APPENDIX B - MOUNT SPECIFIC DATA
For
RSI 240 MVO (with resolvers)

This appendix describes RC3000 operations unique for the RSI 240 MVO mount when installed with resolvers. Differences between this version and the operation described in the "baseline" RC3000 manual are noted on a paragraph by paragraph basis.

1.1 Manual Organization

This appendix is provided as a supplement to the baseline RC3000 manual.

1.2 RC3000 Features – Configuration

A RC3000A version of hardware is required for this mount. The mount model will be designated as R2.

Software will be designated as RC3K-R2-xxx

1.3.1 Controller Description

RESOLVER BOARD. A resolver to digital conversion board has been added to the baseline RC3000A hardware. A schematic of this board is shown in section 4.2.

1.3.2 System Interface Requirements

The R2 interface differs from baseline RC3000 interface requirements as follows:

- HPA and alarm contact closure interfaces are used to energize azimuth and elevation brakes
- The CCW polarization limit switch drives the pol stow limit input
- No azimuth potentiometer exists, a resolver is used for sensing azimuth position and for performing high resolution (tracking) movements in azimuth.
- A resolver is used for high resolution (tracking) movements in elevation.
- Feed type (Ku or Ka) is sensed via the input normally used to sense azimuth pulses.

1.3.3 Operational Overview

The operation of the R2 version is almost identical to that described in the baseline manual. Differences will be noted in the appropriate paragraphs.

1.3.7 Drive System

Position Sensing and Limits. In addtion to azimuth cw and ccw limit switches, azimuth software limits are implemented.

Jam and Runaway Sensing. Jammed and runaway sensing is based on resolver counts.

2.1.4 Inclinometer Orientation

The inclinometer should be rigged with the backstructure vertical. With the backstructure vertical, the inclinometer should be mounted so that it is 12.7 (35.0 –22.3) degrees from vertical.

2.2 Electrical Connections.

A set of adapter cables is fabricated to interface between the RC3000 backpanel connectors and the existing RSI cabling harnesses. The mating connectors from the adapter cables are mounted on a 2U rack face plate. A schematic of these adapter cables is provided in section 4.2.

NOTE: The following connectors on the rack panel do not mate with existing RSI cables:

J1 AP – RF Autopeak Input (see 2.2.8 in manual) – connects to output of LNB

J2 AGC – Signal Strength Input – (see 2.2.5) – connects to AGC signal from receivers

J5 FG – Fluxgate Compass (see 2.2.6) – connects to fluxgate compass

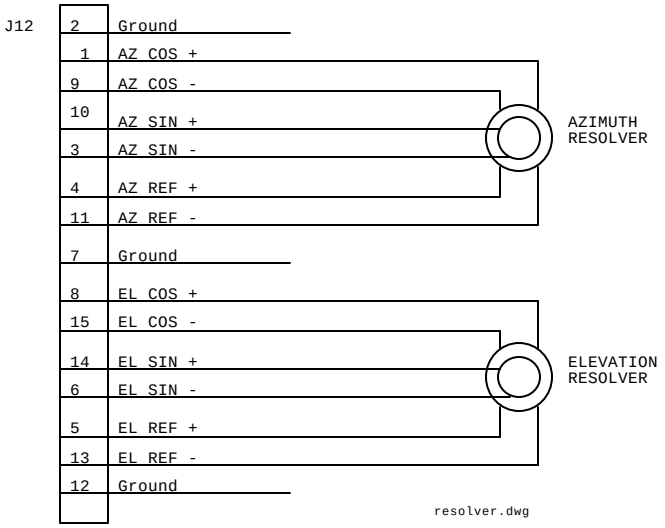
J6 GPS – GPS (see 2.2.6) – connects to GPS receiver

2.2.7 Accessories

The contact closures normally used for the HPA disable and ALARM functions are used for energizing the azimuth and elevation brakes. The schematic showing the wiring changes internal to the RC3000 to allow control of the brakes is shown in section 4.2.

2.2.12 Waveguide Switch

J12 is used for the resolver interface.



2.3.1 Reset Defaults

The table at the end of the document supplies the default configuration item values for this mount.

NOTE: The default values reflect the values used for the installation of this type of mount on a particular vehicle. All configuration item values should be examined to determine if they are appropriate for your specific installation.

2.3.2 Elevation Calibration

Sensor Polarity. The inclinometer should increase in voltage when going up, elevation resolver count should also increase.

Elevation Reference Position. Both the inclinometer and elevation resolver should be calibrated while the backstructure is vertical (i.e. the elevation reference position).

With the inclinometer oriented as described in 2.1.4 the elevation reference voltage should be approximately 1.45 volts.

Rotate the elevation resolver until a raw resolver angle of approximately 122.3 degrees in seen in the MAINTENANCE-VOLTS screen. Lock the elevation resolver in place and observe the raw resolver angle. Subtract 22.3 from this observed angle and enter it as the elevation resolver offset (see 3.3.1.2.2)

2.3.3 Azimuth Calibration.

The only position sensor on the azimuth axis is the resolver.

