

**TYPE ACCEPTANCE APPLICATION**  
**FOR**  
**ACR/RLB-33S**



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## 1.0 INTRODUCTION

This report contains the required information and test data for Type Acceptance Approval for the **ACR/RLB-33S** 406 MHz Ship Security Alert System (SSAS). The **ACR/RLB-33S** meets all the current RTCM and COSPAS-SARSSAT requirements for a 406 MHz SSAS beacon.

The **ACR/RLB-33S** is identical to the previously Type Approved **ACR/RLB-33** Emergency Position Indicating Radio Beacon (EPIRB) except for differences in the activation circuit required for SSAS. The FCC ID for the **ACR/RLB-33** is **B668L2ACR-RLB-33**. The differences between the **ACR/RLB-33S** and the **ACR/RLB-33** will be detailed in this document.

## 2.0 GENERAL INFORMATION REQUIRED FOR TYPE ACCEPTANCE (Per 47 CFR Ch. I, 2.1033(c), (For a Part 80, Subpart V, 80.1061 device.))

- |     |                                          |                                                                                              |
|-----|------------------------------------------|----------------------------------------------------------------------------------------------|
| (1) | Name and Address of Applicant:           | ACR Electronics, Inc.<br>(manufacturer)<br>5757 Ravenswood Road<br>Fort Lauderdale, FL 33312 |
| (2) | Identification of Equipment:             | 406 MHz SSAS                                                                                 |
|     | FCC ID: B66ACR-RLB-33S                   | Model: RLB-33S                                                                               |
| (3) | Installation and operating instructions: | Appendix 1                                                                                   |
| (4) | Type of Emission:                        | 16K0G1D                                                                                      |
| (5) | Frequency Range:                         | 406.028 MHz $\pm$ 0.001 MHz                                                                  |
| (6) | Range of Output Power:                   | 5 W $\pm$ 2 dB                                                                               |
| (7) | Maximum Output Power:                    | 7.9 W                                                                                        |
| (8) | DC Voltages and Currents:                | 8.2 V, 2.0 A @ U5-0635                                                                       |
| (9) | Tune-Up Procedures:                      |                                                                                              |

There is no tuning required. An RLB-33 required tuning only for the 121.5 MHz output, which is eliminated for the RLB-33S.

- |      |                        |             |
|------|------------------------|-------------|
| (10) | Schematic Diagrams:    | Appendix 2  |
|      | Technical Description: | Section 4.0 |

- (11) Label drawings: Appendix 3.
- (12) Photographs: Section 5.0
- (13) Digital Modulation:

The modulation for the 406 MHz signal passes through a one pole RC filter provided by R11-0636, R12-0636 and C16-0636. The purpose for this filter is to provide the rise and fall times (150  $\mu$ s nominal) for the modulating data. This provides the necessary filtering of the 400 baud data to ensure that spectral mask requirements are met. (This is identical to the RLB-33.)

- (14) The required test data is summarized in Section 6.0.

Paragraphs (15), (16), and (17) of section 2.1033(c) are not applicable.

### 3.0 DOCUMENTS (Included Herein by Reference)

- (1) Type Acceptance Application for ACR/RLB-33 (FCC ID: B668L2ACR-RLB-33)
- (2) RTCM Recommended Standards for Ship Security Alert Systems (SSAS) Using the Cospas-Sarsat Satellite System (RTCM Paper 110-2004/SC110-STD, Dated 4 June 2004)

### 4.0 TECHNICAL DESCRIPTION (Per 47 CFR Ch. I, 2.1033(c)(10))

Refer to schematic diagrams in Appendix 2.

This section describes the technical differences between the RLB-33S and the RLB-33. Refer to Type Acceptance Application for ACR/RLB-32/33, Section 3.0 for a detailed technical description of the RLB-33.

The RLB-33S is identical to the RLB-33 except for minor changes of the activation circuit required for SSAS beacons. These changes include adding a latch to the activation circuit, removing the integral antenna to provide a 50 Ohm coaxial output, and removal of the strobe and 121.5 MHz circuitry. Each of these changes will be described in detail below.

The RTCM Recommended Standards for SSAS requires external activation switches and a latching activation circuit internal to the beacon. This latching function is accomplished by adding Q15-0638-1 and U8-0638-1 to the RLB-33 control circuitry. Refer to schematics "RLB-33 Activation Circuit" and "RLB-33S Activation Circuit" in Appendix 2 for details.

A strobe and a 121.5 MHz transmitter are not allowed in SSAS beacons. Therefore the circuitry used to generate strobe and 121.5 MHz signal on the RLB-33 is deactivated on the RLB-33S. This includes the 121.5 MHz Crystal (Y3-0638-), the oscillator (Q12-0638-) and amplifiers (Q13-0638- and Q11-0638-). These requirements were fulfilled by hardware modification only. Refer to the marked-up schematic Y1-01-0638-1 in Appendix 2 for details of the strobe and 121.5 MHz transmitter changes.

The removal of the 121.5 MHz transmitter and the requirement for a 50 Ohm output eliminates the need for the antenna coupler. Q3-0635 and U5-0635 already provide the required 50 Ohm 406 MHz output. Refer to the marked-up schematic Y1-01-0638-1 in Appendix 2 for details of the antenna coupler changes.

