

## APPENDIX B - MOUNT SPECIFIC DATA

### For

### Vortex Design 7.0 m Fixed Base Antenna

This appendix describes RC3500 operations unique for the Vortex Design 7.0 m. fixed-based mount antenna. Differences between this version and the operation described in the "baseline" RC3000 manual are noted on a paragraph by paragraph basis.

#### REVISION HISTORY

8 March 2011, Software Version 1.60

#### 1.1 Manual Organization

This appendix is provided as a supplement to the baseline RC3000 manual. The corresponding paragraphs in the baseline RC3000 manual are referred to when data specific to the Vortex Design 7.0 m. mount are described.

#### 1.2 Mount Model

All basic features of the RC3000 are utilized to provide the operations for this mount. Some features have been modified (as described below) to customize operations for this antenna.

##### Hardware Configuration.

A RC3000D version of hardware is utilized for this mount. The "D" version of hardware is used to provide drive signals to a separate Antenna Interface Unit (AIU).

##### Software Configuration.

The basic RC3000 software operation has been modified to better accommodate fixed-based (vs. mobile) antenna operations. This fixed-based antenna operation leads to the designation **RC3500** to follow on from other RCI models such as the RC2500.

The mount model will be designated as **D2**. Software will be designated as RC3K-**D2**-abcd.

#### 1.3.2 System Interface Requirements

The D2 interface differs from baseline RC3000 interface requirements as follows:

- 1) No stow limit switch feedback is provided from the azimuth or elevation axes. Azimuth and elevation range of motion will be limited by UP/DOWN and CW/CCW limit switches (i.e. no "stow tail" as is common for mobile antennas.)
- 2) Resolvers present on the azimuth and elevation axes
- 3) No Inclinometer
- 4) Rather than driving azimuth, elevation and polarization motors directly, the D2 ACU links to an Antenna Interface Unit (AIU). The AIU will receive control signals from the ACU and provide greater drive capability than available from a standard RC3000 ACU.

### **1.3.4 Antenna Pointing Solution**

The baseline RC3000 is mechanized for operations of a mobile satellite antenna. Whenever the antenna is relocated, the RC3000 determines the antenna's new latitude, longitude and estimated heading.

The D2 mount is considered a "Fixed Base" antenna in that it will typically be installed in one location for extended periods of time. Slight differences in the installation and operation of the RC3500 are made to better accommodate operations of a fixed base antenna. These differences will be highlighted in following paragraphs of this appendix.

With respect to the antenna pointing solution, the latitude and longitude of a fixed base antenna only needs to be entered once. Once entered, this lat/lon will remain (not dynamically updated as with a mobile mount.) Also the heading reference for a fixed base antenna will be considered 180 (True South) when the antenna is in the Northern Hemisphere and 0 (True North) when the antenna is operating in the Southern Hemisphere.

### **1.3.5 Timekeeping**

When the RC3000 is used for a mobile antenna, the internal real time clock is updated every time the antenna's lat/lon is obtained from the GPS. This will typically not be the case for a fixed base antenna so the user should be aware to periodically (perhaps monthly) adjust the clock. NOTE: Exact timekeeping would be most important when the Ephemeris (Two Line Element) Tracking option is present.

### **1.3.7 Drive System**

Jam and Runaway Sensing. Azimuth and Elevation jammed and runaway sensing is based on resolver counts.

## 2.0 INSTALLATION

### 2.2 Electrical Connections

Example schematics for the electrical connections between the RC3500 and the D2 mount are shown in section 4.2.

The following subparagraphs describe any unique items with respect to the D2 system.

#### 2.2.2 Motor Drive.

Drive signals are sent to the AIU. See the RC3500/AIU schematic in section 4.2.

#### 2.2.7 Accessories.

Polarization Limit switch status is sent via the AIU. See the RC3500/AIU schematic in section 4.2.

#### 2.2.4 Limit Switches.

Azimuth and Elevation limit switch status is sent via the AIU. See the RC3500/AIU schematic in section 4.2.

**2.2.6 Navigation Sensors.** No GPS receiver or Fluxgate Compass will be used with the D2 mount.

**2.2.11 PC Remote Control.** The remote control interface is wired as shown in the baseline manual.

### 2.3 Initial Configuration, 2.4 Final Calibration

Setup and calibration of the D2 mount is somewhat unique compared to that described in the baseline manual for a vehicle mounted antenna.

#### 2.3.2 Elevation Calibration

The first elevation calibration step should be performed from the 0 degree look angle position. From Manual Mode, jog the antenna until the reference position is achieved.