Sensor Polarity. Azimuth resolver "counts" should increase as the mount rotates clockwise. If it does not, the polarity may be changed by setting the azimuth resolver reverse flag.

Azimuth Reference Position. - Position the mount at the azimuth stow position as exactly as possible. Loosen and adjust the azimuth resolver to be as close to 180 degrees (seen at a/d volts screen 3.3.2.1) as possible. The azimuth resolver offset will be 0.0 – "raw resolver angle".

Azimuth Limits. In addition to using CW and CCW limit switch inputs, this version of the RC3000 implements "software" limits. The azimuth CW and CCW pulse limits (3.3.1.3.3) should be set to values that reflect the azimuth resolver count values near the end of azimuth travel. When the RC3000 senses that the azimuth axis has reached these values, it will generate a "software" limit condition even though the actual hardware limit has not been reached. If the user does not want to use the "software limit" feature, set these configuration items to values outside the range of normal azimuth travel.

3.2.1 Manual Mode.

The scroll up key will switch the display between azimuth and elevation angles to resolver "counts".

The azimuth angle is generated as a function of the azimuth resolver feedback. Elevation angle represents true mount elevation based on feedback from the inclinometer.

NOTE: if the feed type input has sensed that a Ka band feed is installed, no POL field will be displayed since the RC3000 assumes that there is no need for polarization feedback from a circular polarized system.

3.2.2.2 Stow

As part of the STOW sequence the polarization axis will be driven to the polarization CCW limit when the Ku band feed is attached. If the polarization axis is not at the CCW limit, elevation movement below the DOWN limit will not be allowed.

3.2.2.8 Settings

Signal Source.

In addition to selecting the signal source for autopeak movements, this will select the signal source for tracking.

3.3.1.2.2 Elevation Calibration.

In addition to the normal inclinometer calibration items, two elevation resolver calibration items are included.

```
REF_V:1.69 OFF:  0.0        CONFIG-ELEV
 DOWN:  0   UP: 90.0   SF:50.00
 LOOK:1    RES: 0.0   REV:0
SET REFERENCE VOLTAGE <0.50 – 3.50>
```

RES: ELEV RESOLVER OFFSET<+/-300.00 DEGREES>

The elev_resolver_offset configuration item defines the offset to be applied to the angle read directly from the elevation resolver for the purpose of displaying elevation angle. Example: If when at the elevation reference (stow) position the raw elevation resolver angle reads 122.3, a elev_resolver_offset of -100.0 will result in a resolver based elevation angle of 22.3.

NOTE: currently the resolver-based angle is not displayed on any screen.

REV: ELEV RESOLVER<0-NORMAL 1-REVERSED>

The elev_resolver_reversed configuration item defines whether the polarity of the elevation resolver matches that of the RC3000 resolver circuitry. If the raw elevation resolver angle decreases as the mount moves up, the elev_resolver_reversed item must be described as reversed.

3.3.1.2.3 Azimuth Calibration

In addition to the normal azimuth calibration items, two azimuth resolver calibration items are included. No azimuth reference_voltage item is displayed since no azimuth potentiometer is present.

```
          OFF: 0.0         CONFIG-AZIM
  CCW:180   CW:180
  RES: 0.0 REV:0
SET REFERENCE VOLTAGE <2.00 – 3.00>
```

RES: AZIM RESOLVER OFFSET<+/-300.00 DEGREES>

The azim_resolver_offset configuration item defines the offset to be applied to the angle read directly from the azimuth resolver for the purpose of displaying azimuth angle. Example: If when at the azimuth stow position the raw azimuth resolver angle reads 181.3, a azim_resolver_offset of –181.3 will result in a resolver based azimuth angle of 0.0.

REV: ELEV RESOLVER<0-NORMAL 1-REVERSED>

The elev_resolver_reversed configuration item defines whether the polarity of the elevation resolver matches that of the RC3000 resolver circuitry. If the raw elevation resolver angle decreases as the mount moves up, the elev_resolver_reversed item must be described as reversed.

3.3.1.3.2 Azimuth Pot Drive

Since no potentiometer exists on the azimuth axis, these items actually are used to tune azimuth movements based on angles derived from the resolver feedback.

3.3.1.3.3 Azimuth Pulse Drive

3.3.1.3.6 Elevation Pulse Drive

The items on the Pulse Drive screens are actually used to tune drive movements based on resolver “counts”. The resolver counts are used in the same fashion as pulse counts are used for making precise movements (during tracking, recall) of the mount.

NOTE: the azimuth and elevation pulses_per_radian values are set to 10,431. This is the number of resolver counts per radian.

360 degrees / 65536 total counts = 0.005493164 degrees/count or 182.044 counts/degree.

182.044 counts/degree * 57.29 degrees/radian = 10431 counts/radian

3.3.1.3.4 Azimuth Drive Monitoring

3.3.1.3.7 Elevation Drive Monitoring

The items on the Drive Monitoring screens are actually used to tune drive movements based on resolver “counts”. The resolver counts are used in the same fashion as pulse counts are used for making precise movements of the mount.