The microprocessor (U1-0638-1) code was modified only as required for SSAS beacons: required message coding and the elimination of audio beeps indicating transmission. The message coding changes are detailed in Table 1 below: changed 4 bit word to code for SSAS and 1 bit to indicate no 121.5 MHz transmitter. No other software changes that affect the modulated signal of the transmitter were made.

**TABLE 1: CODING CHANGES**

| <b>ACR Model Number</b> | <b>Beacon Type</b> | <b>Protocol Code Bits 37-40</b> | <b>Supplementary Data (121.5 MHz) Bit 112</b> |
|-------------------------|--------------------|---------------------------------|-----------------------------------------------|
| RLB-33                  | EPIRB              | "0110"                          | "1"                                           |
| RLB-33S                 | SSAS               | "1100"                          | "0"                                           |

Each active device and its function are listed in Table 2.

**Frequency stability:** The 406 MHz carrier is phase locked to a high stability oven controlled oscillator as required by the Cospas-Sarsat system. (This is identical to the RLB-33.)

**Suppression of spurious radiation:** Spurious radiation is suppressed by means of power supply decoupling (various capacitors and inductors) and low phase noise oscillators. (This is identical to the RLB-33.)

**Modulation limitation:** Limitations to the modulation of the 406 MHz signal consists of a current source provided by resistors (R6, R7, R11, and R12-0636). These resistors limit the current into the phase lock loop detector circuit (SH2-0636) and the currents set the level of modulation. (This is identical to the RLB-33.)

**Power limitation:** A regulated control voltage limits the maximum power output of the 406 MHz amplifier (U5-0635). Under best battery voltage, maximum power is limited to 7.9W. (This is identical to the RLB-33.)

**5.0 PHOTOGRAPHS** (Per Per 47 CFR Ch. I, 2.1033(c)(12))

Refer to Type Acceptance Application for ACR/RLB-32/33 (FCC ID: B668L2ACR-RLB-33), Appendix 5 for interior photographs showing internal construction methods. (RLB-33S assembly methods are identical to the RLB-33.)

Additional photographs of the exterior of an RLB-33S showing external activation switches can be found in Appendix 4.

**6.0 REQUIRED TEST DATA** (Per 47 CFR Ch. I, 2.1033(c)(14))

Refer to Type Acceptance Application for ACR/RLB-32/33 (FCC ID: B668L2ACR-RLB-33), Section 4.0 for a list of test data for 406 MHz output.

Additional test data verifying compliance to requirements of RTCM Recommended Standards for SSAS that are unique to SSAS beacons can be found in Appendix 5.

**TABLE 2: FUNCTION OF ACTIVE ELEMENTS**

| DESIGNATOR           | FUNCTION                  |
|----------------------|---------------------------|
| U1,2-0635            | VOLT REG., MIC2954        |
| U3-0635              | VOLT REG., LP2980         |
| U5-0635              | PWR AMP., M687321         |
| Q1,7,8,9-0635        | XSTR SWITCH, MMBT2907     |
| Q2,4,5-0635          | XSTR SWITCH, MMBT3904     |
| Q3-0635              | RF AMP, NE85633           |
| Q6-0635              | P-FET, SWITCH, RFD1505SM  |
| U1A,B;U2A,B-0636     | D FLIP-FLOP, MC74VHC74A   |
| U3,7,8-0636          | XOR, NC7SZ86              |
| U4A,B,C,D-0636       | AND, MC74VHC00A           |
| U5-0636              | RF AMP, HP2111            |
| U6-0636              | PRESCALER, MC12080D       |
| U9-0636              | OVENIZED OSCILLATO        |
| Q1-0636              | VCO, MMBR521LT            |
| U1-0638-1            | MICROPROCESSOR, PIC16C57A |
| U2-0638-1            | EEPROM, X24C01            |
| U3-0638-1            | VOLT REG, MAX667          |
| U4,5,8-0638-1        | NAND, MC14011UBD          |
| U7-0638-1            | VOLT SUPERVISOR, MAX809   |
| Q1,2-0638-1          | XSTR SWITCH, MMBT3906     |
| Q3,4,5,6,7,15-0638-1 | XSTR SWITCH, MMBT3904     |
| Q8-0638-1            | XSTR SWITCH, MMBT2222A    |
| Q9-0638-1            | PHOTODETECTOR, QSC112     |
| U6-0638-1            | MICROPROCESSOR, PIC16C622 |
| Q10-0638-1           | VOLT REG, CMPT930         |

## **APPENDIX 1**

# **PRODUCT SUPPORT MANUAL ACR Y1-03-0180**



## **APPENDIX 2**

### **CIRCUIT DIAGRAMS**

**ACR Y1-01-0638-1**

**RLB-33 Activation Circuit**

**RLB-33S Activation Circuit**



## **APPENDIX 3**

### **LABEL DRAWINGS**



## **APPENDIX 4**

# **PHOTOGRAPHS**



## APPENDIX 5

### TEST DATA

