



OWNER _____
VESSEL _____
RADIO CALL SIGN _____

Product Support Manual

ThunderBird SSAS Ship Security Alert System

Product No. 2800

RLB-33S

Y1-03-0180
Rev. D

FCC Type Accepted

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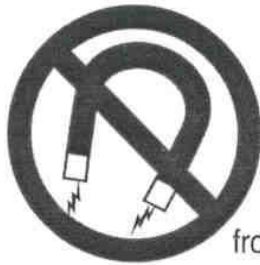
***** WARNING *****

THIS BEACON IS AUTHORIZED FOR USE ONLY DURING SITUATIONS WHERE THE SECURITY OF YOUR VESSEL IS UNDER THREAT OR HAS BEEN COMPROMISED AND POLICE ACTION IS REQUIRED

DELIBERATE MISUSE MAY INCUR A SEVERE PENALTY

*****Attention*****

This beacon **MUST** be reprogrammed by an authorized ACR distributor prior to installation and use. Failure to do so will result in incorrect routing of a security alert.



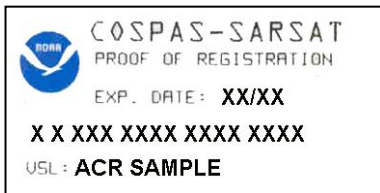
**Magnet
safe distance
1 m (3.3 ft)**

Keep this container a safe distance away from all magnetic sources.



**Stereo Speaker
safe distance
1 m (3.3 ft)**

Keep this container a safe distance away from all stereo speakers.



To ensure covert nature of the beacon, do not place the proof of registration label onto your SSAS beacon. Attach this label and all SSAS materials securely to your SSAS Annex portion of your vessel security plan.

Foreword

Congratulations and thank you for purchasing the ACR **ThunderBird 406 MHz Ship Security Alert System (SSAS)**. The combination of superior design, high quality raw materials and quality controlled manufacturing produces a product that will perform for years to come. The test facility at ACR can reproduce some of the harshest environmental conditions known to man. This assures that the products we design and manufacture can stand up to the rigors found in a marine environment. With proper care and maintenance, your SSAS will be in service for years to come.

ACR is proud to be certified to the ISO 9001:2000, the International Standard for Quality.

This manual provides installation, operation and maintenance instructions for the **ThunderBird 406 MHz SSAS**, hereinafter referred to as the beacon. This manual also describes the characteristics and details of the beacon system. The FCC authorizes the use of 406 MHz radio beacon by any ship that is also equipped with a VHF Ship Station. This will make the 406 MHz radio beacon available for use on most U.S. ships and boats.

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SECTION 1 - REGISTRATION AND PROGRAMMING YOUR 406 MHZ BEACONS

1.1 Programming

This SSAS beacon is programmed with a serialized Unique Identifier Number (UIN). In order for a security alert to be routed properly, this beacon must be reprogrammed by an authorized ACR distributor before installation or use can occur.

This beacon must be reprogrammed as follows:

- **With protocol code for SSAS**
- **With the country code of the vessel's flag state**
- **With the vessel's unique MMSI**

1.2 Registration importance

It is imperative that the owner of this 406 MHz beacon registers it with the National Authorities*. All 406 MHz beacons transmit a Unique Identifier Number (UIN) when activated. For SSAS the UIN programmed in the beacon must be the vessel's MMSI. Registration provides the security forces with up to date emergency contact information, which will speed up the launch of a rescue operation. The national authorities use the information to verify if an actual emergency exists. Valuable resources are wasted every year responding to false alarms. For beacons that are not registered, the national authorities will not know who you are, what type of vessel you have, your homeport, or who has a copy of your float plan. This will delay the launch of the mission.

* National Authority is the governmental body that is responsible for SSAS registration database administration for the country the SSAS is programmed for.

1.3 Where to register

The owner of a 406 MHz beacon (SSAS) should register it with the national authority of the vessels flagged state, regardless of where they operate. Each beacon must be programmed with the country code of the vessels flag state, and will only be accepted for registration in that country. To verify the country for which a beacon is programmed, see the label with the UIN on the back of the unit. Beacons purchased outside the flagged state of the vessel **MUST** be reprogrammed by a properly equipped distributor for registration.

1.4 Registration in the United States

It is the owner's responsibility to register 406 MHz beacons that are programmed for and purchased in the United States. The national authority that accepts registrations in the United States is the National Oceanic and Atmospheric Administration (NOAA). The owner should complete the enclosed registration form (Do not confuse this with the ACR Electronics warranty card) and mail with the pre-addressed; postage paid envelope to:

SARSAT beacon Registration,
E/SP3, RM 3320, FB-4
NOAA/NESDIS
5200 Auth Rd.
Suitland, MD 20746-4304

Online registration is now available. Please visit - www.beaconregistration.noaa.gov

The information provided on the registration form is used only for rescue purposes. The registration form should be filled out and mailed immediately. Registration can be expedited by registering online or by faxing the registration form to Fax # (301) 568-8649. Registrations should be faxed in the event the beacon is to be placed in immediate service and followed up with the mailing of the hard copy form.

All registration forms will be entered in the 406 MHz beacon registration database within 48 hours of receipt. A confirmation letter, a copy of the actual registration and a proof-of-registration decal will be mailed to you within two weeks. When you receive these documents, please check the information carefully and place in the SSAS annex of your vessel security plan. Do not affix the registration label to the beacon. This may compromise the covert nature of the beacon. (See page 1). If you do not receive confirmation back from NOAA, please call toll free 1-888-212-7283 for assistance.

1.4.1 Commercial vessels in the United States

In the United States, commercial vessels that are required to have a radio station license are required to modify that license when an SSAS is added to the vessel. Please update FCC FORM 605 to modify your radio station license. For information on whether you need a radio station license, call toll free 1-888-CALLFCC (225-5322)

1.5 Registration outside of the United States

For use on vessels flagged in countries other than the United States, the sales agent should assist in filling out the forms and sending to that country's national authority at the time of purchase. To verify that the unit is properly programmed for that country, view the UIN label on the back of the unit. In the event that the beacon is not programmed for the country in which the vessel is flagged, the sales agent (if properly equipped) **MUST** reprogram the unit for that country.

1.6 Change of ownership or contact information

It is the owner's responsibility to advise the National Authority of any change in the information on the registration form. If the current owner of the beacon is transferring the beacon to a new owner, the current owner is required to inform the national authority by letter, fax or telephone of the name and address of the new owner. The new owner of the beacon is required to provide the national authority with all of the information requested on the registration form. This obligation transfers to all subsequent owners. In the United States registration forms are available from NOAA. Call 1 (888) 212-7283 or visit www.beaconregistration.noaa.gov

1.7 Commercial vessels worldwide

406 MHz SSAS beacons that are carried on commercial vessels world wide, should be registered with the country where the vessel is flagged regardless of where the vessel operates. When a commercial vessel acquires a 406 MHz SSAS beacon from outside of its flagged country; the beacon **MUST** be reprogrammed and register the beacon according to its flag state and its MMSI.

SECTION 2 - FALSE ALARMS

2.1 Prevention of false alarms.

There are a few precautions that should be taken to prevent false alarms:

Do not transport beacon within 1 meter (3.3ft) of a magnetic source.

Do not mount beacon within 1 meter (3.3ft) of a magnetic source.

Do not mount remote switches where they can be confused with another switch.

Do not mount beacon where it can get wet.

Do not clean beacon with any liquid.

2.2 Reporting of false alarms

Should there be, for any reason, an inadvertent activation or false alarm, it must be reported to the national authority of your vessels flagged state. The information that should be reported includes the SSAS Unique Identifier Number (UIN), date, time, duration and cause of activation, as well as location of beacon at the time of activation.

2.2.1 To report false alarms in the United States or Canada contact any of the following:

Atlantic Ocean / Gulf of Mexico
USCG Command Center
Tel: (757) 398-6390

Pacific Ocean Area \ USCG Command Center
Tel: (510) 437-3700

From Any Location

USCG Headquarter Command Center
Tel: (800) 323-7233

For Canadian Pacific waters:
Canadian Coast Guard Rescue Coordination Centre Victoria
Tel: (800) 567-5111

For Canadian Atlantic waters:
Canadian Coast Guard Rescue Coordination Centre Halifax
Tel: (800) 565-1582

For other Canadian waters (Great Lakes, Hudson's Bay, and Arctic)
Canadian Coast Guard Rescue Coordination Centre Trenton
Tel: (800) 267-7270

2.2.2 To report false alarms worldwide contact your national authority.

SECTION 3 - INSTALLATION

3.1 Preparation

3.1.1 Parts included:

<input type="checkbox"/> Beacon/mounting bracket assembly	Qty: 1	PN: A3-06-2410-1
<input type="checkbox"/> Cross dipole antenna	Qty: 1	PN: 2810
<input type="checkbox"/> SMA male conn, RG-8/U crimp	Qty: 1	PN: 2814
<input type="checkbox"/> Activation switches	Qty: 2	PN: 2820
<input type="checkbox"/> Antenna mount	Qty: 1	PN: 2821
<input type="checkbox"/> TNC male conn, RG-8/U crimp	Qty: 1	PN: 2633
<input type="checkbox"/> Insulated terminals, crimp	Qty: 4	PN: A1-05-0125-17

3.1.2 Tools needed:

- Phillips screwdriver
- Drill
- RG-8/U crimp tool
- Saw
- Solder iron

3.1.3 Additional materials needed for installation:

- Marine grade RG-8/U coaxial cable
- Switch wire or cable
- Screws/Bolts for mounting bracket (3/16" or #10)
- Screws/Bolts for antenna mount
- Boeshield T-9 or equivalent waterproof lubricant

3.2 Beacon installation

3.2.1 The **ThunderBird SSAS** is shipped attached to its mounting bracket. Typically, the beacon must be removed from the mounting bracket during installation. The beacon can be removed from the mounting bracket as follows:

- First disconnect the 2-Pin waterproof connector on the left side of the beacon.
- Unbuckle the strap holding the beacon to the bracket.

