

APPENDIX 2

Instruction Manual

FCC ID: B66-ACR-PLB100

Type acceptance under Part 95 Subpart K

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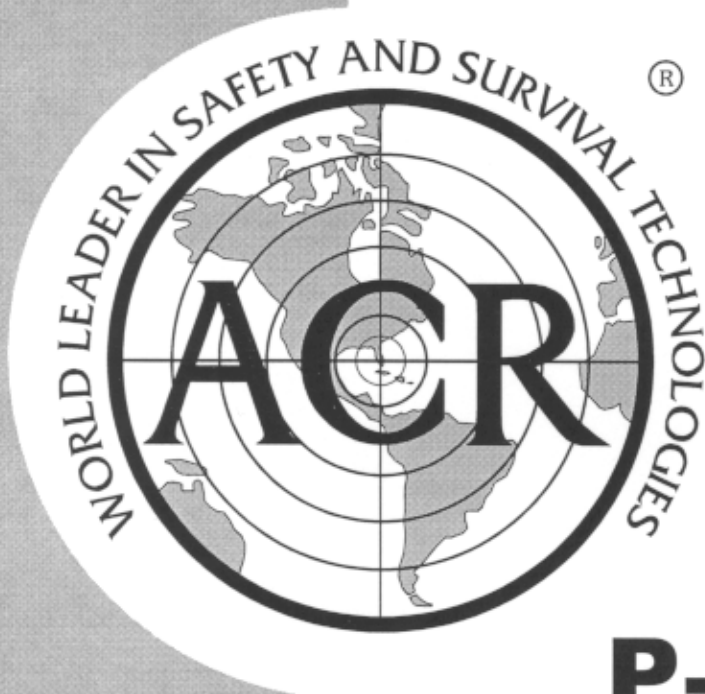


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**Instruction
Manual
PLB-100**

DRAWING NO
APPENDIX 2

REV
A



PRODUCT SUPPORT MANUAL

Y1-03-0155
Rev. A

P-EPIRBTM 406

Prod. No. 2791 Model RLB-36
Prod. No. 2792 w/GPS I/O Model RLB-37

Personal Satellite EPIRB
FCC Type Accepted

Owner _____
Vessel _____
Radio CallSign _____

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***** WARNING *****
THIS TRANSMITTER IS AUTHORIZED FOR USE
ONLY DURING SITUATIONS OF GRAVE
AND IMMINENT DANGER

DELIBERATE MISUSE MAY RESULT IN A SEVERE PENALTY

Advice to owners of Personal Satellite EPIRBs

Registration of 406 MHz satellite P-EPIRB with the Registration Section of the *national authority** is mandatory because of the global alerting nature of the system.

The information provided in the Registration Card is used only for rescue purposes and will greatly assist in any beacon alarm incident.

Fill in the owner registration card immediately upon completion of the sales transaction. Immediately Mail the Registration Card.

If the beacon is to enter service immediately, complete the Registration Card and fax the information to the national authority. The original card must still be mailed to the *national authority** for hard-copy reference and filing.

If the current owner is transferring the beacon to a new owner, the current owner is required to inform the *national authority** by letter, facsimile or telephone, of the name and address of the new owner.

The subsequent owner of the beacon is required to provide the *national authority** with the information as shown on the owner Registration Card.

Additional Registration Cards may be obtained by contacting ACR or the appropriate national authority.

THIS OBLIGATION TRANSFERS TO ALL SUBSEQUENT OWNERS.

**National Authority*

The term “national authority” appears throughout this manual. Wherever these words appear, reference is made to the government body responsible for registration for the country in which the unit is registered. The addresses for various national authorities can be found on the Registration Card.

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SECTION 1 - THE SYSTEM

1.1 GENERAL 1.1

- 1.1.1 This manual provides operation and maintenance instructions for the P-EPIRB™ 406, Personal Satellite EPIRB, model RLB-36 hereinafter referred to as the beacon or unit. This section describes the characteristics and details of the P-EPIRB™ 406 system.

