OPERATIONAL DESCRIPTION

1.0 INTRODUCTION

This report contains the required information and test data for Type Acceptance Approval for the **ACR/PLB-200/201** 406 MHz Personal Locator Beacon (PLB). The **ACR/PLB-200/201** meets all of the current FCC requirements for a 406 MHz PLB.

The **ACR/PLB-200/201** contains 2 battery packs, each consisting of four 2/3 A size cells of Lithium Manganese Dioxide chemistry. The battery packs will have a 5-year replacement cycle. The enclosure is made of high impact, corrosion resistant, ultra violet resistant plastic.

The **ACR/PLB-200** and **ACR/PLB-201** are identical EPIRBs with the exception of the identifying label and whether or not they have an active internal GPS. The **ACR/PLB-200** has an active internal GPS and the **ACR/PLB-201** does not. Both the **ACR/PLB-200** and **ACR/PLB-201** have an active external GPS interface. The **ACR/PLB-200/201** is a class 2 beacon that operates from -20°C to +55°C**.** Throughout this document, the **ACR/PLB-200/201** may be referred to as the Beacon or PLB.

2.0 GENERAL INFORMATION REQUIRED FOR TYPE ACCEPTANCE

(Per 47 CFR Ch I, 2.1033(c). (For a Part 95, Subpart K 95.1402 PLB))

1)	Name of Applicant:	ACR Electronics, Inc. (manufacturer) 5757 Ravenswood Road Fort Lauderdale, FL 33312
2)	Identification of Equipment:	406 MHz PLB
	FCC ID: B66ACR-PLB-200	Model: PLB-200 Class 2
	FCC ID: B66ACR-PLB-201	Model: PLB-201 Class 2
3)	Installation and operating instructions:	Users Manual Exhibit
4)	Type of Emission:	406 MHz - 16K0G1D 121.5 MHz – 3K20A3X
5)	Frequency Range:	406.028 MHz ± .002 MHz 121.5 MHz ± .006 MHz
6)	Range of Output Power:	406 MHz - 5W ± 2dB 121.5 MHz - 50 mW ± 3 dB
7)	Maximum Output Power: (into 50 ohm)	406 MHz - 7.9 W 121.5 MHz - 100 mW

8) DC Voltages and Currents: 406 MHz – 6.0 V, 2.0 A @ U702
121.5 MHz – 8.0 V, 30 mA @ Q107

9) Tune-up Procedures:

There is no tuning required for the 406 MHz 5 watt signal. There is no tuning required for the 121.5 MHz 0.050 watt signal. The antenna-matching network is tuned at 406 MHz by adjusting C501 and L501 and measuring the return loss into the antenna coupler network. The antenna matching network is tuned at 121.5 MHz by adjusting L504 and L506 and measuring the return loss into the antenna coupler network.

10) Schematic Diagram: Schematic Exhibit

Description of Circuitry [Refer to Schematic ACR Y1-01-0667 (Schematic Exhibit)]**:**

Circuitry for Determining and Stabilizing Frequency:

The Beacon generates a phase modulated 406 MHz signal for transmission of the distress message. The 406 MHz carrier is frequency synthesized by a PLL; U606, U602, U607, U604, U603, U605 and U608 and VCO. It is locked to an OCXO (U601) to provide the high frequency stability required for the COSPAS-SARSAT system. The VCO is built around Q601 in a common base configuration. The carrier is phase modulated by the phase lock loop filter of the PLL, R607,C610,R611 and C611. U609, Q706 and power amplifier U702 amplifies the phase-modulated signal to provide 5W output at the antenna.

The Beacon also has a 121.5 MHz radio homer output. The 121.5 MHz is generated by a crystal (Y101) controlled oscillator (Q103) for frequency stability of better than ± 50 PPM over the full operating temperature range. Q104 and Q107 amplify the carrier to provide a nominal power output at the antenna of 50 mW. This signal is AM modulated by switching the 121.5 MHz drive signal on and off using Q104 and Q107.