The **ThunderBird SSAS** is intended to transmit covertly a security alert, notifying competent authorities that the security of the vessel is under threat or has been compromised. A key component of the system is its covert nature, which should be maintained as much as possible to protect the beacon from malicious tampering. The **ThunderBird SSAS** is shipped in the "OFF" position. During the installation procedure, leave the beacon in the "OFF" position to prevent false alarms.

3.2.2 Mounting location

The location selected must be sufficiently rigid to support the weight of the total installation (approx. 2 lbs) and at the same time consider vibration, exposure to surrounding hazards, such as equipment movement, doors openings, personnel traffic, etc. **The bracket should only be mounted to a flat surface at least as big as the bracket. Mounting to a rail or post is not recommended.**

Also to be considered in selecting a location for installation is the harmful effect that certain corrosive vapors might have on the beacon. Under no circumstances should a location be selected for installation where the beacon would be jeopardized by any foreign articles being temporarily or permanently positioned during “at sea” or “in port” activities.

Do not mount or store the beacon within 1 meter (3.3 ft) of strong magnetic (such as loud speakers) or electrical (such as radar or high power radio transmitter) fields. The beacon should not be mounted closer than 1 meter (3.3 ft) to a navigation compass.

In order to maintain the required covert operation, the **ThunderBird SSAS** mounting location should be hidden from the view of most personnel and all passengers and guests. Suitable locations include inside an equipment closet or cabinet, under the navigation bridge and inside a closed equipment rack.

The bracket can be mounted in any orientation; however, the beacon controls and system connections are designed for vertical installation. When selecting a mounting location the following should be carefully considered:

- Routing of switch wires/cables. (Connects to top of mounting bracket.)
- Routing of RG-8U coaxial antenna cable. (Connects to top of beacon.)
- Routing of GPS interface cable. (Connects to top left part of beacon.)
- Accessibility to beacon control switch. (Top right part of beacon.)
- Visibility of test and Xmit LED's. (Top left part of beacon.)

3.2.3 Hardware

Use three stainless steel pan head fasteners to secure beacon mount to surface. Size 3/16” or #10 bolts can be used. (*Not Supplied*)

3.2.4 Installing the beacon in the bracket

The mounting bracket is keyed to prevent the beacon from being installed backwards. Install the **ThunderBird SSAS** with the front label facing out. The strap should be tightened to secure the beacon snugly in the bracket. Connect the 2-Pin waterproof connector on the left side of the beacon (see Figure 11).

3.2.5 Connecting the beacon to a GPS receiver via the optical interface (IR transmitter)

Your beacon comes with a NMEA GPS optical interface cable (transmitter plug with lead wires) that should be connected to the ship's GPS system. The IR transmitter plug attaches to your beacon, via the keyed blue bezel on the top left of the beacon. The cable can be routed through the hole in the upper left corner of bracket. The lead wires attach to the ship's GPS system via the NMEA 0183 connector from your GPS receiver. The black lead wire with white stripes should be connected to the positive transmitter pin (Data Out). The black wire should be connected to the negative pin (Ground).

NOTE: The baud rate output for your GPS receiver NMEA 0183 should be 4800. Consult your GPS manufacturer for correct installation.

3.3 Activation switch installation

- Per IMO's SOLAS Chapter XI-2, Regulation 6: Ship Security Alert System:

Paragraph 3.1: “The ship security alert system shall be capable of being activated from the navigation bridge and in at least one other location;”

3.3.1 General information

SSAS beacons are required to have at least two remote activation points, one of which is on the navigation bridge. Two switches are supplied with the **ThunderBird SSAS**. Contact the factory if additional switches are required.

The switches are required to be protected from inadvertent activation and activate only with two independent mechanical actions. These requirements are satisfied by the spring-loaded switch guard attached to the switch when shipped. The switches must be installed with the guard in place.

3.3.2 Switch location

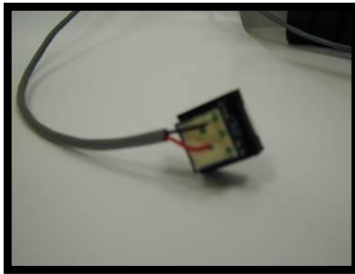
The switches are designed to be installed through a hole in a panel and require approximately 1" (25.4 mm) by 1" (25.4 mm) clearance on both the front and the back. The recommended panel thickness is 0.039" (1mm) to 0.106" (3.2mm).

There are some additional factors that should be considered when selecting the switch locations. A primary consideration is installing the switches per IMO requirements: one on the navigation bridge and the other in a secondary covert location. Each switch should also be installed in a location that will not draw unnecessary attention, yet be easy to access. The switches should not be installed in a location where they might be confused with other switches. Lastly, the wiring routing may also be considered.

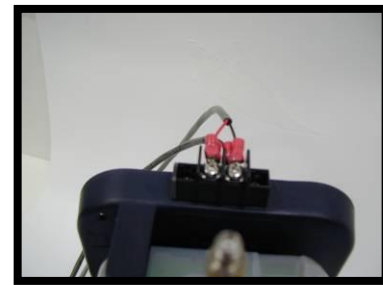
3.3.3 Recommended wire

ACR recommends using stranded, tinned wire between 16 to 22 AWG to connect between the remote activation switches and the beacon mounting bracket. Stranded wire is recommended to better withstand the effects of vibration. Tinned wire is resistant to corrosion. The recommended wire gauge is a compromise between weight and strength. ACR provides crimp-on terminal lugs for 16 to 22 AWG wire for the connection to the mounting bracket. Other marine grade lugs (*Not Supplied*) can be used for different gauge wire.

Because two wires are required to connect the switch to the mounting bracket, a two conductor cable is ideal. This makes routing the wire easier and provides additional strength.



**ACTIVATION BUTTON WITH
RECOMMENDED WIRE SOLDERED
TO THE SWITCH
FIGURE 1**



**WIRING CONNECTION ON THE
MOUNTING BRACKET COMING FROM
ACTIVATION SWITCH
FIGURE 2**

3.3.4 Switch installation

Cut a 0.638" x 0.638" (16.2 mm x 16.2 mm) square hole in the selected panel. The recommended panel thickness is 0.039" to 0.106" (1.0 mm to 3.2 mm).

The switch should be pushed back into the hole from the front. It is recommended to make the wire connections before installing the switch into the panel. Connect the wires to the back of the switch; one wire to "COM" terminal and the other to "N.O." terminal. There should be no connection to the "N.C." terminal. The wires should be soldered to the switch terminals (see Figure 1). Once the connections are made, make sure the spring-loaded switch guard is securely attached to the switch and press the switch assembly into the panel hole. The switch will snap into place.

Repeat the above procedure for the other switch.

3.3.5 Connection to mounting bracket

Route the switch wire from the switch locations to the **ThunderBird SSAS** beacon mounting bracket. Care should be taken to route and secure the wire properly. The wires should then be trimmed to the appropriate length.

If using the recommended 16 to 22 AWG wire, crimp the terminal lugs (provided) onto the wires. If other wire is used, appropriate lugs (*Not provided*) can be used. Alternatively, the wire can be connected directly to the terminal block on the mounting bracket (see Figure 2). Connect one wire from each switch to one of the two terminals on the top of the mounting bracket by placing the lug under the screw and tightening the screw. Repeat with the other wire from each switch in the other terminal.

3.3.6 Switch installation verification

To verify proper installation of the switches, the following procedure should be followed (requires two persons, preferably with 2-way radio communications):

- Perform this procedure with all connections made between the switches and the beacon.
- The beacon must be in OFF mode. Performing this test with the beacon in READY mode may result in a live transmission to the satellite system.
- With a multi-meter, measure the resistance between the two screws on the left side of the beacon. This should be an open circuit ($> 100 \text{ k}\Omega$.) If not, check the switch wire connections to make sure the two wires from each switch are connected to different screws on the mounting bracket terminal block.
- Depress each switch (one at a time) while measuring the resistance between the two pins on the mounting bracket connector. The resistance should momentarily (as long as the switch is depressed) read a short ($< 10\Omega$.) If the resistance never reads a short, verify all connections are per 3.2.4 and 3.2.5 above.

3.4 Cross dipole antenna installation

3.4.1 General information

The cross dipole antenna is intended for operation far away from a ground plane. With this in mind, the location of installation should be carefully selected to keep the antenna as far from horizontal conductive (metallic) planes as possible (see Figure 12).

The length of cable from the SSAS beacon to the cross dipole should be kept as short as possible. Secure antenna cable (3 ft. maximum) away from antenna to reduce stress on antenna connector (see Figure 12).

A stainless steel 4 inch tall antenna mount is included with your SSAS kit. If the supplied bracket is not ideal for the desired mounting location, the cross dipole has a standard female 1" x 14 thread allowing it to be mounted to a variety of off-the-shelf brackets and masts.