1.2 PURPOSE 1.2

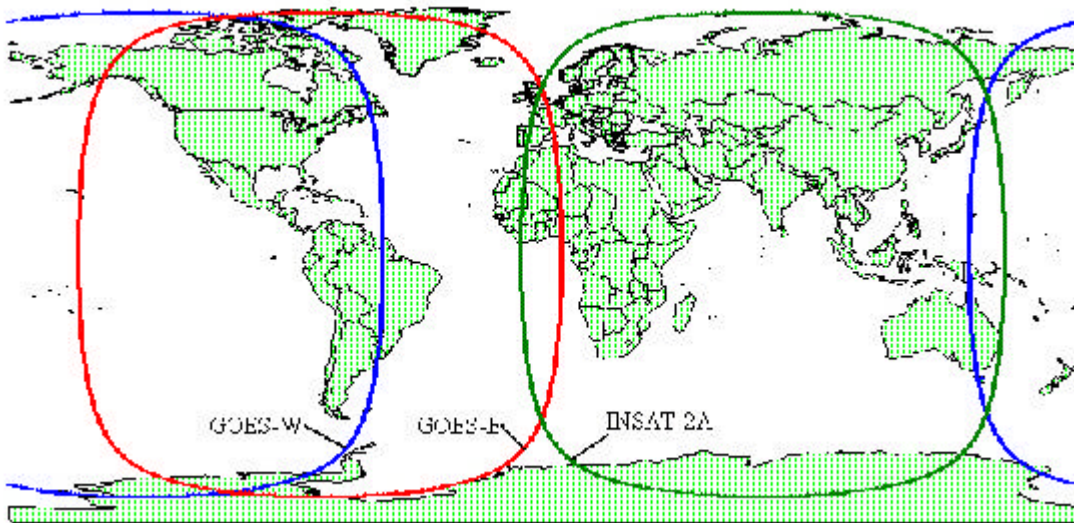
- 1.2.1 The beacon provides distress alerting via radio transmission on 406 MHz to satellites of the COSPAS-SARSAT network. The unit can also transmit a distress alert to the GEOSAR network that includes GPS latitude and longitude coordinates that are inputted through an I/R Interface that connects to the data output of a GPS Receiver.
- 1.2.2 The message transmitted by the beacon is unique for each unit, which provides identification of the transmitter through computer access of registration files maintained by the National Authority. **It is the user's responsibility to fill out and mail the enclosed registration form to the appropriate agency of the country under which the beacon is registered.** The beacon is programmed by ACR during manufacture and can be reprogrammed by an ACR authorized programming facility for the registered country. **Remember**, if your beacon is **not registered**, SAR Authorities do not know who you are, where you live or where to contact anyone who might know anything about your situation.
- 1.2.3 Once Search and Rescue (SAR) forces are alerted by the units signal (406 MHz), relayed through the COSPAS-SARSAT and/or GEOSAR network, they can converge on the position estimated by the satellite. With GPS data in the message SAR authorities can know your precise location and speed up reaction time. Intermediate and short range location is aided by the unit with its on board radio beacon homing signal transmitter (121.5 MHz).
- 1.2.4 Power is provided by a self-contained long life battery pack that has a recommended 5-year replacement cycle. *See Factory Authorized Service Center for replacement (Section 4.0 – Maintenance).*
- 1.2.5 **Self-test** (Section 2.5) is initiated by momentarily lifting the switch to the test position (vertical stance) then releasing back to original position. During self-test, an actual satellite message is transmitted and certain key performance parameters are measured and recorded. The self-test message is modified such that the satellite will not forward an alert message during self-test. The LED will flash 3 times amber before turning **green**. During this time the unit will also beep 3 times to indicate correct operational status. Approximately 2 seconds after self-test the unit will beep and the amber LED will flash to indicate if the unit has GPS data.

