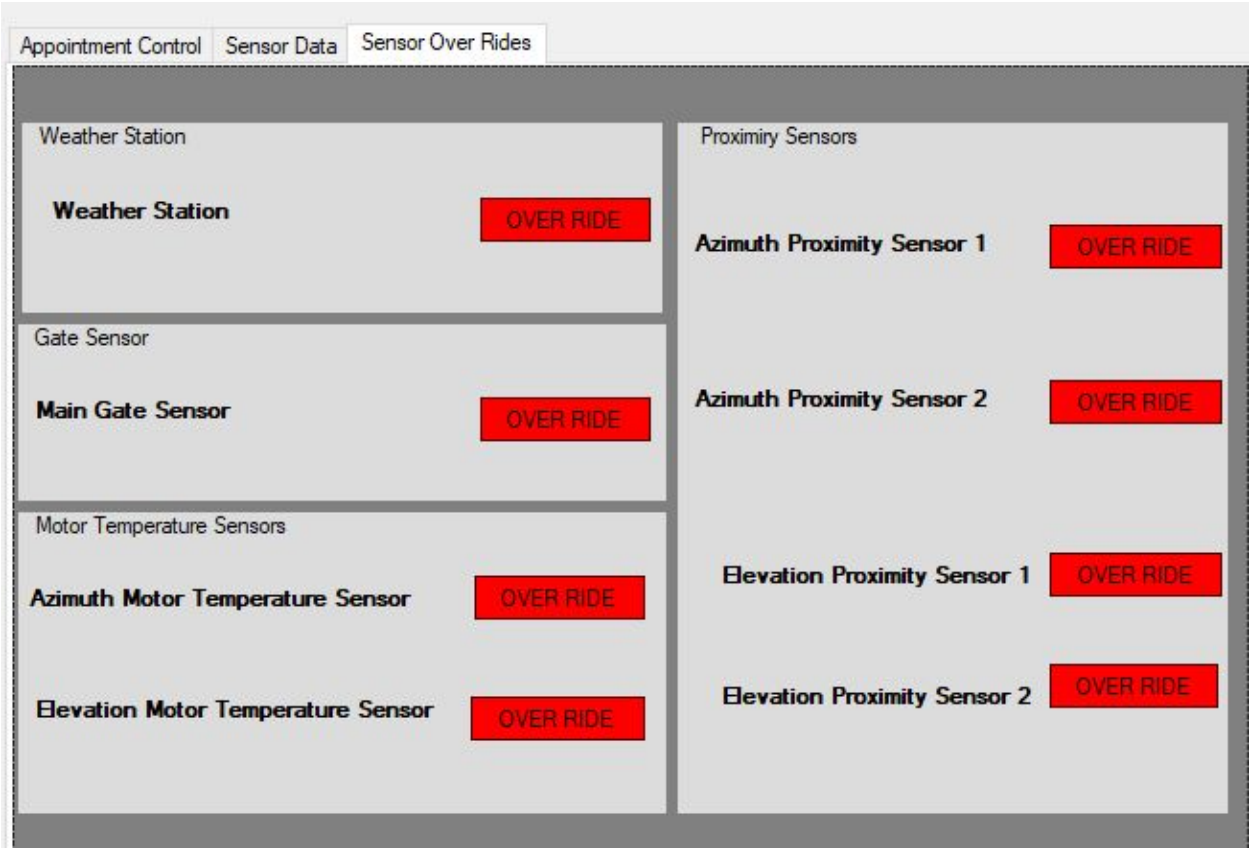
Sensor data: This group box allows the user to view the status of several different azimuth and elevation sensors.

Weather sensor data: This group box allows the user to view the current values of being read in by the weather station

Wind Speed-
Wind Direction-
Daily Rainfall-
Rain Rate-
Inside Temperature-
Outside Temperature-Default measurement of
Barometric Pressure- Measured in Inches/Hg

Motor sensor data: This group box allows the user to view the current azimuth and elevation of the RT as well as the current temperature for both the azimuth and elevation motors

Sensor Override Page



Operation of the Diagnostics Page

3.2. Diagnostics Description

3.3. Appointment Control Operation

Step 1-

Step 2-

Step 3-

3.4. Sensor Data Operation

Step 1-

Step 2-

Step 3-

Section Five Script Descriptions

5.1. Control Scripts-

Thermal Calibration(Done)-

Stow-

Snow Dump-

5.1. Diagnostic Scripts-

Full elevation move(Done)-

Hit hard stops

Hit limit switches (Done)

Full 360 move (Done)

Return from beyond limit switch

Return from hard stop

Track two points

Hit two limit switches at once