3.4.2 Mounting guidelines

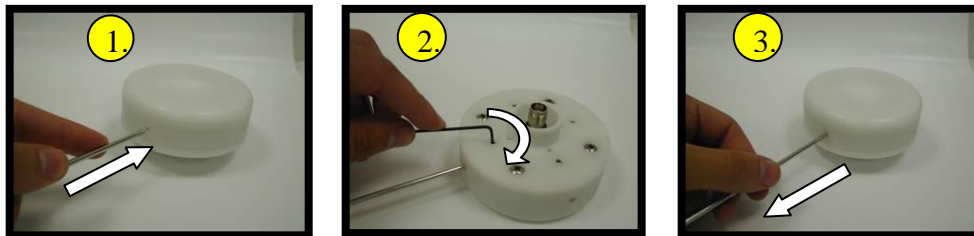
- Minimum height above deck: 10 feet (3 m)
- Allowable obstructions: Obstructions are allowable only below the antenna. There should be no conductive (metallic) objects in the entire hemisphere above the antenna.
- Coaxial cable length: Maximum: 100 feet (30.5 m)
* Contact the factory if longer runs or different coaxial cable is required.
- Coaxial cable type: RG-8/U marine grade

3.4.3 3.4.3 Antenna assembly

The antenna is shipped with the four elements removed from the housing. Before using the antenna, these elements must be assembled to the antenna housing.

For each element, assemble as follows:

1. Slide the grooved end of the element into a hole in the side of the housing until it stops
2. Install and tighten appropriate set screw through hole in the bottom housing using included wrench
3. Pull lightly on the element to ensure it is tightly secured



**ANTENNA ASSEMBLY
FIGURE 3**

3.4.4 Antenna installation

Select mounting location using guidelines and general information above. The top of a mast is an ideal location for the cross dipole. Mounting to an existing spar or to a bracket attached to a mast is also acceptable. See Figure 12 for examples. The antenna must be mounted with the connector pointing down and the elements horizontal. If mounting on a spar or bracket, the antenna elements must be oriented approximately 45° to the horizontal support when looking from the top or bottom, as shown in Figure 12.

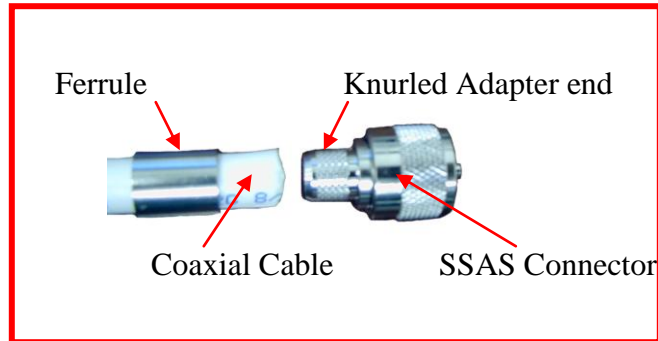
Use one of the following methods to mount the antenna per the guidelines and general information above with all four elements in the horizontal plane:

- The included mount can be used to attach to any small, flat, horizontal surface; i.e. the top of a mast or a spar. In this case drill holes in the pattern of the mount and attach with marine grade screws as needed (*not supplied*).
- The included mount can be used to attach the antenna to a round spar using U-bolts.
- The antenna can be mounted to any bracket or mast with the standard 1" x 14 thread.

3.4.5 Connection to beacon

Attach male TNC connector (supplied) to marine grade RG-8/U coaxial cable (*Not provided*) as follows:

- Strip the coax cable per Figure 13.
- Solder the connector pin to the center conductor.
- Slide the ferrule over the cable.



**CABLE CONNECTION
FIGURE 4**

- Slide the cable/pin assembly into the connector body. Make sure the pin goes into the center of the connector insulator and the braid goes over the knurled part of the back of the connector.
- Slide the ferrule to the back of the connector.
- Using an RG-8/U die (approx. 0.429"), crimp the ferrule tightly over the cable and connector.

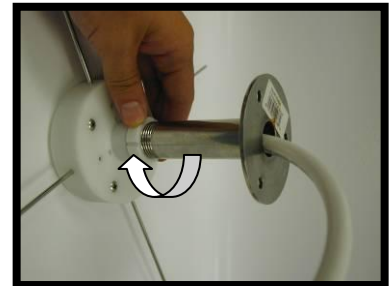
Connect the male TNC cable assembly to the mating female TNC connector on antenna. For additional protection from corrosion, spray exposed metal surfaces of connectors with Boeshield T-9 or equivalent waterproof lubricant (*not provided*).



Slide wire thru mounting bracket to connect to



Fasten TNC cable assembly to the mating female TNC



Secure antenna to the mounting bracket

FIGURE 5

Route cable to SSAS beacon as needed, making sure to adequately secure the cable. Provide a drip loop in the cable near the beacon to prevent water from running directly on to the beacon. Trim the cable to the appropriate length.

Attach male SMA connector (supplied) to marine grade RG-8/U coaxial cable as follows:

- Strip the coax cable (per Figure 14).
- Solder the connector pin to the center conductor.
- Slide the ferrule over the cable.
- Slide the cable/pin assembly into the connector body. Make sure the pin goes into the center of the connector insulator and the braid goes over the knurled part of the back of the connector.
- Slide the ferrule to the back of the connector.
- Using an RG-8/U die (approx. 0.429"), crimp the ferrule tightly over the cable and connector.

Connect the male SMA connector on the cable assembly to the mating female SMA connector on the beacon. For additional protection from corrosion, spray exposed metal surfaces of connectors with Boeshield T-9 or equivalent waterproof lubricant (*not provided*).



**ANTENNA INSTALLATION
FIGURE 6**

3.4.6 Antenna installation verification

To verify proper installation of the cross dipole antenna, the following procedure should be followed (requires two persons, preferably with 2-way radio communications):

- One person should be on the deck with an FPR-100 with line-of-sight view of the cross dipole antenna. The FPR-100 antenna should be oriented horizontally and ideally be located directly under the cross dipole antenna.
- With the FPR-100 ready to receive a test burst, the other person should initiate a Self-Test.
- If the FPR-100 successfully receives the test burst, then the cross dipole antenna is installed correctly.
- The FPR-100 can also verify that the **ThunderBird SSAS** is programmed correctly.
- If the test burst was not received, the FPR-100 may be too far from the antenna. Repeat the test with the FPR-100 closer to the antenna. (Typically, an FPR-100 can receive a signal from the cross dipole at a maximum range of 100 ft. (30.5m).
- If the FPR-100 still does not receive the test burst, check all coaxial connections from the beacon to the antenna.

SECTION 4 - OPERATION

4.1 General

4.1.1 The **ThunderBird SSAS** beacon can only be activated manually while installed in the mounting bracket.

4.1.2 The following two conditions must be satisfied to activate the **ThunderBird SSAS**:

- 1) The switch on the beacon must be placed in the "READY" position.
- 2) One of the remote activation switches must be depressed.

4.1.3 The **ThunderBird SSAS** is designed to allow the user to perform periodic testing while SSAS is in the mounting bracket, to assure a functioning beacon.

4.2 Controls

4.2.1 Thumb Switch: The thumb switch on the top right side of the beacon controls the mode of operation of the **ThunderBird SSAS**. There are three switch positions (see Figure 11):

- 1) Off: Down to the front, indicated by "O"
- 2) Self-Test: Vertical
- 3) Ready: Down to the back, indicated by "I"

4.2.2 Remote activation switches: These are momentary switches installed on the ship that are used to activate the beacon when the beacon is placed in READY mode. To activate, lift the spring-loaded guard and press the button.

Note: Once the beacon has been activated, it must be manually deactivated.

4.3 Indicators

4.3.1 LED's: There are two LED indicators located on the top right part of the beacon:

- 1) TEST LED: Green
- 2) XMIT (transmitting) LED: Red

4.3.2 Buzzer: There is an internal buzzer in the **ThunderBird SSAS**. The buzzer beeps only during the self-test.

4.3.3 There are no indicators of the beacon's mode of operation at the remote activation points.

4.3.4 There is no audible indication while in the transmission (operating) mode.

4.4 Modes of operation

4.4.1 OFF Mode: The **ThunderBird SSAS** can not be activated when in OFF mode. The beacon is in OFF mode whenever the thumb switch is in the "Off" position (down to the front) as indicated by the "O" symbol displayed on the thumb switch.

4.4.2 READY Mode: The **ThunderBird SSAS** is capable of being activated when in READY mode. The beacon is in READY mode whenever the thumb switch is in the "Ready" position (down to the back) as indicated by the "I" symbol displayed on the thumb switch.

4.4.3 ON Mode: The **ThunderBird SSAS** is activated and is transmitting bursts of data when in ON mode. The beacon is in ON mode when one of the remote switches is depressed while the beacon is in READY mode. ON mode is indicated by a flashing red XMIT LED.

4.4.4 SELF-TEST Mode: The **ThunderBird SSAS** is in Self-Test mode while it is performing the self-test. The beacon goes into self-test mode when the thumb switch is held in the self-test position (vertical) for at least 1 second. Self-Test mode is indicated by a series of flashing green test LED and red XMIT LED's and beeps as detailed in section 4.7.

4.5 Activation

An ACR 406 MHz SSAS can be activated by two different methods.

1. With the beacon switch in the ready position and depressing one of the buttons of the remote activation points, or
2. With the beacon switch in the ready position and shorting the two wire leads from the beacon.

4.5.1 The **ThunderBird SSAS** can be manually activated by first placing the beacon in READY mode. This is done by lifting the thumb switch to a vertical position, sliding it to the left and pushing it down to the back side of the SSAS READY mode is indicated by the "I" symbol displayed on the thumb switch.