1.3 SATELLITE DETECTION

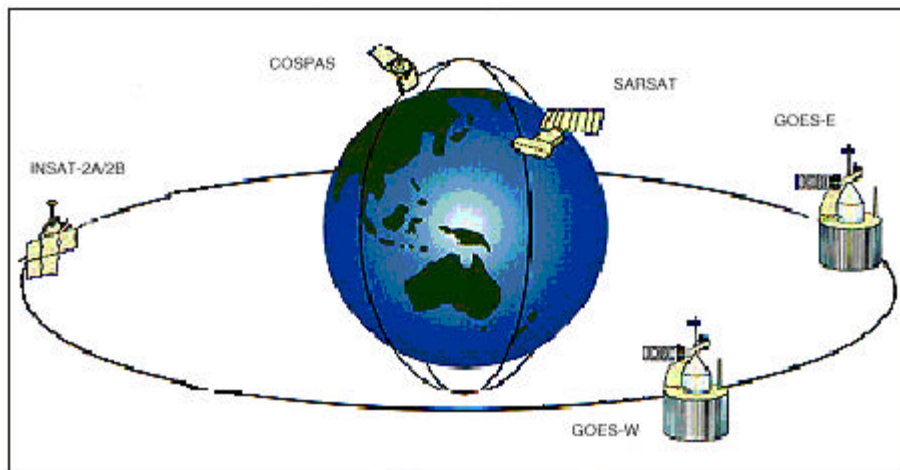
- 1.3.1 The beacon transmits an encoded phase modulated radio signal to the SAR satellite portion of the COSPAS-SARSAT System. The system was developed and implemented by the COSPAS-SARSAT Partners (Russian Federation, Canada, France and the United States).
- 1.3.2 COSPAS-SARSAT is an international system that uses Russian Federation and United States low altitude, near polar orbiting satellites that assist in detecting and locating activated 121.5/243 MHz and 406 MHz Satellite beacons. The Russian Federation provides aboard COSMOS navigational spacecraft COSPAS payloads that are interoperable with the SARSAT System. In addition to weather and environmental sensors, SARSAT payloads, provided by Canada and France, are carried aboard the United States National Oceanic and Atmospheric Administration's (NOAA) Advanced TIROS environmental satellites.
- 1.3.3 COSPAS and SARSAT satellites receive distress signals from the beacon transmitting on the frequency of 406 MHz. The COSPAS-SARSAT 406 MHz satellite signal consists of a transmission of non-modulated carrier followed by a digital message format that provides identification data for SAR authorities. The 406 MHz system uses spacecraft-borne equipment to measure and store the Doppler-shifted frequency data along with the satellite digital data message including GPS data, and time of measurement to identify your position. This information is transmitted in real time to an earth station called the Local User Terminal (LUT), which may be within the view of the satellite, as well as being stored for later transmission to other LUTs. In the real-time mode, the signal detection is limited to a mutual satellite-LUT circular visibility area of about 2500 km radius that moves with the satellite along its track. However, because of the stored-mode capability at 406 MHz, the need for this mutual satellite-LUT visibility is not essential, and the system is fully functional in just the global mode.
- 1.3.4 The LUT processes the Doppler-shifted signal and determines the location of the distress signal; then the LUT relays the position of the distress signal to a Mission Control Center (MCC) where the distress alert and GPS location information is immediately forwarded to an appropriate Rescue Coordination Center (RCC). The RCC dispatches Search and Rescue (SAR) forces.
- 1.3.5 The COSPAS-SARSAT System includes 36 LEOSAR LUT Stations, 6 GEOSAR LUT stations and 19 Mission Control Centers that provide real-time as well as global-mode coverage for the Northern Hemisphere, while the Southern Hemisphere is presently served primarily by the global-mode. Additional LUTs and MCCs are planned for installation in the near future both in the northern and southern hemispheres.

The addition of the GEOSAR Satellite system greatly improves the reaction time for a SAR event. This satellite system has no Doppler capabilities at 406 but will relay the distress alert to any of the LUT stations. When there is GPS data included in the distress

message this will instantly tell SAR authorities where you are located. Hence speeding up the reaction time by not having to wait for one of the LEOSAR satellite's to come around.



**GEOSAR SATELLITE COVERAGE
FIGURE 1**



**SAR SATELLITE ORBITS
FIGURE 2**

- 1.3.6 Because most of the search and rescue forces presently are not equipped to home on the 406 MHz Satellite signal, homing must be accomplished at 121.5 MHz.
- 1.3.7 The P-EPIRB™ 406 is a Class 1, P-EPIRB.

1.4 AUTHORIZATIONS

- 1.4.1 The P-EPIRB™ 406 meets the requirements of the RTCM version 1:1997 for PLB's, and Cospas/Sarsat T.001 & T.007.

1.5 CHARACTERISTICS

- 1.5.1 The beacon is a floatable; battery operated unit that accepts external GPS data via an I/R interface cable that is included with your unit. The beacon case, with its external antenna, is waterproof. The semiconductor circuits are mounted within the case assembly along with the battery power supply. A "On/Off" switch is installed on top of the beacon, along with an internal beeper.

