OPERATION AND MAINTENANCE MANUAL
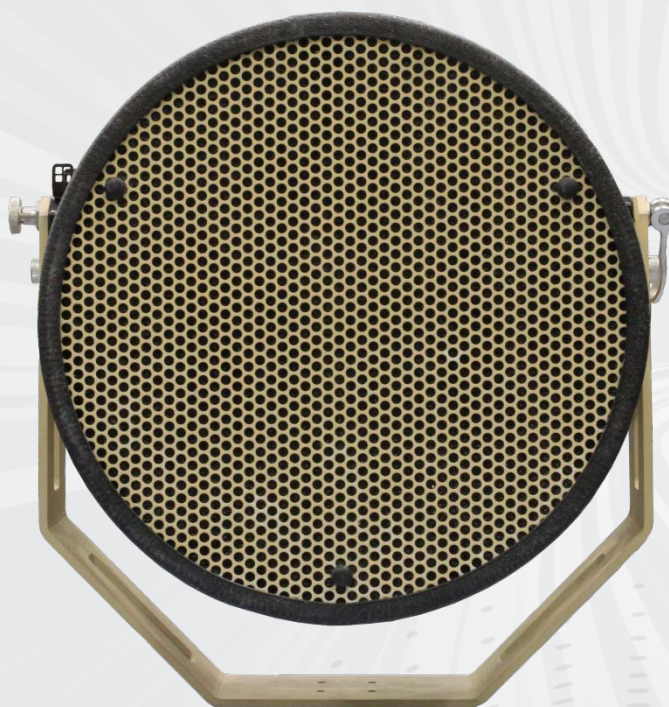
HYPERSPIKE® MODEL HS-14

Ultra ELECTRONICS | HYPERSPIKE
Sound that Moves

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LIST OF FIGURES

This manual contains information that is proprietary to Ultra Electronics USSI. It is intended solely for the education and use of parties operating and maintaining the equipment described herein.

SAFETY PRECAUTIONS

The HyperSpike® HS-14 uses high operating voltages and sound levels. The primary safety risks are: 1) electrical shock and 2) hearing damage or loss. Only properly trained personnel should operate the HS-14 and abide by the critical safety warnings identified in this manual to prevent injury or death during operation.

WARNING:

**LIFE THREATENING ELECTRIC SHOCK OR DEATH BY ELECTROCUTION
10-34 VDC IS PRESENT WHEN ENERGIZED**

Never immerse the unit or power cable in water or allowed to sit in pooled water.
Do not operate the device if the power cable is pinched, frayed, or cut.

WARNING:

**TEMPORARY OR PERMANENT HEARING DAMAGE MAY OCCUR
HIGH LEVEL OF SOUND CAN BE EMITTED**

Always wear hearing protection according to OSHA's hearing conservation program.
Operators must remain behind the HS-14 during operation.

Additional Electrical Safety Measures

Following these basic safety measures will prevent dangerous or potentially deadly situations from arising :

- Inspect the power cable for damage before each use.
- Keep the power cable away from heated surfaces.
- Never remove the power cable from power source by pulling on the cord.
- Never leave the unit plugged into a power source when unattended.
- Never override any of the HS-14's electrical safety features.
- Never connect battery connectors in a reverse polarity state.

Sound Safety Measures

Threshold of Pain

The National Institute for Occupational Safety and Health (NIOSH) recognizes 120 dB as the threshold of pain for unprotected hearing. Operators should wear hearing protection and ensure that personnel are not directly in front of the device, at close range, when the power is ON.

High/Low Feature

The unit features a HI/LOW switch as pictured in Safety Figure 1. If your unit comes equipped with key switches, refer to Safety Figure 2. To change the unit from low to high using the key switch, insert the key and rotate the key 90 degrees to the right. When the device is operated, the following output levels are present:

LOW POWER: maximum output of the HS-14 is set from the factory at 130 dB at 1 meter from the front of the HS-14. In Low power mode, the approximate distance to where the device emits 120 dB (OSHA's defined threshold of pain) is 5 meters in front of the device.

HIGH POWER: maximum output of the HS-14 is 151 dB at 1 meter from the front of the HS-14. In High power mode, the approximate distance to where the device emits 120 dB (OSHA's defined threshold of pain) is 50 meters in front of the device.

Preventing Audio Feedback

The HS-14 emits high levels of acoustic energy that can have a boomerang effect if the unit is transmitted at a solid object in close proximity (less than 25 meters). To prevent sound from reflecting back to the operator, ensure there is a clear path between the HS-14 and the intended target.

**Safety Figure 1
Hi/Low Switch**

**Safety Figure 2
Hi/Low Key Switch**

CAUTION:
Equipment damage may occur
Audio feedback may occur when using a live microphone

Always operate the microphone directly behind the HS-14

Safe Handling

Lifting the HS-14 improperly can lead to unnecessary physical strain and can result in personal injury or equipment damage. When removing the HS-14 from its carrying case or lifting it, always remember to bend at the knees to maintain the optimum center of gravity. See Safety Figure 3 for available lifting points, noting that the saddle bracket needs to be locked prior to being used as a lift point.

Safety Figure 3 HS-14 Lift Points

WARNING:
PERSONNEL INJURY MAY OCCUR
THE HS-14 MAY TIP OVER OR FALL FROM WIND GUSTS OR PLATFORM MOVEMENT

Always secure the HS-14 to the intended mounting device
Never leave the unit unattended without being secured.

1.0   INTRODUCTION

This manual provides instructions on how to setup, operate, and maintain the HS-14; an advanced Acoustic Hailing Device (AHD) that can transmit both voice and tones at distances of more than 1500 meters.

1.1.   Product Description

The HS-14 is intended for long-range hailing, warning, and notification. It projects sound energy into a focused beam that enables clear tones and voice transmissions to reach specific targets at long distances. Whether on foot, in vehicles or inside structures, the HS-14 is used to identify and determine the intent of targeted subjects and modify behavior. At 37 pounds it is transportable by two men. The HS-14 can accept audio input from numerous devices such as a microphone, MP-3/CD, Phraselator devices and laptop computers.