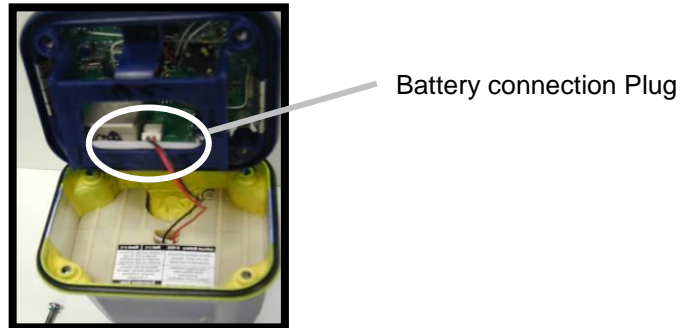
4.5.2 Once in READY mode, the **ThunderBird SSAS** is activated by depressing one of the remote activation switches. At the remote activation locations, there is no indication that the beacon is activated. This is intentional to ensure covert operation. The flashing red XMIT LED on the beacon indicates activation.

4.5.3 The **ThunderBird SSAS** should only be activated when the ships security has been threatened or compromised. However, applicable personnel must be familiar with its operation so the beacon can be activated when needed.

4.6 Deactivation

4.6.1 The **ThunderBird SSAS** can be deactivated by returning the thumb switch to the “OFF” position.



4.6.2 If the beacon continues to operate after it has been deactivated, remove the four screws holding the top cap to the bottom case assembly and unplug the battery to disable the unit. Return it to a Service Center for repair.



BATTERY CONNECTION PLUG
FIGURE 7

4.7 Full functional self test

Please read all instructions before performing any of the tests. Be prepared to record data from the test.

4.7.1 The **ThunderBird SSAS** can be tested in or out of the release bracket. A self test is initiated by lifting the thumb switch to a vertical position and holding it in this position for at least one second. The initiation of the test is indicated by the simultaneous and brief lighting of the green and red   LED's.

The sequence of tests is:

1. Check Data Integrity Beep and lights up Red and Green LEDs if passed
..... Stop if failed
2. Check 406 MHz Synthesizer Beep and lights up Red and Green LEDs if passed
..... Stop if failed
3. Check RF Power/Battery Beep and lights up Red and Green LEDs if passed
..... Stop if failed

4. Turn on Green LED to indicate successful test.

If all of the above occurs, the test has been successful.

5. Check GPS circuitry and data Beep and lights up Red and Green LEDs
Approximately 2 to 3 seconds after the Green LED if passed (GPS location data has been loaded)

4.7.2 It is strongly recommended to test the **ThunderBird SSAS** on a monthly basis.

4.8 External GPS interface

4.8.1 External GPS interface requirements: In order to be compatible with the **ThunderBird SSAS** an external GPS receiver must provide location information according to the following requirements:

- NMEA 0183, Version 1.5 or higher
- Baud rate: 4800
- Talker device identifier: GP (GPS Receiver)
- Sentence format: GGA (GPS Fix Data)

- 4.8.2 Using the GPS interface: Once a compatible operating GPS receiver is connected to the beacon, the beacon will store GPS data for incorporation into the emergency message, which is transmitted to the satellite. This can provide more accurate positioning data to the national authority and may lead to faster response. Since the last valid GPS position data is always kept in the memory of the beacon, the user should take care to make sure that the GPS position data stored is accurate. This can be accomplished by two methods: First, by always leaving a properly functioning GPS receiver connected to the beacon before activation. Second, by connecting a properly functioning GPS receiver with a valid position fix to the beacon and allowing sufficient time for the beacon to acquire valid position data from the GPS. This will take a nominal 20 minutes if old GPS position data is stored in the beacon's memory. If GPS data is not stored, the beacon will acquire current data within a minute of being connected to a GPS with a valid position fix. You can force the beacon to update its position at any time by initiating the beacon's self-test, see 4.8.3 and 4.8.4. If valid GPS position data is not available, it is preferable to reset the beacon with the beacon's default message (See Section 4.8.5).
- 4.8.3 Testing the GPS interface: Connect the optical interface plug to the beacon bezel and allow sufficient time for the GPS receiver to acquire valid GPS position data (usually less than 1 minute; but it can take up to 30 minutes). Lift the thumb switch to the vertical (self-test) position and release. Your beacon will confirm that it has acquired valid GPS data by emitting a beep along with a flash of the red and green LEDs. This will occur approximately 2.5 seconds after the self-test.
- 4.8.4 Updating GPS position data: When the beacon is properly connected to a functioning and compatible GPS receiver, GPS position data is automatically updated about every 20 minutes, while valid GPS position data is present. The operator can force the acquisition of new GPS position data, by executing self-test of the beacon. This bypasses the normal, programmed, waiting time of 20 minutes for the automatic update of GPS position data. Once the beacon has completed the self-test sequence by emitting the beep and flash of red and green LEDs, as described in 4.8.3, the beacon will request and acquire new position data from the GPS. This can take a nominal 15 seconds or up to one minute.

NOTE: When the beacon is not activated, GPS position data will be received and stored by the beacon **(No GPS position data updates will occur while the beacon is activated. However, subsequent position information is determined by the COSPAS-SARSAT Satellite System as described in Section 6.)**

- 4.8.5 Position data set to default: A new **ThunderBird SSAS** is programmed with the GPS position data set to "default". This "default" GPS position data indicates, upon activation, to the satellite system that the beacon has no valid GPS position stored in memory. Once a functioning and compatible GPS receiver is properly connected to the beacon, this "default" data will be replaced by valid GPS position data, as described in the previous sections.

Position data will be reset to default by activating the beacon (by placing the thumb switch in the ready position and then pressing one of the remote activation points) and then turning the beacon off by returning the thumb switch to the off position. Once the beacon is in ON mode, it must be turned OFF within 45 seconds to prevent transmission of a live burst. Because the activation points must be remote from the beacon, it is recommended that two people with 2-Way radios perform this procedure to prevent false alarms.

NOTE: THIS BEACON IS AUTHORIZED FOR USE ONLY DURING SITUATIONS WHERE THE SECURITY OF YOUR VESSEL IS UNDER THREAT OR HAS BEEN COMPROMISED AND POLICE ACTION IS REQUIRED.

ALSO NOTE: The action of turning the beacon ON and then OFF clears any stored GPS position data.

SECTION 5 - CARE AND MAINTENANCE

- 5.1 At least every ninety days, the mounting bracket, antenna and beacon should be inspected for deterioration and/or buildup that may affect the function of the beacon or it's mounting.

Also carefully inspect the beacon 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 for evaluation, (1-800-432-0227 Ext. 112).

Carefully inspect the antenna for excessive corrosion of metal parts and visible cracks on the plastic housing. These could result in a malfunction of the antenna. Any of the above should be immediately referred to ACR for evaluation. Antenna accessories and rebuild kits are available if the antenna should be damaged. (See page 21 for more details).

- 5.2 Clean the beacon and the mounting bracket to remove residue buildups. It is recommended that the mounting bracket be wiped with a damp cloth.
- 5.3 Check coaxial connector on cable from the antenna for tightness.
- 5.4 The battery (P/N 1096) must be replaced by the date indicated on the beacon. At each inspection, check the time remaining until replacement is required. Battery should be replaced if the beacon has been activated for any use other than the self test.

NOTE: There are no user serviceable items inside the SSAS. **DO NOT OPEN THE SSAS UNLESS TO DISABLE IN CASE OF FAULTY ACTIVATION.**

Self contained long life batteries with a five-year recommended replacement cycle provide power. See *Factory Authorized Service Center for replacement.*

Battery replacement includes: replacement of the lithium battery pack and proper disposal, replacing all o-rings, testing the water seal and performing a full electrical diagnostic check.

Always refer all battery replacement and other SSAS 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) or visit our website at www.acrelectronics.com

- 5.5 The **ThunderBird SSAS** contains lithium batteries which meet the requirements of the DOT Hazardous Materials Regulations. They also meet the United Nations classification of lithium batteries for shipment as “Non – Dangerous Goods”.

SECTION 6 – THE SEARCH AND RESCUE SYSTEM

6.1 General overview

SSAS beacons provide distress alerting via radio transmission on 406 MHz to satellites of the COSPAS-SARSAT network. The **ThunderBird SSAS** 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.

The message transmitted is unique for each beacon, which provides identification of the transmitter through computer access of registration files maintained by the National Oceanic and Atmospheric Administration or other national authority. Remember, if your beacon is **not registered**, Search and Rescue (SAR) Authorities **do not** know who you are, or how to contact anyone who might know anything about your situation (Refer to Section 1).

Once the signal (406 MHz) is relayed through the LEOSAR and/or GEOSAR network, SAR forces determine who is closest, and then track the signal using the 121.5 MHz homing frequency for intermediate and short-range location.

6.2 Satellite detection

SSAS beacons transmit to the satellite portion of the COSPAS-SARSAT System. COSPAS-SARSAT is an international system that uses Russian Federation and United States low altitude, near-polar orbiting satellites (LEOSAR) that assist in detecting and locating activated 121.5/243 MHz beacons and 406 MHz Satellite beacons.

COSPAS and SARSAT satellites receive distress signals from the SSAS transmitting on the frequency of 406 MHz. The COSPAS-SARSAT 406 MHz beacon signal consists of a transmission of non-modulated

carriers followed by a digital message format that provides identification data. The 406 MHz system uses Satellite-borne equipment to measure and store the Doppler-shifted frequency along with the beacons digital data message and time of measurement. 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.