**Elevation Resolver Reference.** Rotate the elevation resolver until a raw resolver angle of approximately 180 degrees is obtained. Lock the resolver and note the raw resolver angle. Calculate the correct resolver offset to obtain the look angle of 0 degrees and enter it as the `elevation_resolver_offset` (refer to step 3b in baseline manual)

**Elevation UP limit.** Carefully move the elevation axis up to confirm operation of the UP limit switch.

**Elevation DOWN limit.** Carefully move the elevation axis down to confirm operation of the DOWN limit switch.

#### 2.3.3 Azimuth Calibration

The first azimuth calibration step should be performed from the azimuth center of travel position. If possible, this position should be close to true South in the Northern Hemisphere or true North in the Southern Hemisphere. From Manual Mode, jog the antenna until the azimuth is as close to this position as possible.

**Azimuth Resolver Reference.** Rotate the azimuth resolver until a raw resolver angle of approximately 180 degrees is obtained. Lock the resolver and note the raw resolver angle. Calculate the correct

resolver offset to obtain an angle of 0.0 degrees and enter it as the elevation\_resolver\_offset (refer to step 3b in baseline manual)

**Azimuth CW/CCW limits.** Carefully move the elevation axis clockwise and counterclockwise to confirm the operation of the limit switches.

#### **2.4.2 Azimuth and Elevation Alignment**

As described in the baseline manual, perform a LOCATE to several known satellites. If necessary, correct any calibration values in order to achieve satisfactory automatic LOCATES.

### 3.0 Detailed Operation

#### 3.1.1 Modes

While the basic functionality of the RC3000 is as described in the baseline manual, several modes are customized for RC3500 operation with the D2 mount.

#### 3.2.1 Manual Mode

Manual mode has been modified to display azimuth and elevation angles to the 0.01 degree resolution vs. the baseline RC3000 resolution of 0.1 degrees.

```
TRUE: 141.12 (157.63 SS1:579      MANUAL
ELEV: -67.54 ( 42.43 SAT:telstar 402
                SPD:FAST          UTC
<0-9>JOG ANTENNA  <MODE>MENU    14:25:47
```

#### TRUE: 141.12

The D2 version will default showing TRUE heading (180.0 + antenna azimuth angle in Northern Hemisphere). Baseline RC3000 operation displays "antenna angle" AZIM.

#### 3.2.2.3 LOCATE

LOCATE mode operates in the fashion described in the baseline manual.

NOTE: rather than AZIM (antenna angle) the LOCATE screen will display the TRUE heading target as this is more appropriate for a fixed base antenna. TRUE and ELEV targets will also be shown to the 0.01 degree resolution.

#### 3.2.2.7 POSITION

From the POSITION screen, only the ability to change lat/lon is provided for the fixed base antenna.

```
L/L: 38.56 N 98.45 W MANUAL      POSITION
<1>LAT/LON                      <MODE>MENU
```

### 3.2.2.8 Settings

When an azimuth or elevation drive alarm condition exists (see 3.4), the additional messages "<5>RESET AZ ALARM" and "RESET EL ALARM" appear on lines 2 and 3 of the SETTINGS mode screen. Pressing the 5 or 6 key will reset the alarm condition until the condition appears again.

1-AUTOPEAK:OFF	SETTINGS
2- AP SIG:SS1	<5>RESET AZ ALARM
<6>RESET EL ALARM	<0>RESET DRIVE
<1-2>CHANGE SETTING	<MODE>MENU

### 3.2.2.9 TRACK

### 3.2.2.10 REMOTE

TRACK and REMOTE modes perform as described in the baseline manual.

## 3.3 Programming Group

All programming group modes described in the baseline manual are provided.

### 3.3.1.2 Reset Defaults

The following table supplies the default configuration item values for this mount. Space has also been provided to record installation specific changes to the configuration items. Note: recording of installation specific changes to defaults may prove valuable when trying to restore system configuration.

