

## APPENDIX BCN – INTEGRATED BEACON RECEIVER

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This appendix describes the additional functions provided by the RC4500's integrated Beacon receiver option.

### 1 Introduction

#### 1.1 Appendix Organization

This appendix is provided as a supplement to the baseline RC4500 manual. The corresponding paragraphs in the baseline RC4500 manual are referred to when data specific to the Integrated Beacon Receiver option is described.

#### 1.2 Features

This option provides the ability to manually and automatically tune an integrated beacon receiver for use during TRACK mode.

##### 1.2.1 Software Configuration

RC4500 software configuration is presented in the form RC45-ab-vwxyz where ab-vwxyz represents: (Mount manufacturer/Model) **ab** (Nav Sensor Option) **v** (Tracking Option) **w** (Remote Option) **x** (Receiver Option) **y** (Thor Receiver Option) **z**

This feature is categorized as one of the (Digit 8) TOP CARD RECEIVER options of the RC4500.

OPTION CATEGORY	DESIGNATOR	DESCRIPTION
Spectrum Analyzer/ Beacon Receiver	N	No integrated receiver supported
	A	ASC (Atlantic Satellite Corp.) Beacon
	B	Novella Beacon
	C	Avcom Spec An
	F	Avcom Spec An & Novella Beacon
	H	DVB-S2
	I	DVB-S2 & Novella
	J	DVB-S2 & SBS2 Spec An/Beacon
	K	Avcom SBS2 SpecAn/Beacon
	L	Avcom SBS2 Beacon
	M	DVB-S2 & SBS2 Beacon
	P	ASC Beacon & DVB-S2

Software supporting the integrated beacon receiver would therefore be designated in the form RC45-ab-vwxYz.

## 1.2.2 Hardware Configuration

The beacon receiver hardware may be purchased in three configurations:

- 1) Embedded Novella Satcoms B38 Compact Tracking Receiver.
- 2) Integrated Atlantic Satellite Corporation ASC350L Beacon Receiver.
- 3) Integrated AVCOMM SBS2-2150E Satellite Beacon Receiver.

The Receiver Option software is used for all hardware configurations. Functional and performance differences between the three hardware configurations are described in the remainder of the appendix.

## 1.3 Integrated Beacon Receiver Overview

For many tracking applications, it is desirable to monitor the satellite's beacon as an indication of received signal strength. Due to the relatively low power and narrow bandwidth of satellite beacons, specialized receiving equipment is required. This option allows the RC4500 ACU to internally house and control any of the three L-band beacon tracking receivers listed above.

All hardware options lock on, while measuring the level of conventional continuous wave beacons. The Novella Satcoms B38 and AVCOMM SBS2-2150E can also lock on, while measuring the signal level of BPSK modulated beacons. High immunity against false lock to telemetry subcarriers is achieved by the use of a universal anti-sideband device that is capable of identifying any sideband located between 2.5 kHz to 75 kHz away from the carrier on the Novella Satcoms B38 Tracking Receiver.

The L-band beacon signal is input to the beacon receiver from the Antenna Interface of the RC4500. Via user programming, beacon frequency may be selected to a resolution of 10 kHz. The receiver is capable of automatically locking to a satellite beacon through a search band listed in the table in section 1.4. Therefore accurate centering of the satellite beacon frequency is achieved despite the 10 kHz granularity of frequency selection.

The beacon receiver tracks the beacon signal's frequency drifts and measures its power level. The receiver generates a DC voltage output which represents, in logarithmic scale, the beacon power at the receiver's input. The output voltage to input power log-conformity is better than 0.1 dB over a 40 dB measuring range. The RC4500 monitors this DC voltage during tracking operations in order to keep the antenna peaked on the satellite.