1.2.   Standard Equipment and Accessories

The HS-14 is delivered with the following standard equipment shown in Figure 1.2-1:

- HS-14 Emitter Head
- Saddle Bracket
- Record / Play Microphone
- HS Audio Optimizer software
- Banded & Disposable Earplugs
- Accessory Bag
- Operations Manual
- Power Cable

The following accessories are also available:

- Tripod
- Ship Rail Mount Kit
- Maritime Cover
- See the Parts List in Section 10 for a complete list of accessories and part numbers.
- Power Cable (configurable as needed)
- Portable DC Power Source
- AC Power Adapter
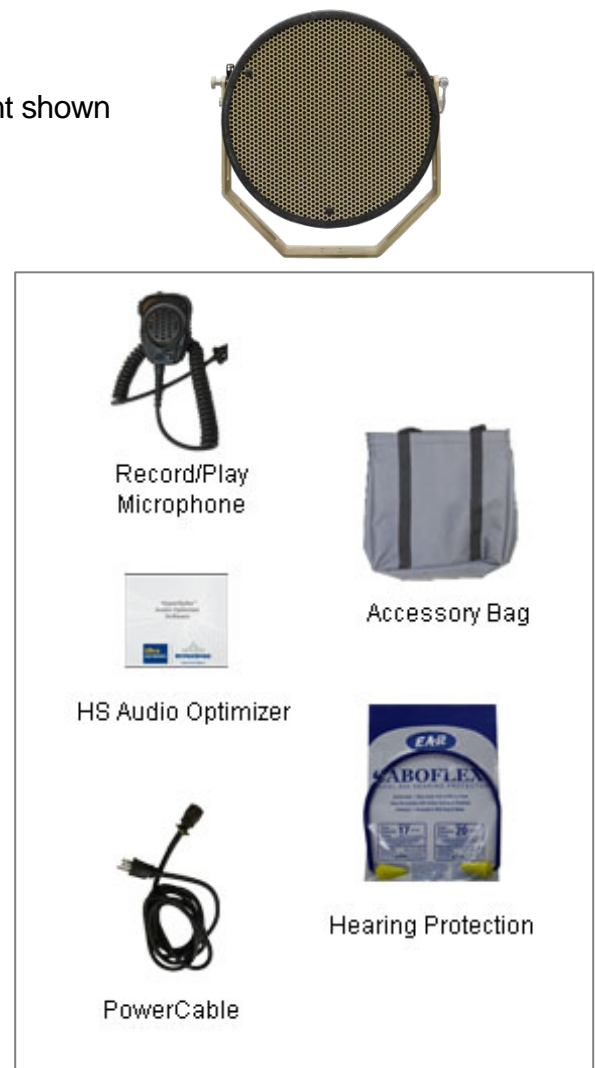
Figure 1.2-1 Standard Equipment

1.3. Physical Features

The HyperSpike® HS-14 is designed for easy assembly and maximum transportability by a single user. The unit can go from disassembled to fully operational in just moments. The physical characteristics of the HS-14 are provided in Figure 1.3-1 and Figure 1.3-2.
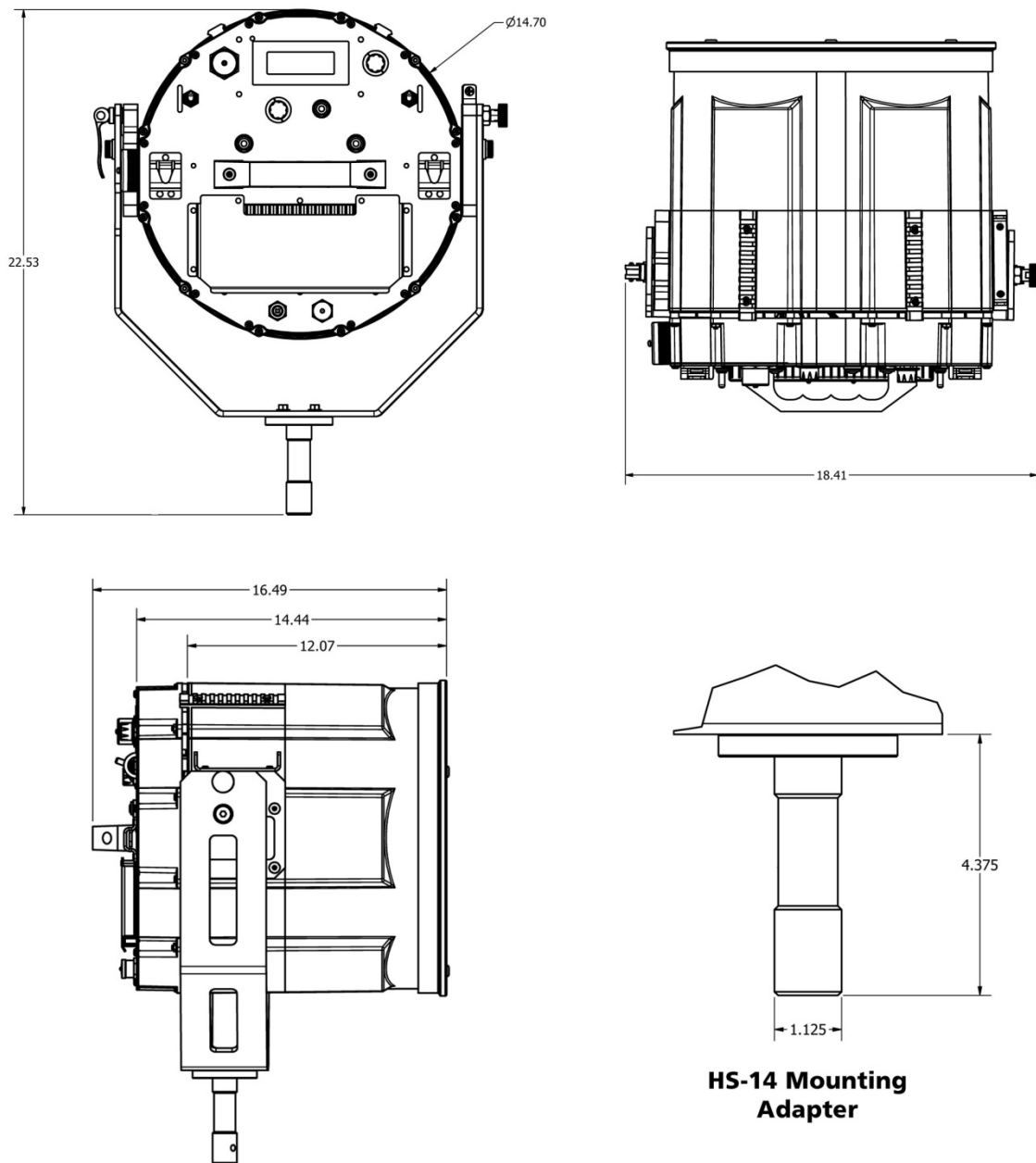
Figure 1.3-1 HS-14 Dimensions