1.6 TECHNICAL DATA

1.7

1.6.1 Applicable Documents

COSPAS-SARSAT	Document C/S T.001 & T.007 (specification for 406 MHz distress beacons)
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RTCM	RTCM Version 1.0 1997
------	-----------------------

1.6.2 Specifications

406 MHz Transmitter

Frequency	406.025 MHz
Frequency Stability	±2 parts per billion/100ms
Output Power	5 watts

Digital Message

Format

Long message / serialized

Message protocol

Standard Location or optional National location
Protocol

Duration

520 ms

Rate

400 BPS

Encoding

Biphase L

Modulation

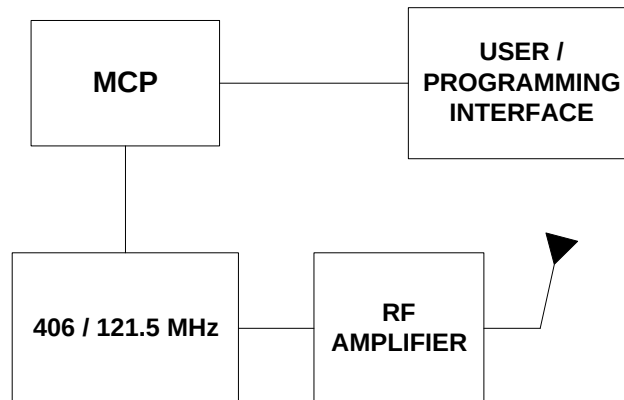
±1.1 radians peak

The unit leaves ACR with a serialized code but can be reprogrammed at a service center to other coded formats including country of registration.

121.5 MHz Transmitter

Frequency	121.5 MHz
Frequency Tolerance	±50 ppm

Output Power	25 mW PEP
Modulation	
Type	AM (3K20A3N)
Sweep Range	400 to 1200 Hz
Sweep Rate	3 Hz
Duty Cycle	37.5%
Antenna	
Frequency	406.025 & 121.500 MHz
Polarization	Vertical
VSWR	Less than 1.5/1
<u>General/Environmental</u>	
Battery Life	
Operating	24 hours minimum @ -40°C
Replacement Interval	5 years
Size	
Unit less Antenna	6.65 x 3.55 inches
Material	High impact and UV resistant plastic Color High
Visibility	Yellow
Weight	514 grams
Temperature Range	
Operating	Class I -40°C to +55°C



**BLOCK DIAGRAM
FIGURE 3**

KNOWN COMPATIBLE RECEIVERS

Manufacturer	Model	Notes	Y2K and EOW Compliant
B&G	Network LCD Plotter / DGPS	*	Yes
B&G	Network LCD Plotter / GPS	*	Yes
B&G	Network GPS and DGPS	*	Yes
B&G	Network GPS	*	Yes
Data Marine	Chartlink D7000 XT	*	Yes
Data Marine	Chartlink D7000 XTC	*	Yes
Data Marine	Chartlink II D8000	*	Yes
Data Marine	Link D3500	*	Yes
Data Marine	Link D3500 LD	*	Yes
Furuno	GP1810F	*	Yes
Furuno	GP1810	*	Yes
Furuno	GP1610C	*	Yes
Furuno	GP1600F	*	Yes
Furuno	GP1600	*	Yes
Furuno	GP30	*	Yes
Furuno	GP35	*	Yes
Garmin	10	*	Yes
Garmin	12	*	Yes
Garmin	20	*	Yes
Garmin	25	*	Yes
Garmin	30	*	Yes
Garmin	31	*	Yes
Garmin	35	*	Yes
Garmin	36	*	Yes
Garmin	38	*	Yes
Garmin	40	*	Yes
Garmin	45	*	Yes
Garmin	48	*	Yes
Garmin	50	*	Yes
Garmin	75	*	Yes
Garmin	85	*	Yes
Garmin	89	*	Yes
Garmin	90	*	Yes
Garmin	92	*	Yes
Garmin	95	*	Yes
Garmin	120	*	Yes
Garmin	126	*	Yes
Garmin	128	*	Yes
Garmin	130	*	Yes
Garmin	135	*	Yes