## 1.4 Beacon Receiver Specifications

	Novella Satcoms B38	ASC350L	AVCOMM SBS2
Input Range	940 to 2150 MHz	930 to 2050 MHz	950 to 2150 Mhz
Input Impedance	50 Ohm	50 Ohm	50 Ohm
Input Level	-70dBm to -110dBm	-35 to -85 dBm	0 to -115 dBm
Signal Strength Output Range	±10 VDC	0 to 10 VDC	0 to 10 VDC
Signal Strength Output Slope	2 dB/V	2 dB/V	2 dB/V
Post-detection Time Constant	100 ms	400 ms	100 ms
Threshold for Lock Reacquisition	< 43 dB-Hz	< 45 dB-Hz	<44 dB-Hz
Search Range	±200 kHz	±30 kHz	±92 kHz
Attenuation Control	0 – 40 dB	0 – 50 dB	0 – 40 dB
Demodulation	CW or BPSK	CW only	CW or BPSK

## 1.5 External Beacon Receiver Controls

In addition to the fully integrated beacon tracking receiver, the RC4500 also support the control of external beacon receivers via RS-232 or Ethernet.

### 1.5.1 Software Configuration

RC4500 software configuration is presented in the form RC45-ab-vwxyz where ab-vwxyz represents: (Mount manufacturer/Model) **ab** (Nav Sensor Option) **v** (Tracking Option) **w** (Remote Option) **x** (Receiver Option) **y** (Thor Receiver Option) **z**

This feature is categorized as one of the (Digit 9) THOR CARD RECEIVER options of the RC4500.

OPTION CATEGORY	DESIGNATOR	DESCRIPTION
Spectrum Analyzer/ Beacon Receiver	N	No External Receiver Control
	A	ASC (Atlantic Satellite Corp.) Beacon
	B	Novella Beacon (Analog
	C	Full Serial Novella
	S	SSC/Radeus Labs Beacon Receiver

Software supporting the external beacon receiver controls would therefore be designated in the form RC45-ab-vwxy**Z**.

## 2 SOFTWARE CONFIGURATION

### 2.3 INSTALLATION

For this option to work properly, all other normal calibration steps described in the baseline manual must be performed correctly.

#### 2.3.1 Signal Strength Adjustment

##### 2.3.1.1 Signal Strength Channel

The RC4500 monitors the input power level signal and lock status from the beacon receiver via the Internal Receiver circuitry. When mounted internally, these connections are made inside the RC4500. When the software has the internal beacon receiver option, BCN will become an available signal source.

For units with external beacon receiver control, the circuitry is monitored via the external receiver circuitry. This will be available via J2-AGC on the rackmount version. For other versions please consult the interface diagram included with your system.

### 3 MODE DESCRIPTIONS

#### 3.1 Operating Group

##### 3.1.2 MENU Mode

##### 3.1.2.1 SETUP Mode

The inclusion of the integrated beacon receiver allows for the ability to store a beacon detection point during the SETUP Mode. The screen will display as shown below:

NAME:AMSC 1		SETUP
LON:106.7W	INCLIN:11	
BAND:KU	TRACKING:M/S	SIG:2
<1>EXTERNAL <2>BEACON		

By selecting option <2>BEACON for the signal source, the RC4500 will then prompt the user to enter beacon frequencies for the satellite. The screen will display as shown below:

HFREQ:	HMOD:	SETUP
VFREQ:	VMOD:	
HORZ BEACON FREQUENCY <0-30000.00 MHz>		

A description of each item is found below:

**HFREQ: HORZ BEACON FREQUENCY <0-30000.00 MHz>**

This field allows you to set a beacon frequency for the horizontal polarization.

**HMOD: HORZ BEACON MODULATION <0-CW, 1-BPSK>**

This field allows you to set the modulation for the horizontal beacon frequency. Note that the ASC beacon receiver does not support this option.

**VFREQ: VERT BEACON FREQUENCY <0-30000.00 MHz>**

This field allows you to set a beacon frequency for the vertical polarization.

**VMOD: VERT BEACON MODULATION <0-CW, 1-BPSK>**

This field allows you to set the modulation for the vertical beacon frequency. Note that the ASC beacon receiver does not support this option.