The LUT processes the Doppler-shifted signal from the LEOSAR and determines the location of the beacon; then the LUT relays the position of the distress to a Mission Control Center (MCC) where the distress alert and location information is immediately forwarded to an appropriate Rescue Coordination Center (RCC). The RCC dispatches Search and Rescue (SAR) forces.

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 MHz, but will relay the distress alert to any of the LUT stations. When there is GPS data included in the distress message, SAR authorities instantly know your location to within 110 yards. This speeds up the reaction time by not having to wait for one of the LEOSAR satellite to pass overhead. Because most of the search and rescue forces presently are not equipped to home in on the 406 MHz Satellite beacons signal, homing must be accomplished at 121.5 MHz.

6.3 Global Positioning System (GPS)

The GPS system is a satellite group that enables a GPS receiver to determine its exact position to within 30m anywhere on Earth. With a minimum of 24 GPS satellites orbiting the Earth at an altitude of approximately 11,000 miles they provide users with accurate information on position, velocity, and time anywhere in the world and in all weather conditions. The **ThunderBird SSAS** stores this data into its distress transmission allowing search and rescue forces to narrow the search into a very small area and thus minimize the resources required and dramatically increases the effectiveness of the overall operation.

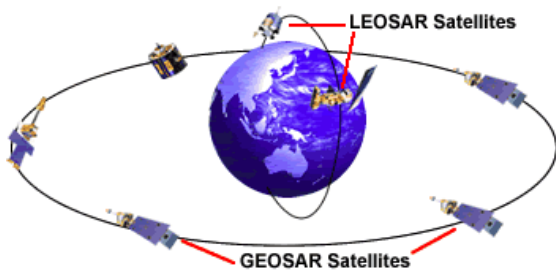


FIGURE 8 - SATELLITE COVERAGE

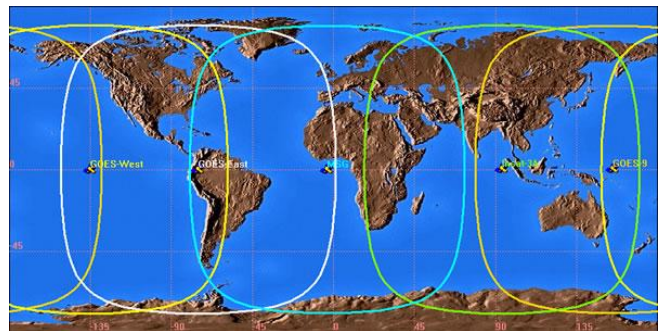


FIGURE 9 - GEOSAR SATELLITE ORBITS

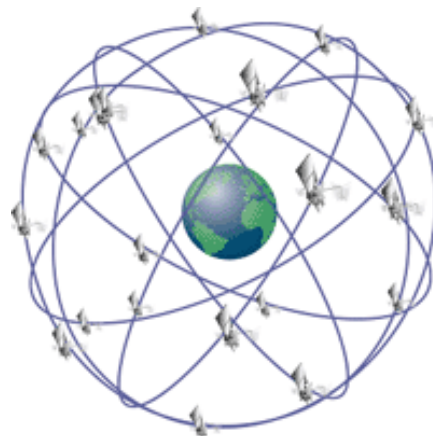


FIGURE 10 - GPS SATELLITE ORBITS

SECTION 7- AUTHORIZATIONS

7.1 Type approvals

7.1.1 The **ThunderBird SSAS** meets the requirements of Federal Communications Commission (FCC) Part 80 and GMDSS. FCC ID: B66ACR-RLB-33S

7.1.2 COSPAS-SARSAT Type Approval Certification No.141

7.2 Characteristics

7.2.1 The **ThunderBird SSAS** is a floatable, battery operated unit. The beacon case, with its external antenna, is waterproof. The semiconductor circuits are mounted within the case assembly that also contains the battery power supply. A thumb switch is installed on top of the beacon. The beacon must be stored in its special mount.

7.3 Technical data

7.3.1 Applicable Documents

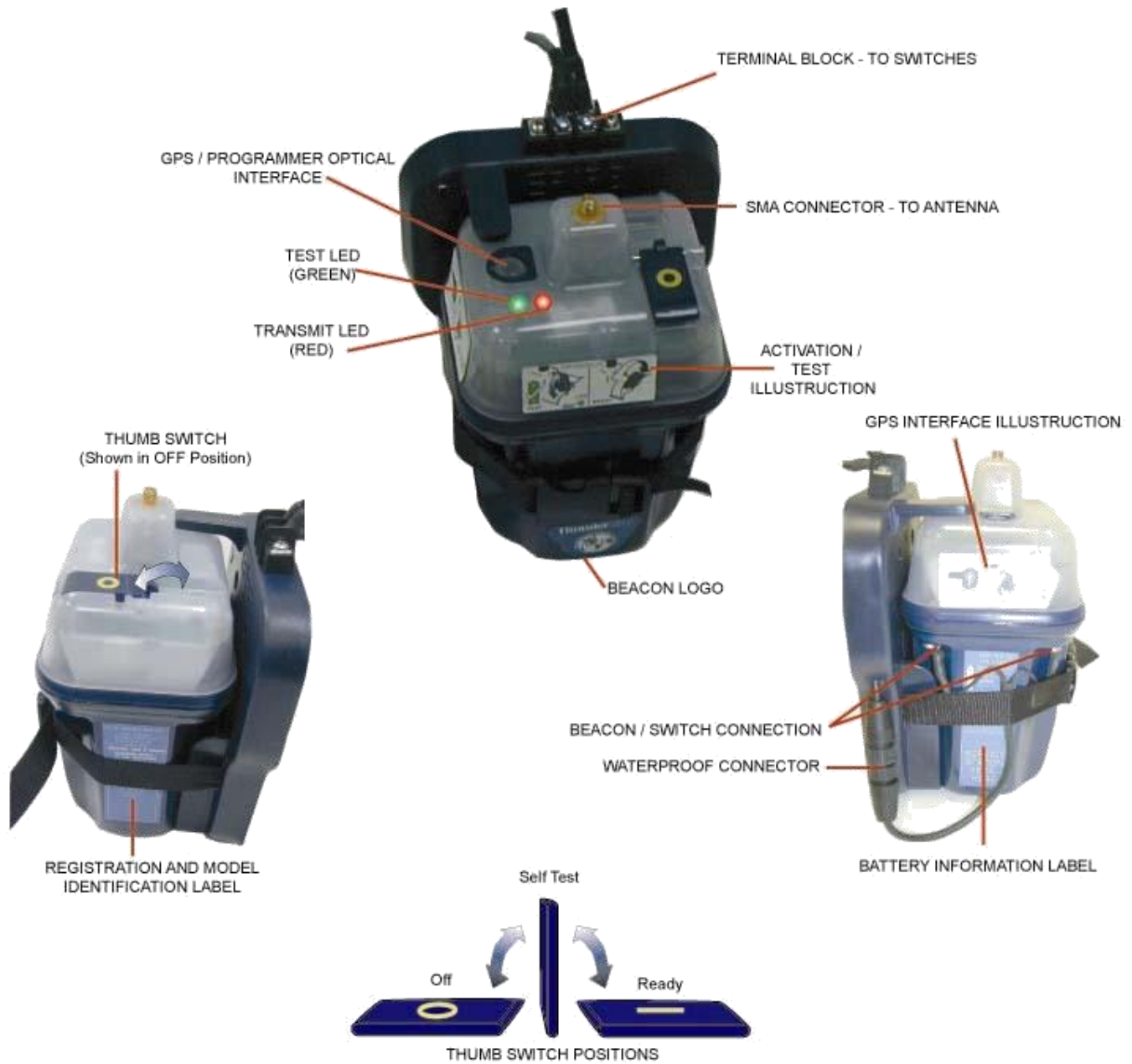
IMO	Chapter XI-2, Regulation 6: Ship Security Alert System
RTCM	Recommended Standards for Ship Security Alert Systems (SSAS) Using the Cospas-Sarsat Satellite System
COSPAS-SARSAT	Interim Cospas-Sarsat Type Approval Guidelines for 406 MHz SSAS beacons
FCC	Part 80 and GMDSS

7.3.2 Specifications

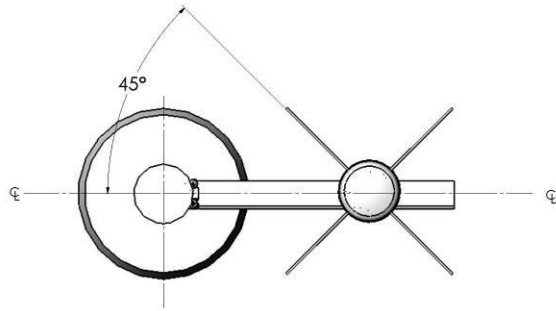
406 MHz Transmitter	
Frequency	406 MHz
Frequency Stability	±2 parts per billion/100ms
Output Power	5 watts
Digital Message	
Format	Serialized ¹
Duration	520 ms
Rate	400 bps
Encoding	Biphase L
Modulation	±1.1 radians peak
Antenna	
Frequency	406 MHz
Polarization	Right-Hand Circular (RHCP)
VSWR	Less than 1.5:1
General/Environmental	
Battery Life	
Operating	48 hours minimum
Replacement Interval	5 years
Size	
SSAS less Antenna	7.20" (18.29 cm)
Material, SSAS	High impact and UV resistant plastic
Color	Blue
Weight	1.9 lbs. (862 g)
Temperature Range	
Operating	-25°C to +55°C
Stowage	-25°C TO +70°C
¹ Leaves ACR with Serialized U.S. code but must be reprogrammed at an authorized ACR Service center with SSAS protocol code, the vessels Maritime MMSI and country code of the flag state before installing on a ship.	