Manufacturer	Model	Notes	Y2K and EOW Compliant
Garmin	175	*	Yes
Garmin	180	*	Yes
Garmin	185	*	Yes
Garmin	190	*	Yes
Garmin	195	*	Yes
Garmin	210	*	Yes
Garmin	GPSMAP 215	*	Yes
Garmin	220	*	Yes
Garmin	GPSMAP 225	*	Yes
Garmin	GPSMAP 230	*	Yes
Garmin	GPSMAP 235 SOUNDER	*	Yes
Garmin	120XL	*	Yes
Garmin	12XL	*	Yes
Garmin	45XL	*	Yes
Garmin	55AVD	*	Yes
Garmin	95XL	*	Yes
Garmin	GPS II	*	Yes
Garmin	GPS II+	*	Yes
Garmin	GPS III	*	Yes
Lowrance	GlobalMap 12	*	Yes
Lowrance	GlobalMap 1600	*	Yes
Lowrance	GlobalMap Sport	Some older versions of software may not output GGA, contact Manufacturer	Yes
Lowrance	LMS-160	*	Yes
Magellan	GPS 2000 XL	*	Yes
Magellan	GPS 3000	*	Yes
Magellan	GPS 3000 XL	*	Yes
Magellan	GPS 4000	*	Yes
Magellan	GPS 4000XL	*	Yes
Magellan	Meridian XL	*	Yes
Magellan	Trailblazer	*	Yes
Magellan	Trailblazer XL	*	Yes
Magellan	White Meridian	*	Yes
NorthStar	941X	*	Yes
NorthStar	951X	*	Yes
NorthStar	961X	*	Yes
Raytheon	Autohelm ST50 Plus GPS	*	Yes
Raytheon	GPS-11	*	Yes
Raytheon	HSB Chart Plotter	*	Yes
Raytheon	NavCenter 600	*	Unit will display wrong time and date after Y2K. Send unit to manufacturer for upgrade
Raytheon	Raychart 620	*	Unit will display wrong time and date after Y2K. Send unit to manufacturer for upgrade
Raytheon	RC-520	*	Yes
Raytheon	RL-70RC	*	Yes

Manufacturer	Model	Notes	Y2K and EOW Compliant
Si-Tex	DGPS-11	*	Yes
Si-Tex	GPS-1	*	Yes
Si-Tex	GPS-10	*	Yes
Si-Tex	GPS-10A	*	Yes
Si-Tex	GPS-4A	*	Yes
Si-Tex	GPS-5	*	Yes
Si-Tex	GPS-6	*	Yes
Si-Tex	GPS-7	*	Yes
Si-Tex	GPS-77P	*	Yes
Si-Tex	GPS-8	*	Yes
Si-Tex	GPS-88P	*	Yes
Si-Tex	GPS-9	*	Yes
Si-Tex	GPS-99P	*	Yes
Si-Tex	GPS-9D	*	Yes
Si-Tex	HG-7	*	Yes
Si-Tex	SBR-90	*	Yes
Si-Tex	SBR-91	*	Yes
Trimble	4000DSi	*	Firmware must be upgraded to V7.19 to comply
Trimble	4000RSi	*	Users of Firmware V7.15 - V7.18 must upgrade to V7.19. Users of V7.28 must upgrade to V7.29. Users of V7.29 are fully compliant
Trimble	7400MSi	*	Yes
Trimble	MS750	*	Yes
Trimble	Navgraphic XL	*	N/A - No Date Output
Trimble	NavMariner DGPS	*	Yes
Trimble	NavTrac GPS	*	Version 2.09 is compliant. Earlier versions are not being tested
Trimble	NT200	*	Yes
Trimble	NT200D	*	Yes
Trimble	NT300D	*	Yes
Trimble	DSM	*	Yes for versions 1.10 and later
Trimble	NT100	*	Yes

*GPS units compatible with ACR Beacons based on vendor information
 (*) Indicates that unit complies with ACR requirements*

Known Compatible GPS Receivers FIGURE 4

SECTION 2 – OPERATION

2.1 GENERAL

- 2.1.1 The beacon is designed to be manually deployed and activated.
- 2.1.2 The beacon can accept NMEA 0183 GPS Data (*Version 1.5 and above, the GGA sentence string must be enabled*) through its I/R interface. Data is updated every 30 minutes once an initial position is acquired.
- 2.1.3 The beacon is also designed to allow the user to perform periodic testing and confirmation of GPS connection and downloaded coordinates.
- 2.1.4 The beacon checks for a valid GPS data approximately every 2 seconds if no current valid data exists.
- 2.1.5 The beacon will update its GPS data by initiating the self-test function if data is present.
- 2.1.6 The beacon will hold the last GPS coordinates in memory until the unit is activated. After deactivating the unit, GPS data is returned to default.