Circuitry for Suppression of Spurious Radiation:

Spurious radiation is suppressed by means of power supply decoupling (numerous capacitors and inductors), low phase noise oscillators, and limited bandwidth features (C115, C116, L106, C117, C118, L107, C119, C135, L112, C136) and filtering by the antenna matching (C501,L501, C502, L502, C503, L503, L504, L506, and R501) networks.

Circuitry for Limiting Modulation:

Limitations to the modulation of the 406 MHz signal consists of a current source provided by resistors (R612, R613, R616 and R617). These resistors limit the current into the phase lock loop detector circuit (U605B) and the currents set the level of

modulation. The 121.5 MHz modulation is limited by microprocessor control of U301, Q104 and Q107 that digitally turn on or off the output power.

Circuitry for Limiting Power:

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.

Power limiting for the 121.5 MHz output is obtained by operating the P.A. (Q3-0653) saturated.

Other circuitry:

The modulation and other controls for the Beacon are generated by a microprocessor (U301). This processor provides digital signals for both the 406 MHz and the 121.5 MHz modulations as well as for LED's, a buzzer and other functions.

Both the **ACR/PLB-200** and **ACR/PLB-201** have a GPS interface circuit that operates while the beacon is turned off. Q403, Q404 and Q405 detect a commercially available GPS that is plugged into the beacon. Microprocessor U301 stores the GPS navigation data and incorporates it in to the beacon message when the beacon is turned on.

The **ACR/PLB-200** only, has an internal GPS receiver that operates while the beacon is turned on. This GPS receiver sends GPS navigation data to microprocessor U301 for incorporation into the 406 beacon message.

Description of Devices:

TABLE 1: FUNCTION OF ACTIVE ELEMENTS

DESIGNATOR	FUNCTION
CR701	DETECTOR DIODE, HSMS 2800
D1, D402, D403	DIODE, MBRA120LT3
D101	DIODE, CMD17
D301	DIODE, HSMS 2800
D401, D404, D801	DUAL DIODES, BAV-74
D601	VARACTOR DIODE, MMBV3102LT1
Q1, Q110	FET, REGULATOR, FDC658P
Q402	FET, SWITCH, FDC658P

Q101, Q106, Q705	BIAS, MMBT3904
Q401, Q403, Q404, Q405, Q704	XSTR SWITCH, MMBT3904
Q102	XSTR LIMITER, BFT92
Q103	RF OSC, PBR941
Q104	RF AMP, PBR941
Q107	RF POWER AMP, PBR941
Q108, Q701	CURRENT MIRROR, BCV62
Q105, Q801, Q802	FET, SWITCH, 2N7002
Q109, Q702	DIF AMP, XN1501
Q601	VCO, BFT93
Q703	FET, REGULATOR, FDD5614P
Q706	RF AMP, NE85633
U1	DC/DC CONVERTER, LM3485
U201	GPS RECEIVER, GH-80D
U202	VOLT REG, LP2951CM-3.3
U203	AND, 74HCT1G08
U301	MICROPROCESSOR, PIC18F252
U601	OVENIZED OSCILLATOR, OCXO-50
U602, U607	AND, NC7S08
U603, U608	DUAL D FLIP-FLOP, 74HC74PW
U604	XOR, NC7SZ86
U605A,B,C,D	NAND GATE, 74HC00PW
U606	PRESCALER, MB504L
U609	RF AMP, MSA2111
U701	VOLT REFERENCE, LM431
U702	RF POWER AMP, RA07M4047M
U801	VOLT REGULATOR, MAX1615
U802	MICROPROCESSOR, PIC12LC508A

11) Label drawings: ID Label Exhibit

12) Photographs: External Photos Exhibit & Internal Photos Exhibit

13) Digital Modulation:

The modulation for the 406 MHz signal passes through a one pole RC filter provided by R616, R617 and C612. The purpose for this filter is to provide the rise and fall times (150 μs nominal) for the modulating data. This provides the necessary filtering of the 400 baud data to ensure that spectral mask requirements are met.

The 121.5 MHz is digitally modulated by the microprocessor (U301) that controls transistor (Q106) and switch (Q105) to apply or remove the carrier from the P.A. (Q107) stage.

14) Required Test Data: Test Report Exhibit