HS-14 WEIGHT	
Emitter Head	37 lbs (16.8 Kg)
HS-14 DIMENSIONS	
Emitter Configuration	Circular
Emitter Width	14.7 in (37.3 cm)
Emitter Height	14.7 in (37.3 cm)
Emitter Depth	16.5 in (41.9 cm)
Emitter Area (subject to wind load)	169.7 in^2 (1092.7 cm^2)

Figure 1.3-2 HS-14 Physical Characteristics

1.4. Acoustic Performance

The HS-14 delivers exceptional volume and sound quality at every operating range. See HS-14 Acoustic Specifications in Figure 1.4-1 and the Communication Range in Figure 1.4-2.

HS-14 ACOUSTIC PERFORMANCE	
Beam Width	+/- 12° at 2 kHz/-3 dB
Communication Range	Over 1500 meters* (see Figure 1.4-2)
Frequency Response	300 Hz – 8 kHz
Sound Pressure Level, Peak, A-Weighted	151 dB @ 1 meter
Speech Transmission Index (STI-Intelligibility)	0.81 out of 1.00
*At Maximum Rated Output, Dependent Upon Ambient Conditions	

Figure 1.4-1 HS-14 Acoustic Specifications
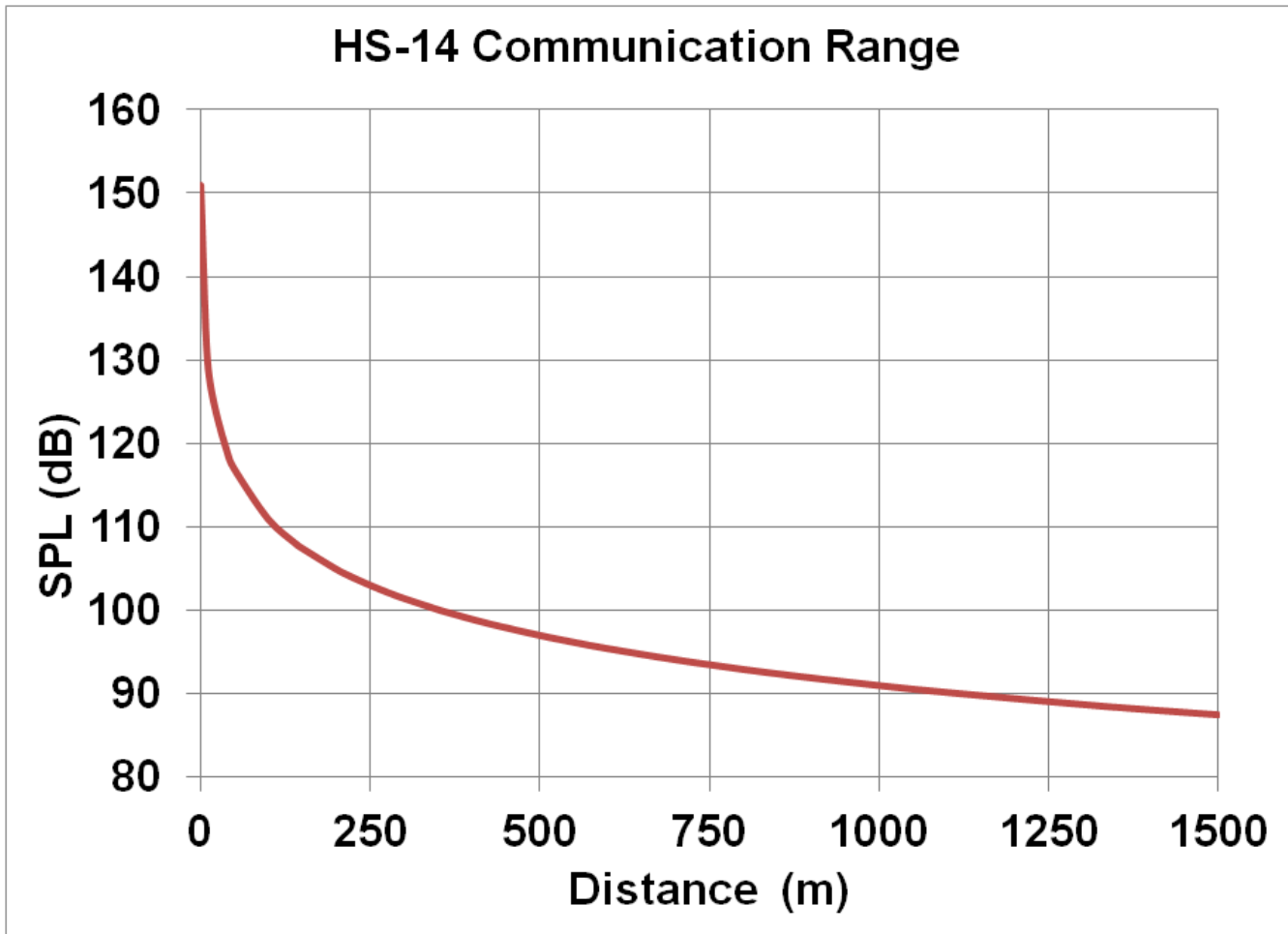
Figure 1.4-2 HS-14 Communication Range

1.5. Audio Inputs and Electrical Specifications

HS-14 INPUTS	
Dynamic Mic Level	600-1 kΩ, balanced twisted pair
Line Level Input	-4 dBV (0.65v RMS)
MP3 Player	Internal
Hi/Low Switch Limits	151 dB/130 dB
HS-14 ELECTRICAL SPECIFICATIONS	
Power Input	10-34 VDC*
Typical Current Draw, Normal Voice	10 Amps, 34 VDC
Typical Current Draw, Maximum Tone	28 Amps, 34 VDC

*Note that operating the HS-14 at the lower end of the voltage range will result in diminished output.