2.2 OPERATING INSTRUCTIONS

2.2.1 Activation

Unfold Antenna from around unit and move Antenna to a Vertical position (See Figure 6) Lift Switch to the "ON" Position by lifting up and sliding over then down to "ON" to activate the unit. "ON" position is indicated by "I" on the face of the switch. Your beacon comes with a Breakaway tab on the switch to keep from accidental turn-on. PUSH SWITCH down to break TAB in case of an emergency. Once activated the unit will; Beep and the RED LED will begin to flash one red flash approximately every 20 seconds. Unit will send Rescue message approx. every 50 seconds and will beep after each message that has been sent. Keep beacon with you at all times.

2.2.2 Deactivation

Turning the switch to the "Off" position will deactivate the beacon.

If the beacon continues to operate after it has been deactivated, remove the two screws at the bottom of the unit, and unplug the battery to disable the unit. Return it to a service center for repair.

2.2.3 Self Test

The beacon self-test is initiated by lifting the switch at the top of the unit to a Vertical Position momentarily and releasing it back to the "Off" position. Switch is spring loaded to return to the "Off" position.

Note: "Off" Position indicated by a "O" on switch face "ON" by "I", on the face of the switch.

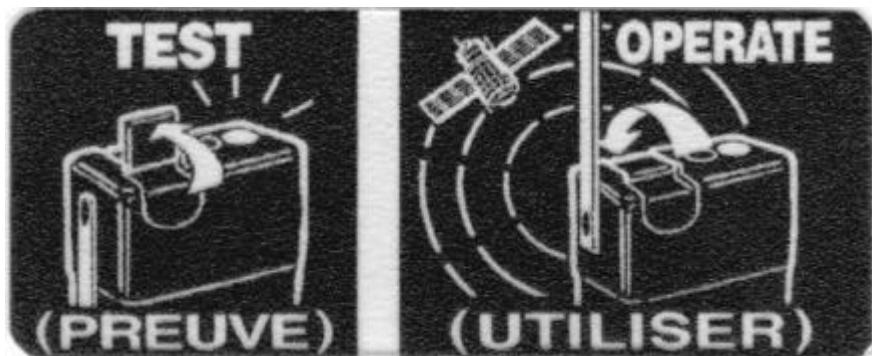
Upon lifting the switch, a very short yellow flash will indicate self-test has been initiated then the following:

Sequence of Tests

1. Check Data I/OBeep & flash yellow LED if pass
.....Stop if failed
2. Check 406 MHz Synthesizer.....Beep & flash yellow LED if passed
.....Stop if failed
3. Check RF Power/Battery.....Beep & flash yellow LED if passed
.....Stop if failed
4. Unit turns on green LED to indicate Successful Test.
5. Approximately 2 seconds after the LED flashes green it will flash amber and beep if valid external GPS data has been received.
A successful test result is indicated by: a short beep then three beeps with three yellowish flashes concurrently then the LED turns green for pass.

NOTE: The 121.5 MHz homing beacon is inhibited during self-test.

It is strongly recommended to test the beacon on a quarterly basis.



**SELF TEST
FIGURE 5**



**OPERATING POSITION
FIGURE 6**

SECTION 3 - EXTERNAL GPS I/R ADAPTER

3.1 GENERAL

Your unit comes with a GPS cable Plug Adapter that can be interfaced to your GPS receiver to input actual GPS data into your beacon. This extra data can help improve reaction time to your position in the event of an emergency. This data is particularly helpful when the GEOSAR Satellite system picks up the Distress Alert.

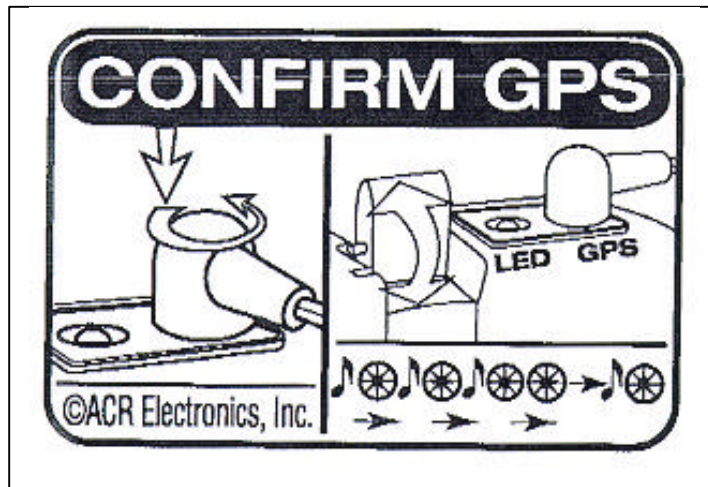
3.2 GPS ADAPTER

3.2.1 Connecting:

Your External GPS I/R cable attaches to your UNIT and the GPS receiver, forming a Link for data to transfer. (Like a printer) The cable Plug's into the socket labeled GPS located at the top of the unit. The other end has two wires that need to be connected to the GPS Receiver's Data/Power Cable. Consult your GPS Manual for wire identification.