7.3.3 Accessories

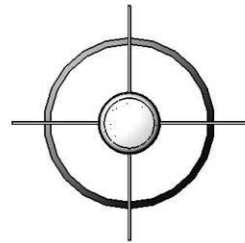
Description	Part Number
Replacement Cross Dipole Antenna	2810
Cross Dipole Rebuild Kit	2811
Marine Grade RG-8/U Cable	2812.1 (10 m)
	2812.2 (20 m)
	2812.3 (30 m)
Activation Switch Cable	2813.1 (5 meters)
	2813.2 (10 meters)
Additional Activation Switch	2820
Antenna Mount	2821
Battery Replacement	1096
SMA Connector – RG 8/U male crimp	2814
TNC Connector – RG 8/U male crimp	2633



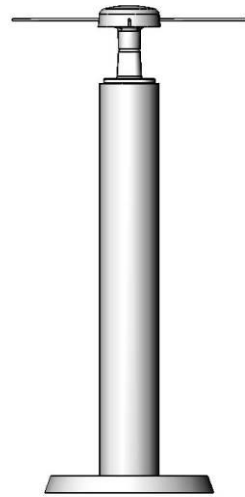
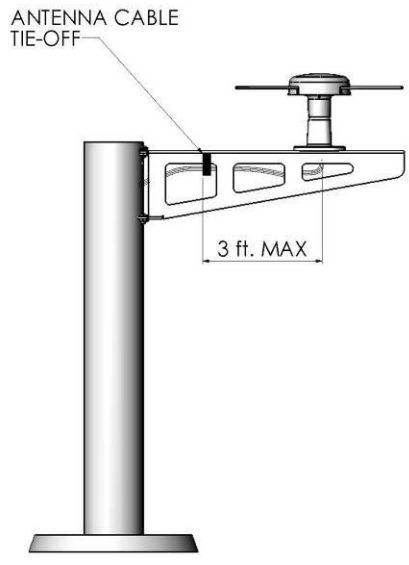
**ACR THUNDERBIRD
FIGURE 11**



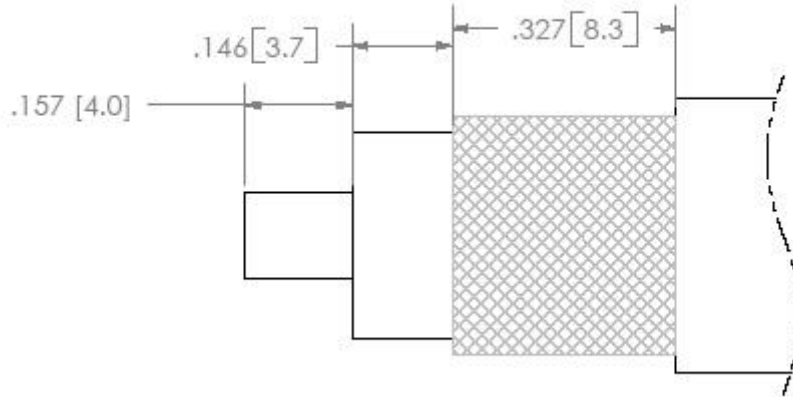
UNIT MOUNTED
ON SPAR ARM



UNIT MOUNTED
TOP OF MAST

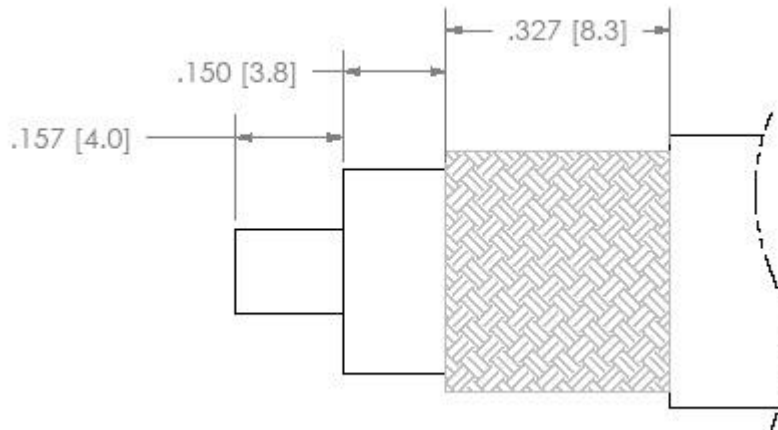


**ANTENNA INSTALLATIONS
FIGURE 12**



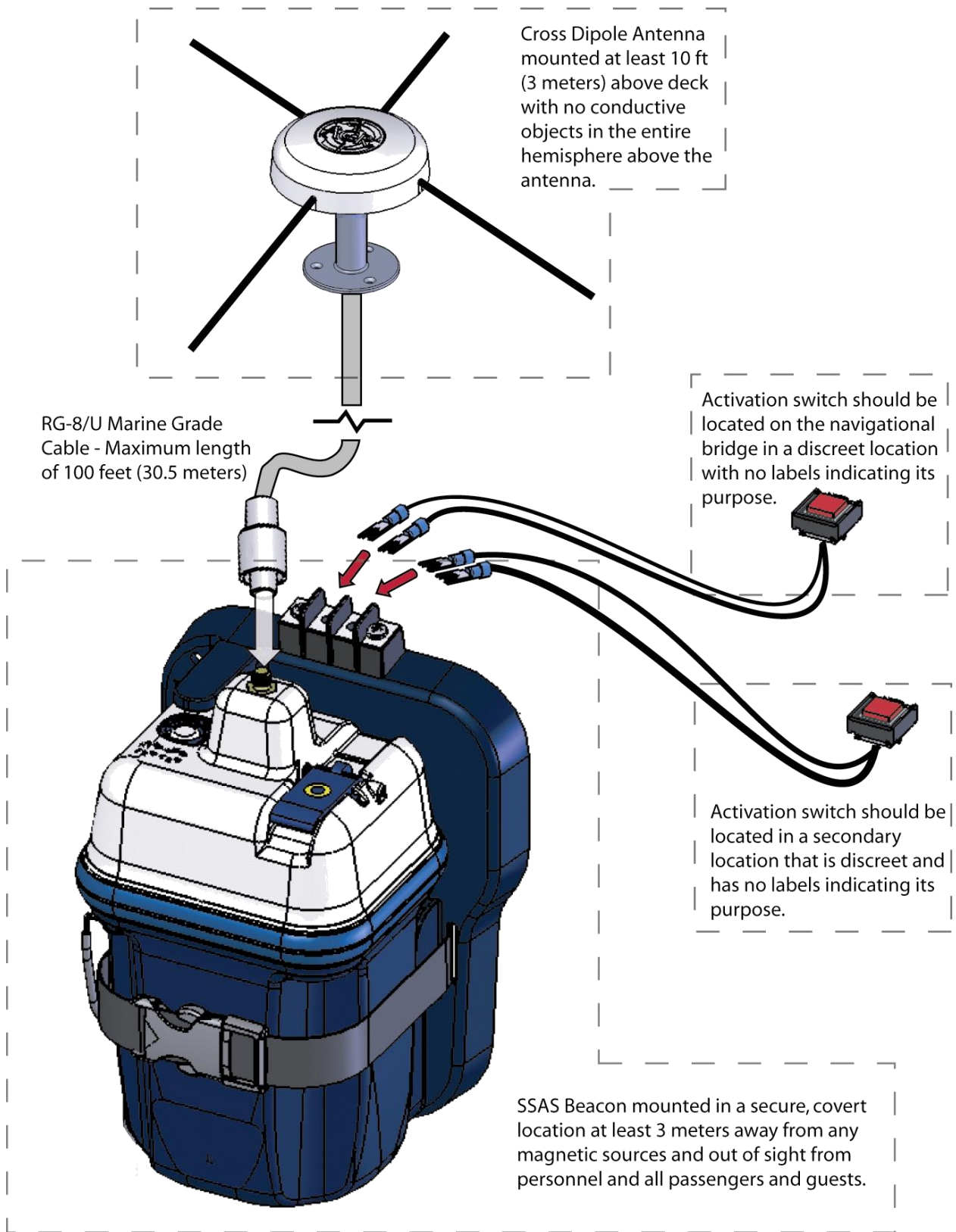
INCH (mm)