Figure 1.5-1 HS-14 Electrical Specifications

2.0   PREPARATION FOR USE

2.1.   HS-14 Layout Overview

Before operating the HS-14, become familiar with the HS-14 control panel and review the unit and all included accessories, ensuring no damage has occurred during shipping. If parts are missing or damaged, or become damaged at a later date, refer to the warranty information in section 12.0 to obtain replacement parts or service.
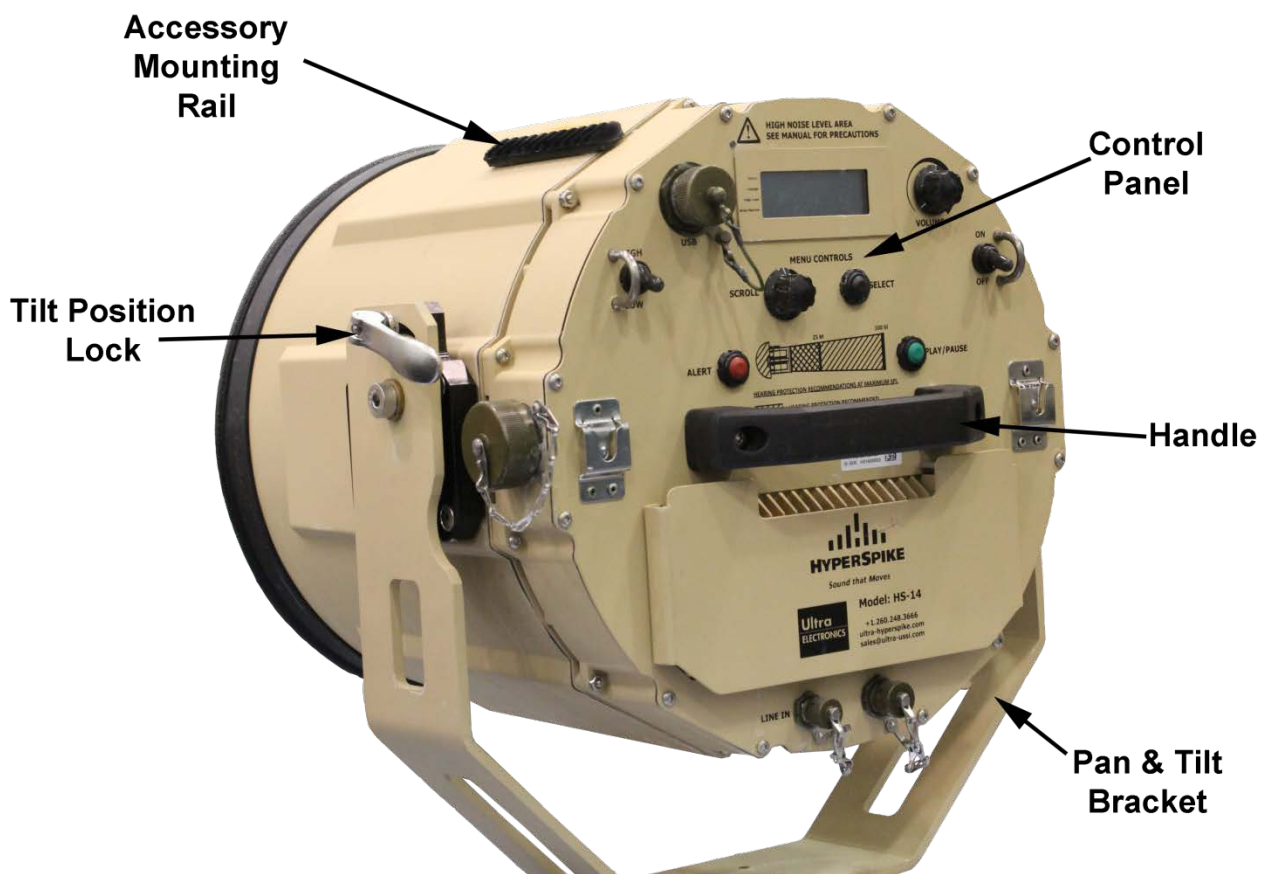
Figure 2.1-1 HS-14 Features

2.2. Installation of Mounting Adapter

The HS-14 is shipped with the Pan & Tilt bracket installed. In order to use the HS-14 with a tripod, ship rail clamp or other mount platform, the HS-14 mounting adapter, which is provided, must be installed.

1. Tools needed are: one torque wrench and a 3/8" socket.
2. Locate mounting adapter and four ¼–20 flange head cap screws.
3. Position the mounting adapter on the bottom of Pan & Tilt bracket as shown in Figure 2.2-1 ensuring that the holes line up with the holes in the Pan & Tilt bracket.
4. Insert the screws into holes from top side of the Pan & Tilt bracket.
5. Tighten screws to a torque of 180 in-lbs.
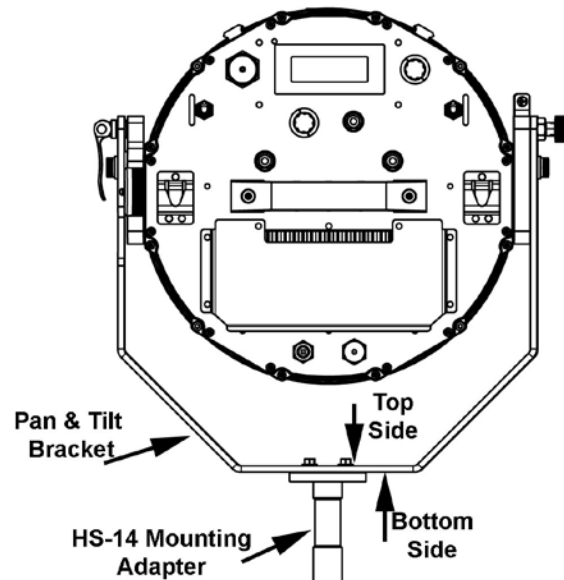
Figure 2.2-1 Mounting Adapter Installation

2.3. Accessory Mounting Installation

Two accessory mounting rails are located on the top of the HS-14 for easy mounting of accessories such as searchlights, lasers, range finders etc. Following the instructions from the accessory manufacturer, install desired accessories.