The Data/Power cable for your GPS receiver typically has connections for an external power source and data output. Ensure proper connection.

The External GPS adapter that is supplied with your UNIT has two wires that are polarized. The wire with the white stripe on it is the + data lead and should be connected to the + Data lead of your GPS Data/Power connector. The other lead with no stripe is the - Data lead and should be connected to the - Data lead of your GPS Data/Power Cable. Use an Epoxy type Heat shrink for weatherproofing connection.



**GPS ADAPTER ILLUSTRATION
FIGURE 7**

3.2.2 Setup:

The Data protocol your beacon will be accepting is the NMEA 0183 Version 1.5 and above. Set baud rate to 4800 and the GGA sentence string needs to be enabled. Some GPS receivers have options on what strings are enabled. Ensure the GGA string is enabled. Consult your GPS manual for further information. This is a very common standard for GPS receivers.

Check your cable to ensure that the polarity is correct for the + data and – data leads. It will not work if polarity is wrong.

Your GPS receiver needs to be set to this data protocol for data transfer into the beacon. If the beacon is not showing conformation of GPS data check, protocol, baud-rate, ensure GGA string is enabled and cable is wired correctly.

See Figure 4 for known compatible GPS receivers. Consult your GPS manual for proper data protocol settings.

3.2.3 Testing:

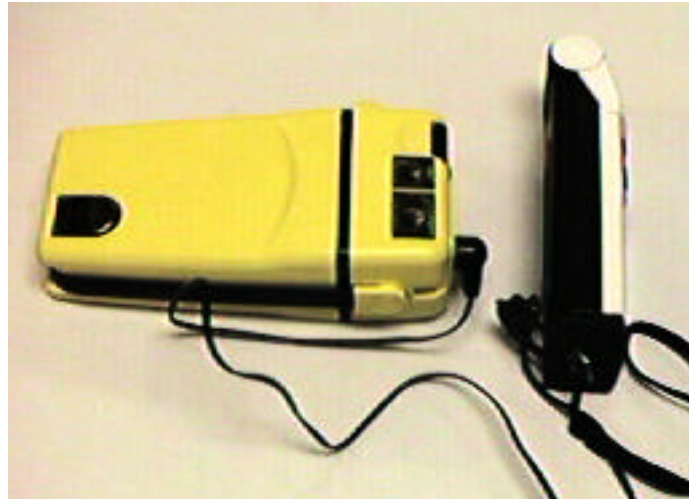
Plug the Adapter into the top of the UNIT into the socket labeled GPS.

Ensure your GPS has acquired a valid position. Momentarily lift the "ON/OFF" switch to the self-test position and stand-by. The beacon will go through it's self test routine and approx. 2 seconds after the LED turns green the unit will beep once and the Yellow LED will flash to indicate that valid GPS data has been transferred into your UNIT. Repeat step 3.2.2 if no conformation.

The beacon will automatically up load new GPS position every 30 minutes if you leave it connected to your GPS receiver.

When you activate self-test the beacon will start to look for new GPS data and update accordingly, if no new data is present or cable is disconnected the original data will still stay in memory.

Once data has been loaded into your UNIT it will remain there until the unit is activated to the "ON" mode.



**EXTERNAL GPS I/R CABLE
FIGURE 8**

3.2.4 Default data:

Default data is when there is no GPS data in the unit. The beacon reverts to default data once the unit has been activated and then shutoff. The unit will function normally without GPS data.

4.0 MAINTENANCE

- 4.1 Carefully inspect the unit's case for any visible cracks. Cracks may admit moisture, which could falsely activate the beacon or otherwise cause a malfunction. Any cracking observed should be immediately referred to ACR or nearest distributor for evaluation, (1-800-432-0227 Ext. 112) *toll free in the USA*.
- 4.2 The battery must be replaced by the date indicated on the beacon. At each inspection, check the time remaining until replacement is required.