If a circular feed is used, the horizontal and vertical beacons should be set identically.

##### 3.1.2.2 RECALL Mode

The inclusion of the integrated beacon receiver allows the RECALL of an inclined satellite to immediately start a TRACK using the beacon frequencies set during the SETUP mode.

### 3.1.2.5 TRACK Mode

The inclusion of the integrated beacon receiver is transparent to the functionality of TRACK mode. TRACKing as described in appendix TRK will proceed using the signal strength from the integrated beacon receiver.

Prior to entering TRACK mode, the beacon should either be manually tuned via the beacon receiver maintenance screen or automatically tuned as part of a RECALL.

When the beacon receiver loses lock, its AGC output also drops to a minimum value. Therefore, loss of lock will manifest itself as a "loss of signal" situation.

## 3.2 Configuration Group

### 3.2.1 CONFIG Mode

#### 3.2.1.1 NORMAL ACCESS ITEMS

##### 3.2.1.1.4 Beacon Detection Points

An additional CONFIG screen is available when this option is present to allow for viewing and modifying of beacon frequencies set during the SETUP mode.

```
SAT#:1                                CONFIG-BCN
      HFREQ:11700.50  HMOD:0
      VFREQ:10751.00  VMOD:0
<SCR>THRU LIST <ENTER>MODIFY DATA
```

A description of each item is found below:

**HFREQ:        HORZ BEACON FREQUENCY <0-30000.00 MHz>**

This field allows you to set a beacon frequency for the horizontal polarization.

**HMOD:        HORZ BEACON MODULATION <0-CW, 1-BPSK>**

This field allows you to set the modulation for the horizontal beacon frequency. Note that the ASC beacon receiver does not support this option.

**VFREQ:        VERT BEACON FREQUENCY <0-30000.00 MHz>**

This field allows you to set a beacon frequency for the vertical polarization.

**VMOD:        VERT BEACON MODULATION <0-CW, 1-BPSK>**

This field allows you to set the modulation for the vertical beacon frequency. Note that the ASC beacon receiver does not support this option.

If a circular feed is used, the horizontal and vertical beacons should be set identically.

### 3.2.1.2 INSTALL ACCESS GROUPS

#### 3.2.1.2.8 Beacon Signal Factors

This screen defines how the signal strength input is used. The Beacon Signal Factors screen is set based on the parameters of the beacon receiver, and should generally not need modified in the field.

LOCK:1	TIME:1.0	CONFIG-BCN
THRES: 10	SENSE:1	
LOCK TYPE <0>NONE <1>HI <2>LO		

**LOCK:**            **LOCK TYPE <0>NONE <1>HI <2>LO**

When the Beacon is being used for TRACK, this item defines whether a discrete signal lock input is required to indicate a satellite has been found. The signal lock input may help in distinguishing the correct satellite while doing a LOCATE.

If a signal lock input is used, it may be defined as either having a HI (>3.5 VDC) or LO (< 0.8 VDC) level that indicates lock.

**TIME:**            **LOCK TIME <0.0-10.0> SECONDS**

This item defines how long the RC4500 will wait after each step before sampling signal strength. Increasing this value may be necessary for noisy beacon frequencies.

**THRES:**            **THRESHOLD <-99.9-00.0>**

The threshold item defines the minimum signal from the beacon receiver for the TRACK mode to know that a satellite is present. If during TRACK mode the signal strength drops below this level, this will create a "loss of signal" situation.

**SENSE:**            **INPUT SENSE POLARITY <0>NEG <1>POS**

The polarity flag tells the controller what the sense is on the signal strength voltage of the beacon receiver. This value should not be changed in the field.