2.4. Installation with Tripod

1. Set the tripod up on a firm, level surface.
2. Ensure that the tripod cannot be knocked over by wind gusts or movement of platform for shipboard applications.
3. Lift the HS-14 onto the tripod and insert the mounting stud into tripod receiver.
4. Ensure the HS-14 and tripod is secure by tightening any locking levers.

WARNING:
PERSONNEL INJURY MAY OCCUR
THE HS-14 MAY TIP OVER OR FALL FROM WIND GUSTS OR PLATFORM MOVEMENT

Always secure the HS-14 to the intended mounting device
Never leave the unit unattended without being secured.

2.5. Installation with Ship Rail Mount

For installations on a rail:

1. Attach the Rail Mount vertically by loosening the Rail Mount flanges and placing the Rail Mount bars in a vertical position as shown in Figure 2.5-1.
2. Attach the Rail Mount horizontally by loosening the Rail Mount flanges and placing the Rail Mount bars in a horizontal position as shown in Figure 2.5-2.
3. Lift the HS-14 and insert the HS-14 mounting adapter into the Rail Mount receiver.
4. Ensure the HS-14 is secure by tightening the Rail Mount locking lever.
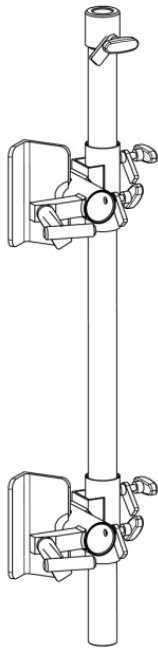
Note: The rail mount can attach to any pipe rail or vertical stanchion that is a standard 2-inch (5 cm) or smaller.
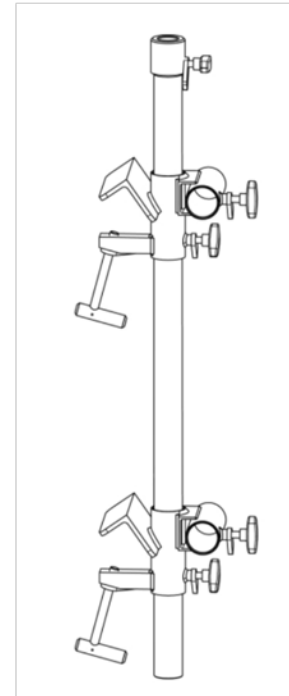
Figure 2.5-1 Vertical Rail Mount

Figure 2.5-2 Horizontal Rail Mount

2.6. Control Panel Connections

*Note: If your unit has been equipped with key switches, see section 2.7 and Figure 2.7-1 for instructions and control panel lay-out.

To prepare the unit for operation, perform the following:
1. Review the HS-14 control panel in Figure 2.6-1.

Figure 2.6-1 HS-14 Control Panel

2. Set the unit POWER switch to OFF.
3. Set the mode switch to LOW.
4. Turn the VOLUME knob all the way to the left.
5. Connect the DC power cable to a 10-34 VDC power source and the emitter head. (Never connect the batteries in a reverse polarity state.)
6. Connect the microphone cable to the Mic connector on the control panel.
7. If using an external MP3 player for pre-recorded messages, connect the MP3 player or other device to the Line-In connector on the control panel. (Note: See section 1.5 for appropriate line-in voltage levels of ancillary devices.)

    Note: Each cable has a different size canon plug connector and will only connect to its respective connector on the unit.

2.7. Control Panel Connections w/ Key Switches

To prepare the unit for operation, perform the following:
    1. Review the HS-14 control panel in Figure 2.7-1.

Figure 2.7-1 HS-14 Control Panel w/ Key Switches

    2. Insert the key into the power key switch and verify the key is turned in the "OFF" position.
    3. Insert the key into the mode key switch and verify the key is turned in the "LOW" position."
    4. Turn the VOLUME knob all the way to the left.
    5. Connect the DC power cable to a 10-34 VDC power source and the emitter head. (Never connect the batteries in a reverse polarity state.)
    6. Connect the microphone cable to the Mic connector on the control panel.
    7. If using an external MP3 player for pre-recorded messages, connect the MP3 player or other device to the Line-In connector on the control panel. (Note: See section 1.5 for appropriate line-in voltage levels of ancillary devices.)

Note: *Each cable has a different size canon plug connector and will only connect to its respective connector on the unit.*

3.0 PRINCIPLES OF OPERATION

This section describes the HS-14's technology and theory of operation.

3.1. Theory of Operation

The patented HS-14 acoustic hailing device projects focused audio energy at very high sound pressure levels with high intelligibility and clarity.

Utilizing a radial array of high-efficiency, wide band transducers, the HS-14 coherently sums all frequency bands of the transducers by mechanically guiding the energy through a hyperboloid waveguide. The result is an acoustic beam that is perfectly in-phase; eliminating the usual destructive interference of adjacent device wave propagation and thus provides extremely low harmonic distortion levels, typically below 1%. Refer to Figure 3.1-1 for a depiction of the collimated sound beam as generated by the HS-14.

The result is that audio energy can be transmitted at even greater distances, with incredible clarity, far exceeding the performance of standard speaker systems.