CONFIGURATION ITEM	D2	COMMENTS	INSTALL VALUE
<b>SYSTEM DEFINITION</b>			
GPS_present	0		
Compass_present	0		
Initial_mode	2		
antenna_size_cm	700		
Waveguide_present	0		
<b>ELEVATION CALIBRATION</b>			
Zero Voltage	2.70	N/A	
Elev_offset	0.0		
Up_elev_limit	90		
Down_elev_limit	0		
Elevation_Scale_Factor	50.00		
Elevation_look_configuration	1		
Elevation_resolver_reversed	0		
Elevation_resolver_offset	-120.00	Set during calibration	
<b>AZIMUTH CALIBRATION</b>			
Fluxgate_offset	0.0	N/A	
ccw_azim_limit	165		
Cw_azim_limit	165		
Azimuth_resolver_reversed	0		
Azimuth_resolver_offset	-180.00	Set during calibration	
Initial_Display	4	Display TRUE	
<b>POLARIZATION CALIBRATION</b>			
Zero Voltage	2.50		
Polarization_Offset	0.0		
CW Polarization Limit	90.0		
CCW Polarization Limit	90.0		
Pol_Scale_Factor	90.0		
Polarization_type	2		
H/V_Reference	1		
Pol_Automove_Enable	1		
<b>SIGNAL PARAMETERS</b>			
Channel 1 Polarity	1		
Channel 1 Threshold	100		
Channel 1 Delay	0.1		
Channel 1 Lock Type	0		
Channel 2 Polarity	1		
Channel 2 Threshold	100		
Channel 2 Delay	0.1		
Channel 2 Lock Type	0		
<b>AUTOPEAK</b>			
Autopeak Enabled	0		
Signal Source	1		
RF Band	4		
Spiral Search AZ Limit	5		
Spiral Search EL Limit	5		
Spiral Signal Threshold	200		
Scan Range Limit	8		
Scan Signal Threshold	200		

CONFIGURATION ITEM	D2	COMMENTS	INSTALL VALUE
<b>AZIMUTH POT DRIVE</b>			
Fast/Slow Threshold	2.5		
Maximum Position Error	0.1		
Coast Threshold	0.1		
Maximum Retry Count	3		
<b>AZIMUTH PULSE DRIVE</b>			
Pulse Scale Factor	10431		
CW Pulse Limit	64000		
CCW Pulse Limit	100		
Fast/Slow Threshold	50		
Maximum Position Error	0		
Coast Threshold	3		
Maximum Retry Count	3		
<b>AZIM DRIVE MONITORING</b>			
Jam Slop	1		
Runaway Slop	200		
Fast Deadband	1000		
Slow Deadband	500		
<b>ELEV POT DRIVE</b>			
Fast/Slow Threshold	2.50		
Maximum Position Error	0.2		
Coast Threshold	0.4		
Maximum Retry Count	3		
<b>ELEV PULSE DRIVE</b>			
Pulse Scale Factor	10431		
UP Pulse Limit	64000		
Down Pulse Limit	100		
Fast/Slow Threshold	50		
Maximum Position Error	0		
Coast Threshold	3		
Maximum Retry Count	3		
<b>ELEV DRIVE MONITORING</b>			
Jam Slop	1		
Runaway Slop	200		
Fast Deadband	1000		
Slow Deadband	500		
<b>POL POT DRIVE</b>			
Fast/Slow Threshold	2.0		
Maximum Position Error	0.5		
Coast Threshold	0.3		
Maximum Retry Count	3		
<b>POL DRIVE MONITORING</b>			
Jam Slop	1		
Runaway Slop	200		
Fast Deadband	1000		
Slow Deadband	500		

CONFIGURATION ITEM	D2	COMMENTS	INSTALL VALUE
<b>TRACK</b>			
Search Enable	0		
Max Track Error	3		
Search Width	4		
Peakup Holdoff Time	120		
Track Signal Source	1	2=SS1	
Signal Sample Time	2		
<b>REMOTE CONTROL</b>			
Remote Enabled	1		
Bus Address	50		
Baud Rate	6		
Jog	20		
<b>STOW / DEPLOY</b>			
AZ STOW	0.0		
EL STOW	0.0		
PL STOW	0.0		
AZ DEPLOY	0.0		
EL DEPLOY	45.0		
PL DEPLOY	0.0		
PL ENABLED	2		

### 3.4 Alarm Displays

The following alarms are unique to operation of the D2 version.

#### EMERGENCY STOP ACTIVE / AIU OFFLINE

This alarm will display whenever the AIU Emergency Stop switch is active. No antenna movement is allowed when this switch is sensed. Note: If the AIU is powered off or disconnected from the RC3500, this condition is also sensed by the RC3500.

#### LOCAL AIU CONTROL ACTIVE

This alarm will display whenever "local" control at the AIU is active. No antenna movement from the RC3500 may be initiated when this switch is sensed.

#### AZIMUTH DRIVE ERROR , ELEVATION DRIVE ERROR

These alarms will be triggered anytime an azimuth or elevation drive error condition is signaled by the AIU. When triggered, this alarm will not allow further movement in the particular axis until it has been cleared by the user as described in the SETTINGS mode (3.2.2.8). If the AIU is still signaling the condition, the alarm will reappear soon after being cleared.

### 4.2 Schematics

-- RC3500 to AIU interconnect ( FB-RC3500-Interface 2)

-- AIU schematics (RC2\_5K\_AIU\_Interconnect)