**RECOMMENDED CABLE STRIPPING DIMENSIONS
FOR TNC CONNECTOR
FIGURE 13**

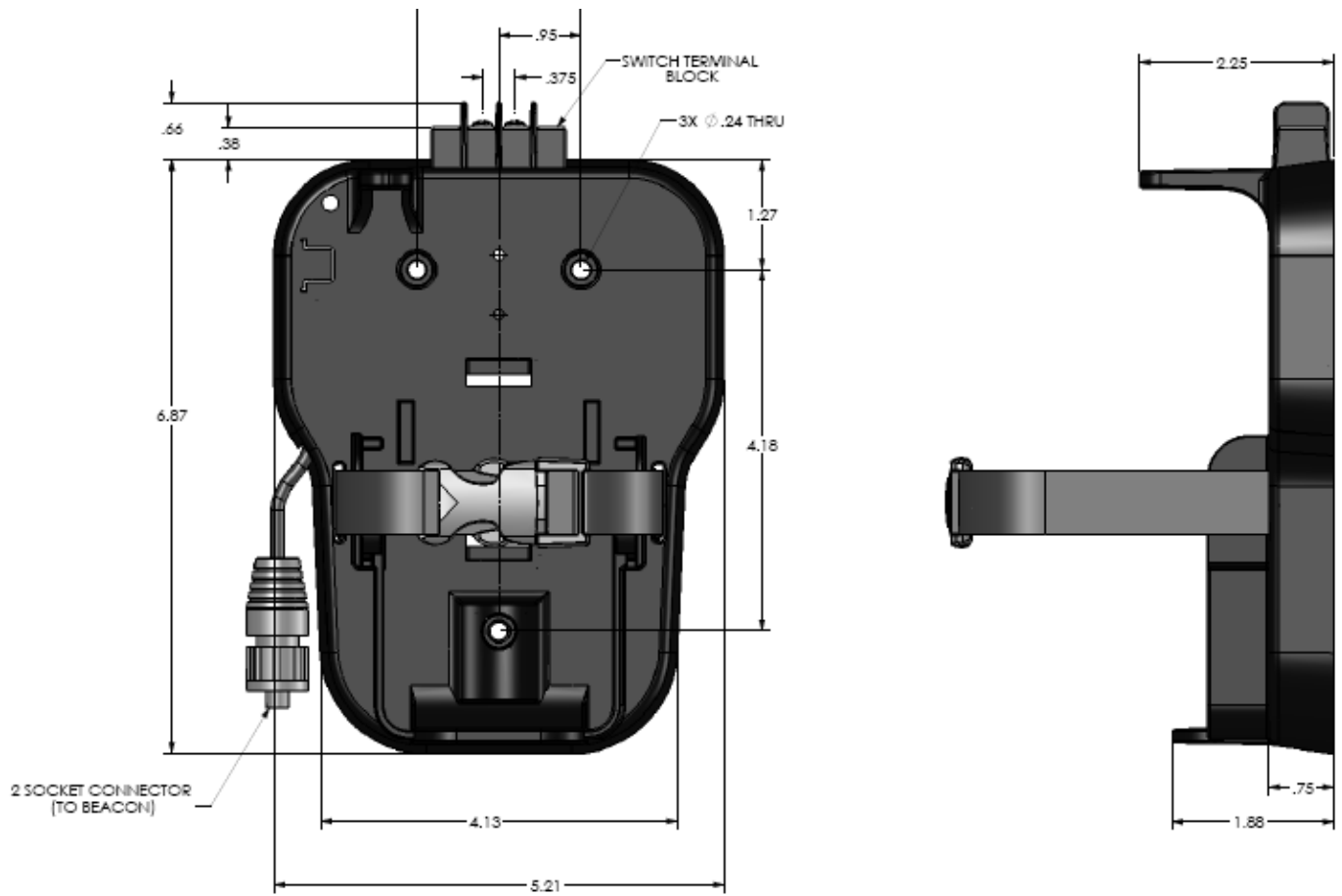


INCH (mm)