Collimated Sound Beam
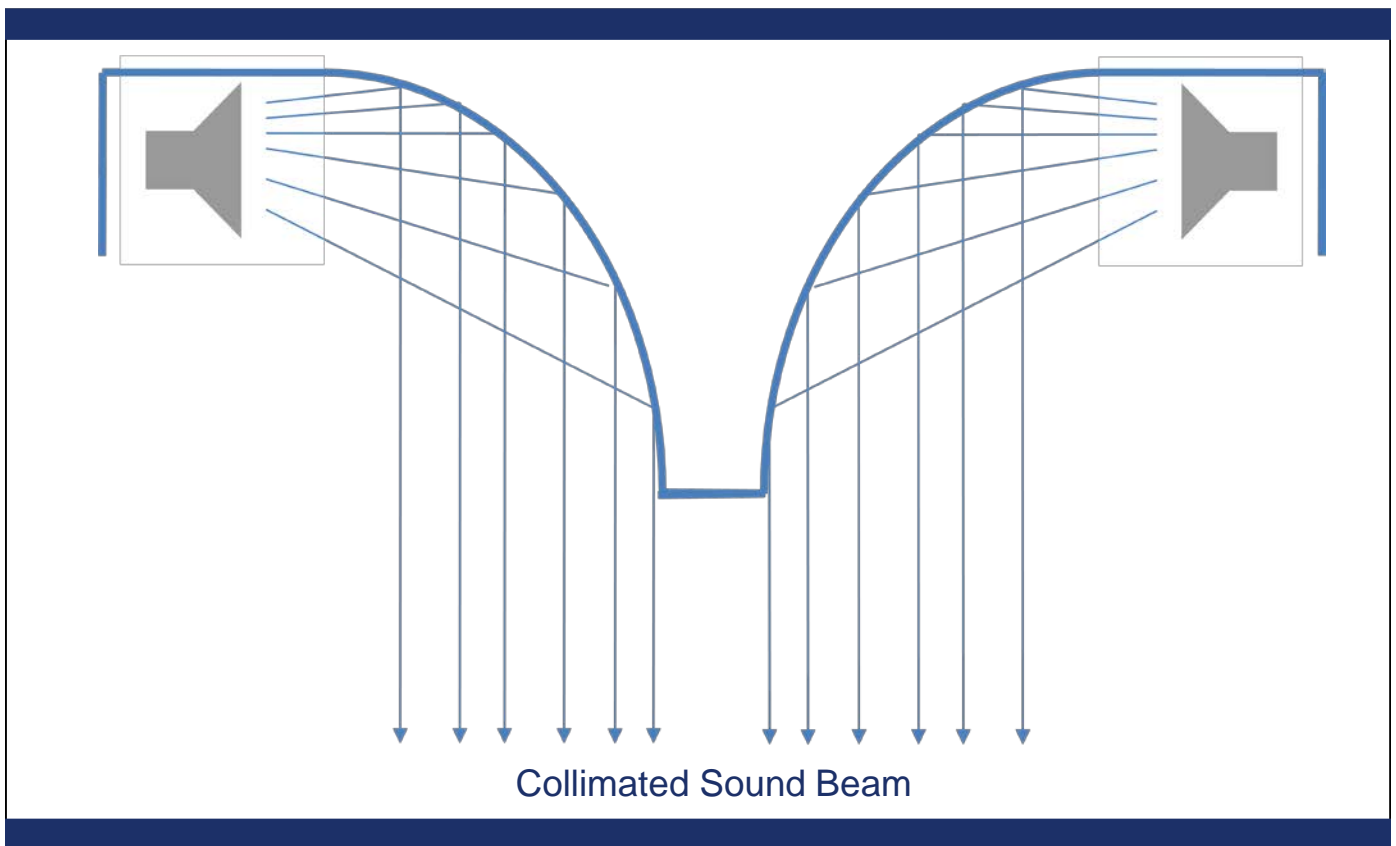
Figure 3.1-1 Coherently Summed Frequencies with Waveguide

3.2. Sound Pressure Level (SPL)

Acoustic devices produce sound pressure levels (SPL) that are measured in units called Pascals. SPL is typically referenced to 20 micro Pascals (µPa). Therefore, an SPL measurement in dB is calculated by the following formula:

SPL FORMULA: *SPL (dB) = 20 x log10 (Sound Pressure Measured / 20 µPa)*

The HS-14 is capable of producing audio tones and messages at 151 dB SPL @ 1 meter. Referencing SPL levels @ 1 meter is simply a convention that is used so that it is easy to compare equipment from various manufacturers.

While atmospheric conditions can affect the outcome, determining the SPL at other distances can be performed by using the conventional "1 meter" reference typically found on data sheets and the following equation:

SPL DISTANCE EQUATION: $SPL_{@\ Distance\ A\ meters} = SPL_{@\ 1\ meter} - 20\ x\ Log_{10}(Distance\ A)$

As a reference, common sound pressure levels for various devices can be found in Figure 3.2-1.

Source of Sound	Sound Pressure Level	SPL Effect
Jet Engine at 50 meters	140 dB	Conversation inaudible
Threshold of Hearing Damage	130 dB	
Threshold of Pain	120 dB	
Siren, Chainsaw	110 dB	
Jackhammer	100 dB	Conversation barely audible
Thunder, Diesel Truck	90 dB	
Machine Shop	80 dB	Must speak loudly
Vacuum cleaner, Hair Dryer	70 dB	
Normal Talking	40 - 60 dB	Normal conversation
Quiet Library	40 dB	

Figure 3.2-1 Examples of Sound Pressure Level

3.3. Environmental Factors

The environment can have a significant impact on SPL readings at the intended range. Refer to Figure 1.4-2 for the typical communication range of the HS-14 for ambient environmental conditions. Wind can easily add or subtract 3 to 6 dB of sound pressure, depending if the wind is a head wind or rear wind. Sound also bends with temperature gradients. Hot ground planes can bend sound upwards for example. Acoustically reflective surfaces can create multi-path conditions that can be either constructive (add SPL) or deconstructive (subtract SPL). These variables are very difficult to

predict in an ad hoc test set up, but can easily create up to 10 dB of variability in what may otherwise seem like fairly benign conditions. It is worth noting that high frequencies are more easily affected by environmental effects, however, lower frequencies, such as voice messages, are less affected.