NOTE: There are no user serviceable items inside the unit. DO NOT OPEN THE beacon UNLESS TO DISABLE IN CASE OF FAULTY ACTIVATION. Refer all long life battery replacement and other internal unit service to a factory authorized service center. For the nearest location of a factory authorized service center, call 1-800-432-0227 Ext. 112 (*toll free in the USA*) or +1 (954) 981-3333, Ext. 112.

It is strongly recommended to test the beacon on a quarterly basis.

5.0 REGISTRATION

- 5.1 It is imperative that this unit is registered with NOAA (National Oceanic Atmospheric Administration) if used in the USA or with your own national authority accordingly. The beacon has been programmed with a unique identification number or code which is broadcast on 406 MHz. Registration with the appropriate national authority provides the Search and Rescue people with important information which will speed up the rescue operation and minimize false alarms.
- 5.2 To register this unit with NOAA, simply fill out and mail the provided form in the enclosed pre-addressed envelope to NOAA or FAX the completed form to (301) 457-5406.
- 5.3 NOAA will supply a beacon registration decal, which is to be affixed to the unit.

6.0 FALSE ALARMS

- 6.1 Should there be, an inadvertent activation or false alarm, it must be reported to the nearest search and rescue authorities. The information that should be reported includes the units Unique Identifier Number (UIN); date, time, duration, and cause of activation; and the location at the time of activation. Information is located on the label.
- 6.2 Contact the appropriate national authority to report false alarms

*****WARNING*****
THIS TRANSMITTER IS AUTHORIZED FOR USE
ONLY DURING SITUATIONS OF GRAVE
AND IMMINENT DANGER!

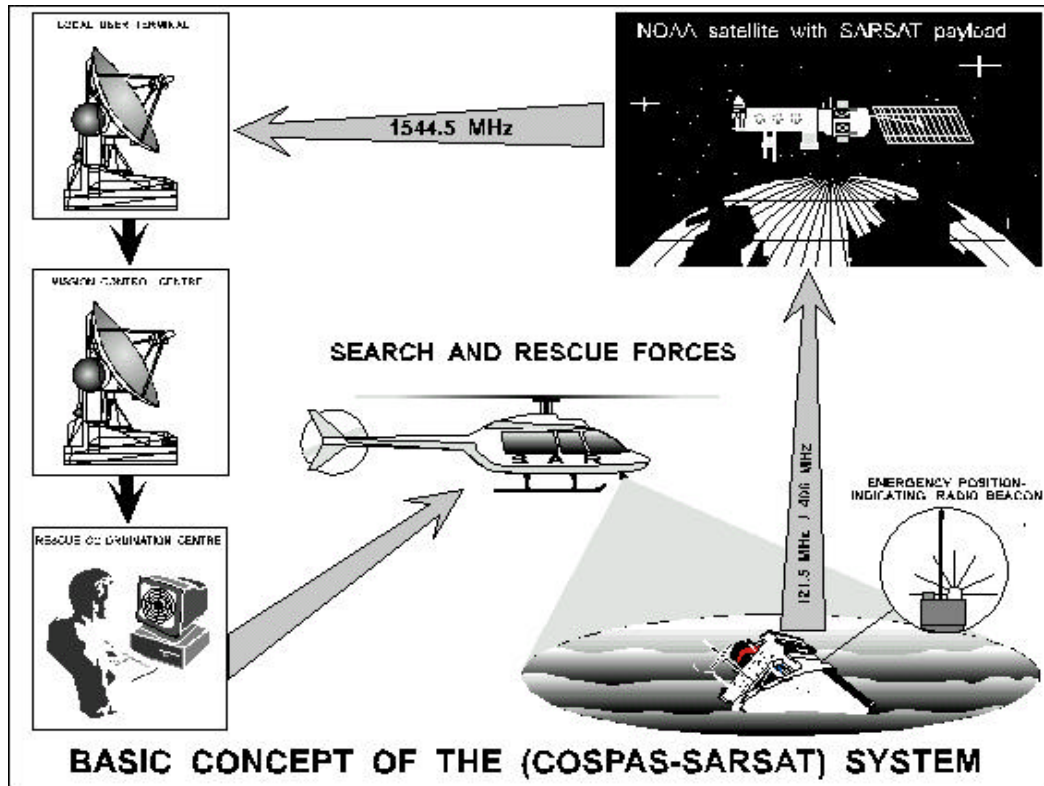


FIGURE 9