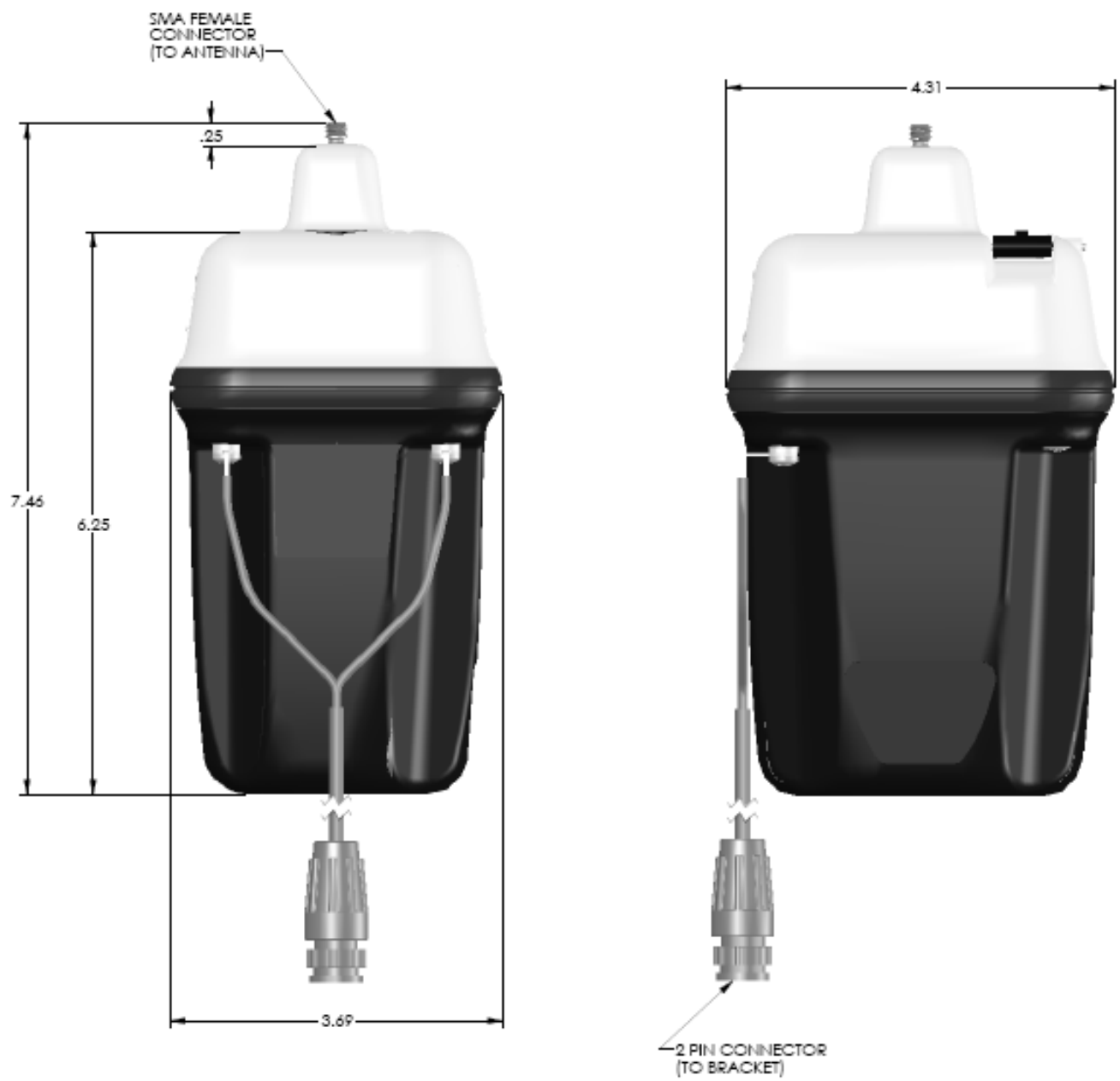
**RECOMMENDED CABLE STRIPPING DIMENSIONS
FOR SMA CONNECTOR
FIGURE 14**



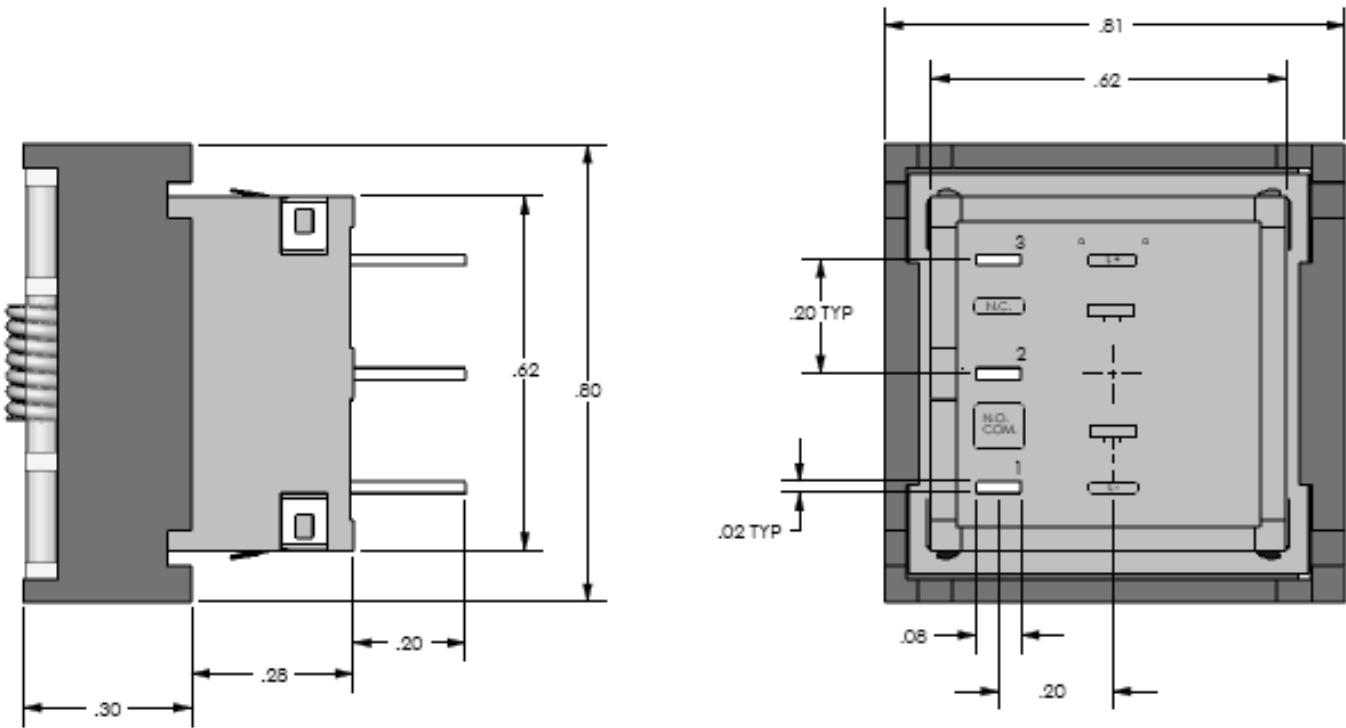
**SSAS SYSTEM
BLOCK DIAGRAM
FIGURE 15**



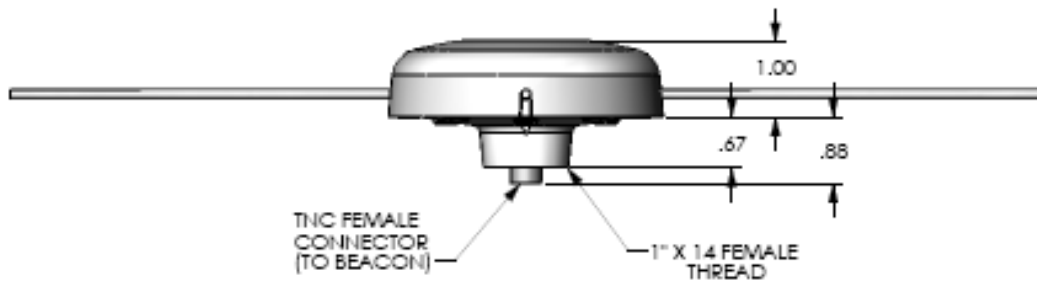
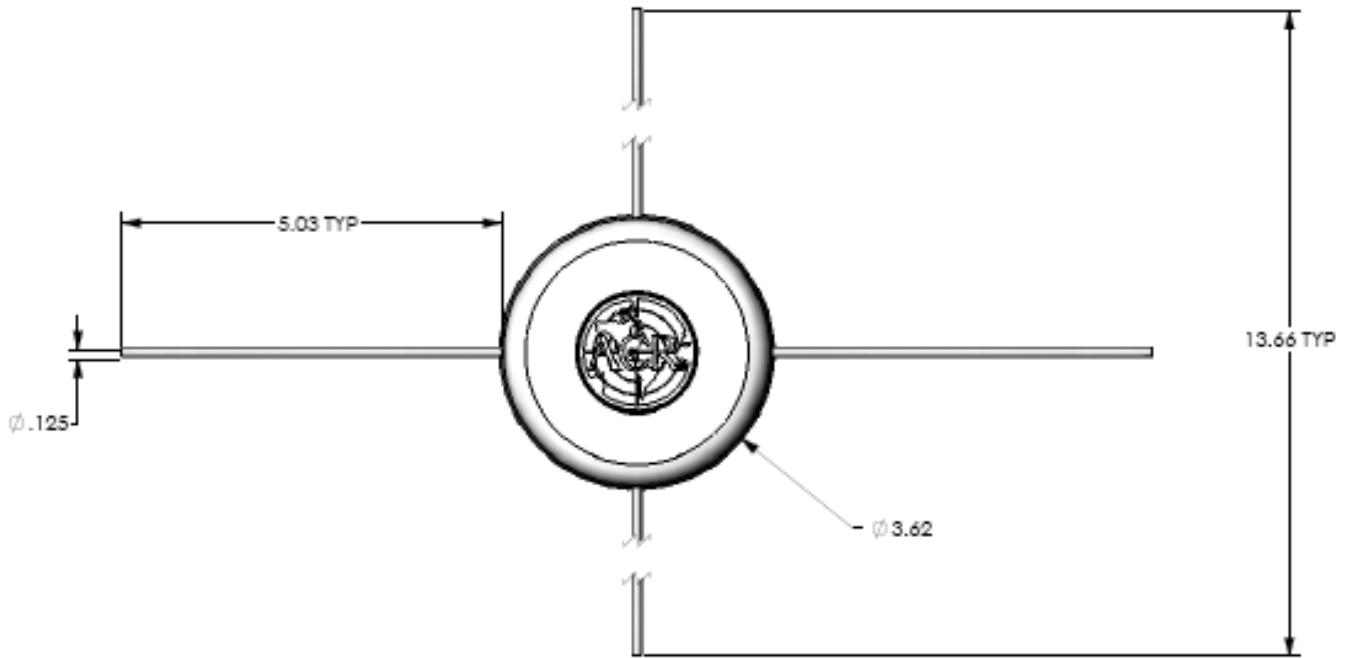
**BRACKET DRAWING
FIGURE 16**



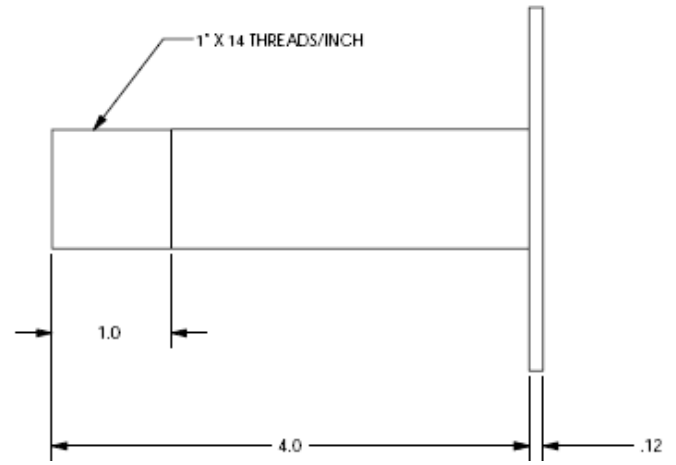
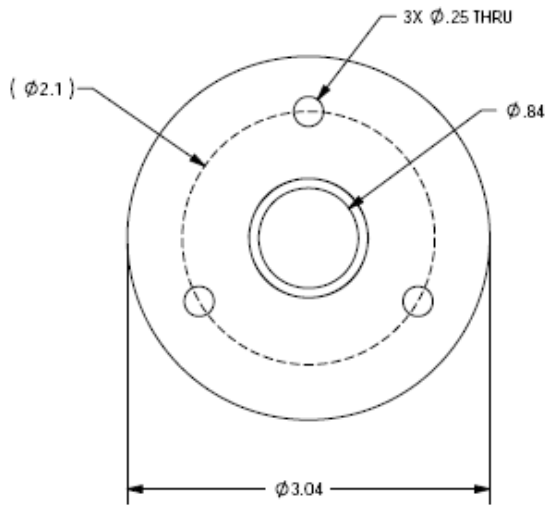
**BEACON DRAWING
FIGURE 17**



**SWITCH DRAWING
FIGURE 18**



**ANTENNA DRAWING
FIGURE 19**



**ANTENNA
MOUNT DRAWING
FIGURE 20**



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MARINE EQUIPMENT DIRECTIVE
DECLARATION OF CONFORMITY

We hereby declare that the following product is in conformity with the EU Directive 1999/5/EC Radio Equipment and Telecommunications Terminal Equipment (R&TTE) 9th March 1999.

Products : ACR Prod. No 2800 RLB-33S
ThunderBird SSAS (Ship Security Alert System)

Notified Body : QinetiQ UK
No. 0191

Type Examination : Standard's : IMO SOLAS Chapter XI-2, Reg. 6: Ship Security Alert System
IMO Res. MSC.147(77), IMO MSC Circ. 1072,
IMO Res. A.694(17), IEC EN60945.4
COSPAS-SARSAT C/S T.001- Rev 5 Oct 2003
COSPAS-SARSAT C/S T.007 – Rev 10 Oct 2003
COSPAS-SARSAT Type Approval Guidelines for 406 MHz
Ships Security Alert System (SSAS) beacon – May 2004
RTCM 110-2004/SC110-STD

Manufacturer : ACR Electronics Inc. Fort Lauderdale, Florida, USA

EU Representative : ACR Electronics Inc. (European Office)
Lymington, Hampshire, UK.

Signed on behalf of ACR Electronics Inc.

Signed: 

Name: John Flood **Title:** VP Engineering

Date: 5/5/05

INSTALLATION CHECK LIST

Please Review to ensure you have properly installed this SSAS beacon:

- Installed the beacon and bracket on a flat vertical surface in a discreet location. (Paragraph 3.2)
- Installed the activation switches. (Minimum of two.)
 - One must be on the navigation bridge.
 - Switches shall not be labeled. (Paragraph 3.3.4)
- Connected switch wire to switches and terminal block on the top of the mounting bracket. Route wire appropriately. (Paragraph 3.3.5)
- Assembled the antenna using the rods, set screws and wrench provided. (Paragraph 3.4.3)
- Installed the antenna in a location at least at least 10 ft (3 m) above deck and with clear view of the sky using either the included 4" mount or other mount with compatible 1" x 14 threads. (Paragraph 3.4.4)
- Connected antenna to beacon using SMA and TNC connectors provided and RG-8/U coaxial connector. Route cable appropriately. (Paragraph 3.4.5)
- Upon completion of the installation, perform the activation switch (Paragraph 3.3.6) and cross dipole antenna (Paragraph 3.4.6) installation verification tests.
- Upon successful completion of installation verification tests, place the beacon in READY mode.

ADDITIONAL NOTES: _____