3.4. Beam Width

Unlike many public address systems, the HyperSpike® acoustic hailing devices have a narrow beam width. Polar plots (two dimensional) provide a basic understanding of the radiation pattern of an acoustic device and are common tools used to determine the beam width of an acoustic device. A polar plot describes the response of the speaker as it rotates around its axis. The most common polar plots are the horizontal and vertical responses.

A typical polar plot for a directional HyperSpike® product is found in Figure 3.4-1. It is important to note that any acoustic source will have varying polar responses depending upon the frequency measured. For this reason, the frequency being measured accompanies beam width specifications whenever they are provided.

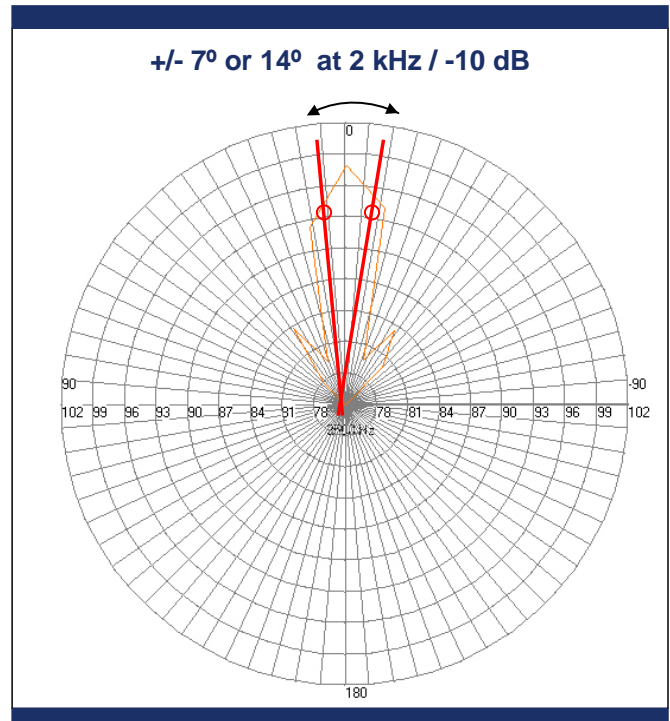**Figure 3.4-1 Typical Polar Plot**

Since the human voice is made up of many frequencies and harmonics, Figure 3.4-2 provides a more comprehensive view into how the HS-14 functions at varying frequencies. The polar plot in Figure 3.4-2 shows the radiation pattern of nine frequencies ranging from a low frequency of 500 Hz to the very high frequency of 8000 Hz.
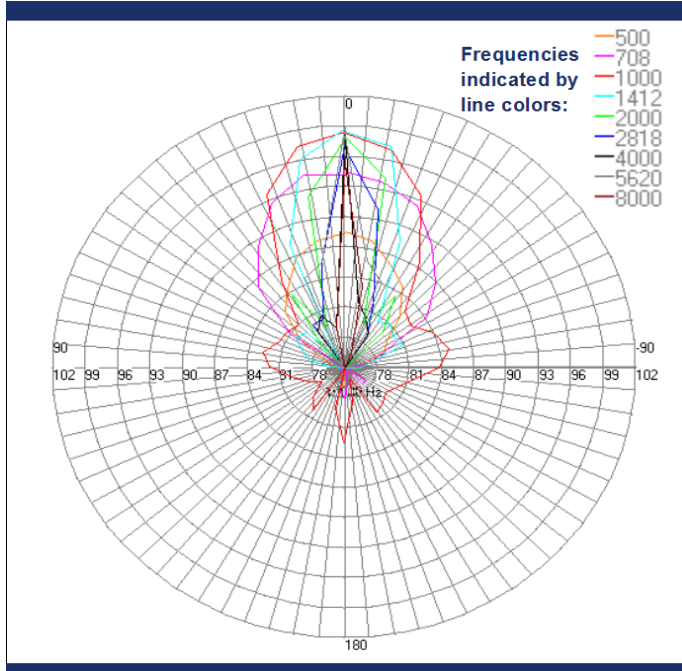
Figure 3.4-2 Multi-frequency Polar Plot

4.0   NORMAL OPERATIONS

Once the HS-14 has been installed or positioned in place, use the following procedures to operate the HS-14.

4.1.   Initial Testing

To confirm the unit is functioning properly, follow these basic steps:

1. Prepare the unit for use as described in Section 2.0.
2. Ensure the area in front of the HS-14 is clear and the operator is wearing ear protection.
3. Ensure the VOLUME control is set to the lowest volume by turning the knob counter clockwise.
4. Turn the POWER switch to ON.
5. Press and hold the ALERT TONE button.
6. Gradually turn the VOLUME control clockwise until alert tone is heard by operator.
7. If the alert tone is not heard, refer to troubleshooting in Section 5.0.

NOTE: *If the HS-14 control panel buttons and LCD display fail to respond, power down the HS-14 and remove power source for 10 seconds.*

4.2.   Operating Conditions

Select the device to broadcast (internal or external MP3 player, Alert Tone, or Microphone). Depending upon the situation or protocol, you may want to initially broadcast in Low volume mode. Point the device toward the intended target and broadcast the desired message.

If you do not gain compliance or acknowledgement from your target, increase the volume by turning the knob clockwise and/or switch to "High" output mode.

If transmitting into a cross wind, direct your target to an up wind position. Winds from the left will blow the acoustic beam to the right as illustrated in Figure 4.2-1. Winds from the right will blow the acoustic beam to the left.