3.3.2.1 Analog to Digital Voltages

In addition to the normal voltages displayed this screen also shows “raw resolver” angles and counts and the state of the feed type signal.

```
AZ: 1.114   181.30 33004    AD VOLTAGES
EL: 1.143 1 122.30 22264
POL:2.237 0
SIG: 3.756(1) <1>RF <2>SS1 <3>SS2 <4>GND
```

The azimuth and elevation resolver angles and counts displayed are read directly from the resolvers without being biased by offset terms. The displayed values will reflect if the azimuth or elevation resolver polarity has been reversed.

The 1 or 0 next to the POL voltage indicates whether the feed type input indicates that a Ka(0) or Ku(1) feed is attached.

3.3.2.5 Limits Maintenance

In addition to the normal limit switch state information this screen also shows the state of the handheld remote/computer switch .

```
AZIM CW:0  CCW:1  STOW:0 (0-OFF)  LIMITS
ELEV UP:1   DN:1  STOW:1 (1- ON)  ACTIVE
 POL CW:0  CCW:1  STOW:1           REM:1
<BKSP>MAKE LIMITS INACTIVE    <MODE>EXIT
```

The REM field will be 1 if the handheld remote is attached and the remote/computer switch is at remote. If the switch is at computer or if the handheld remote is not attached, the REM field will indicate 0.

4.2 Schematics

Attached are schematics for the reslover board, adapter cables and the brake drive modification,

CONFIGURATION ITEM	**R2**							**INSTALL VALUE**
SYSTEM DEFINITION								
Antenna_size_cm	240							
GPS	1							
COMP	1							
MODE	2							
WAVE	0							
AZIMUTH CALIBRATION								
Azim_offset	0.0							
ccw_azim_limit	135							
Cw_azim_limit	135							
Res	0.00							
Rev	1							
ELEVATION CALIBRATION								
Zero Voltage	1.45							
Elev_offset	0.0							
Up_elev_limit	80							
Down_elev_limit	10							
Elevation_Scale_Factor	52.65							
Elevation_look_configuration	1							
Res	0.00							
Rev	0							
POLARIZATION CAL								
Zero Voltage	2.27							
Polarization_Offset	0.0							
CW Polarization Limit	86.0							
CCW Polarization Limit	91.0							
Pol_Scale_Factor	40.90							
Polarization_type	2							
H/V_Reference	0							
Default Horizontal Position	-45.0							
Default Vertical Position	45.0							
Pol_Automove_Enable	1							
SIGNAL PARAMETERS								
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							
AUTOPEAK								
Autopeak Enabled	0							
Signal Source	1							
RF Band	1							
Spiral Search AZ Limit	5							
Spiral Search EL Limit	5							

Spiral Signal Threshold	200							
Scan Range Limit	4							
Scan Signal Threshold	200							

CONFIGURATION ITEM	**R2**							**INSTALL VALUE**
AZIMUTH POT DRIVE								
Fast/Slow Threshold	2.5							
Maximum Position Error	0.20							
Coast Threshold	0.1							
Maximum Retry Count	3							
AZIMUTH PULSE DRIVE								
Pulse Scale Factor	10431							
CW Pulse Limit	57200							
CCW Pulse Limit	9350							
Fast/Slow Threshold	50							
Maximum Position Error	0							
Coast Threshold	3							
Maximum Retry Count	3							
AZIM DRIVE MONITORING								
Jam Slop	1							
Runaway Slop	200							
Fast Deadband	1000							
Slow Deadband	500							
ELEV POT DRIVE								
Fast/Slow Threshold	3.0							
Maximum Position Error	0.2							
Coast Threshold	0.4							
Maximum Retry Count	3							
ELEV PULSE DRIVE								
Pulse Scale Factor	10431							
UP Pulse Limit	32700							
Down Pulse Limit	20200							
Fast/Slow Threshold	50							
Maximum Position Error	0							
Coast Threshold	3							
Maximum Retry Count	3							
ELEV DRIVE MONITORING								
Jam Slop	1							
Runaway Slop	200							
Fast Deadband	1000							
Slow Deadband	500							
POL POT DRIVE								
Fast/Slow Threshold	2.0							
Maximum Position Error	0.5							
Coast Threshold	0.3							
Maximum Retry Count	3							
POL DRIVE MONITORING								
Jam Slop	1							
Runaway Slop	200							
Fast Deadband	1000							
Slow Deadband	500							

CONFIGURATION ITEM	**R2**							**INSTALL VALUE**
TRACK								
Search Enable	0							
Max Track Error	3							
Search Width	4							
Peakup Holdoff Time	120							
Track Signal Source	SS1							
Signal Sample Time	2							
REMOTE CONTROL								
Remote Enabled	1							
Bus Address	50							
Baud Rate	6							
STOW / DEPLOY								
AZ STOW	0.0							
EL STOW	-67.5							
PL STOW	-95.0							
AZ DEPLOY	0.0							
EL DEPLOY	22.3							
PL DEPLOY	0.0							
PL ENABLED	1							