## 3.2.2 MAINT Mode

### 3.2.2.9 Beacon Receiver Maintenance

When the integrated beacon receiver option is present, the MAINTENANCE menu allows the user to select Beacon Receiver maintenance by pressing the ENTER key (symbolized by <>).

```

1-VOLTS   2-DRIVE   3-TIME           MAINT
5-LIMITS
           0-SHAKE           <>-BCN
                                   .-SYS INFO

```

This mode allows the user to manually tune and test the Beacon Receiver's ability to lock onto a satellite's beacon. When the mode is entered, it displays the current IF frequency to which the receiver is tuned. Also displayed is the current attenuation (ATT:) and modulation (MOD:) setting from the receiver.

```

az:181.00 RF:648 SS: 649 L           BCN
el: 44.87 ^-ATT: 0 .-AUTO   7-FR:11750.00
pl: -1.60 v-MOD:CW           LO:10750.00
<5,9,.,.>TUNE BCN           9-IF: 1000.00

```

### Manual Antenna Control

Azimuth, elevation and polarization angles are shown on the display. The antenna may be moved as if it is in the MANUAL mode. The azimuth may be manually jogged via the 4 and 6 keys, elevation via the 2 and 8 keys, and polarization via the 1 and 3 keys. Speed may be toggled via the 0 key. Lower case identifiers (az, el, pl) indicate slow speed is active. Upper case identifiers (AZ, EL, PL) indicate fast speed is active.

Other keys will be used to tune the beacon receiver.

**RF:           -99.9 to 99.9**

This field displays the current signal level from the I-band power detector.

**SS:           -99.9 to 99.9**

This field displays the current signal level from the beacon receiver. Additionally, and L will be displayed if the beacon receiver is currently locked.

**^-ATT:       ATTENUATION <0-xx> dB**

This field allows the user to change the input attenuation of the beacon receiver. Press the <Scroll Up> key to enter this field. The xx will vary depending on model of beacon receiver being used.

**.-AUTO       AUTO ATTENUATE**

Pressing the <./STOP> key will cause the ACU to attempt to auto attenuate the beacon receiver. During this process the ACU will attempt to set the beacon signal strength to 800.

**7-FR: RF <xxxxx.yy> MHz**

This field allows the user to enter the actual frequency of the satellite's beacon. When the frequency is entered, the IF frequency will be derived from the LO frequency. The resulting IF frequency is displayed in the IF field. The beacon receiver will then be tuned to that IF frequency.

**v-MOD: CW (BP)**

The <Scroll Down> key may be pressed to toggle the beacon receiver's demodulation mode between continuous wave CW or BPSK (BP) settings. NOTE: ignored by the beacon receiver that don't support this option.

**9- IF: IF <940.00-2150.00> MHz**

The intermediate frequency to program the beacon receiver to may be entered via this field.

After entering the IF frequency, a tuning command will be sent to the beacon receiver. The success of the programming is then confirmed by a status check of the receiver. During the time of tuning and status checking, the IF field will show "TUNING". If the status check shows that the receiver is now tuned to the entered IF frequency, then the IF value will be displayed in the field. If the status check does not confirm the programming, then the field will be filled with "\*\*\*\*\*.\*\*".

NOTE: as described above (7-FR:), the IF field may also be derived by entering an RF value. After entering the RF value, the IF field will display "TUNING" just as if the IF value had been entered directly.

## 4 TROUBLESHOOTING

If the functionality of the beacon receiver is in question, first go to the maintenance screen and confirm communication with the receiver. If the receiver cannot be tuned, check the internal cabling between the beacon receiver and the rest of the RC5000.

If a TRACK on a satellite does not work, manually position onto the satellite and confirm (via the maintenance screen) that a lock can be obtained at that frequency.

The inability to obtain lock may be due to low signal level reaching the beacon receiver. From the maintenance screen, set the attenuation to 0 to make the receiver as sensitive as possible.

When using the Radeus Labs BTR, the ACU can communicate with the BTR with the unit in Remote or Local Mode. However, if the unit is in 'Local' mode the ACU is unable to tune the receiver as the unit locks out the remote tune command.