Winds that generate from the rear of the unit will enhance the acoustic range whereas winds that generate from the front of unit will reduce the HS-14's acoustic range. Below are typical wind speeds and their likely effects:

- 0-3 mph: Wind hardly felt, but smoke drifts
- 3-5 mph: Wind felt lightly on the face
- 5-8 mph: Leaves are kept in constant movement
- 8-12 mph: Raises dust and loose paper
- 12-15 mph: Causes small trees to sway
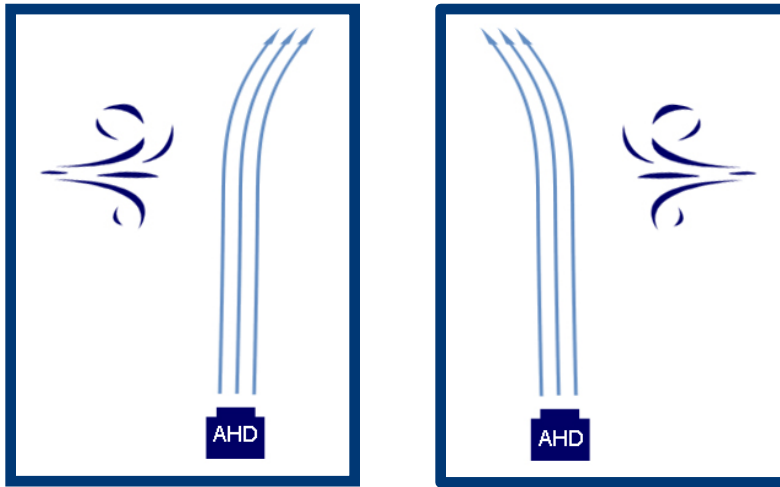
Figure 4.2-1 . Impact of Wind on HS-14 Acoustic Beam

4.3. HS-14 Operating Instructions

4.3.1. Alert Tone Feature

Used to quickly gain the attention of an intended target, the embedded alert tone can be initiated by pressing the button shown in Figure 4.3-1. The high frequency alert tone is emitted as long as the button is depressed. The alert tone can also be activated by pushing the orange button at the base of the record / play microphone as shown in Figure 4.3-2.

**Figure 4.3-1 Alert
Tone Button**

**Figure 4.3-2 RP
Microphone Alert
Tone Button**

CAUTION:
Equipment damage may occur as a result of mis-use of alert tone function.

The alert tone was designed to be used for short periods to gain attention prior to communication.
To extend the life of the product, do not use the alert tone for extended continuous durations.

4.3.2. Microphone Operation

Place the microphone element 1"- 2" from your mouth. Press and hold the transmit button to talk. For best results, speak loudly and clearly into the microphone. If using the record / play microphone, see separate owner's manual for operation guidelines.

CAUTION:
Equipment damage may occur
Audio feedback may occur when using a live microphone

Always operate the microphone directly behind the HS-14

4.3.3. External MP3 Player Operations

If your HS-14 is equipped with the optional external MP3 player; to transmit pre-recorded voice messages and tones, select desired message from menu and press the MP3 play button.
NOTE: Ensure the MP3 volume is set to maximum output. Failure to do so will result in less than maximum HS-14 volume output.

4.4. HS-14 Menu Navigation

The HS-14 comes equipped with a standard built-in file player as well as menu options to customize the operability of the unit for settings such as: screen intensity and contrast, menu time-out, max volume, beam width, and system diagnostics.

4.4.1. Loading Audio Files to the Internal File Player

To load new audio files to the internal file player:
1. Clear the USB storage device and create a folder called "AUDIO" in all caps. (**All USB sticks used for this action must support USB 2.0 Full Speed operation.**)
2. Create desired folder structure within the "AUDIO" folder. (Warning: Audio files not in a sub-folder in the "AUDIO" folder will not be recognized! While the HS-14 contains a function to scroll longer file names, it is recommended that all files names be as short as is practical.)
3. Insert into the HS-14 the USB storage device that is free from all files and folders except for the "AUDIO" folder with its associated MP3 or WAV audio files.
4. Wait for command screen to appear.
5. Select "Append" or "Replace" files. (Append – Load files to existing file structure. Replace – Replace existing files with structure represented on USB drive.)
6. Select "Allow Transfer".
7. Press "Select" Button.
8. Select "Exit Transfer".

4.4.2. Selecting Files from the Internal File Player

To play a file from the internal file player:
1. Scroll to "File Select".
2. Press the "Select" button.
3. Navigate to desired audio file (folder structure is defined by the end user).
4. Press the "Select" button. (This audio file will remain as the selected audio file until another file is selected. The name of the selected file will appear in the bottom line of the LCD display.)

4.4.3. Playing Files from the Internal File Player

To play the selected audio file from the internal file player, press and release the "Play / Stop" button. To stop an audio track that is in progress, press and release the "Play / Stop" button. (Note: When a file has been stopped and the "Play / Stop" button has been pressed again, the file will start again from the beginning of the track.)

4.4.4. Changing Display Settings

To change display settings for intensity, contrast, or display time-out:
1. Scroll to "Display Settings".
2. Press the "Select" button.
3. Scroll to desired display setting.
4. Press the "Select" button.
5. Scroll knob to desired level (if changing display time-out, adjust to a value between 5 – 99).
6. Press "Select" button.
7. When complete, exit to main menu.

4.4.5. Changing Audio Settings

The HS-14 is equipped with a High/Low switch to alter the output from max power to a lower setting for safe operation. The level of the low setting can be set from 0 – 50 (the low setting on the HS-14 will be set from the factory at 130 dB). The HS-14 can also be adjusted so the output of the device is wide or narrow. To change audio settings:
1. Scroll to "Audio Settings".
2. Press the "Select" button.
3. Scroll to the desired audio setting.
4. Press the "Select" button.
5. Choose beam width or volume setting (if setting volume, adjust to a value between 0 – 50).
6. Press the "Select" button.

4.4.6. Cloning the HS-14 Settings

The HS-14 comes equipped with the ability to clone the display and audio settings, as well as audio files, so that multiple units can be set-up with the same settings and audio files.
To clone a unit:
1. Insert a USB storage device that is free from all files. (**Note: All USB sticks used for this action must support USB 2.0 Full Speed operation.**)
2. Select "Export to USB".
3. Allow cloning status to reach 100%.
4. Remove USB storage device.

To insert a cloned file:
1. Insert a USB storage device that is free from all files except for the clone file. (**Note: All USB sticks used for this action must support USB 2.0 Full Speed operation.**)
2. Select "Import from USB".
3. Allow cloning status to reach 100%.
4. Remove USB storage device.

4.4.7. Updating Firmware

To update the firmware of the HS-14:
1. Clear the USB storage device and create a folder called "UPDATE" in all caps. (**All USB sticks used for this action must support USB 2.0 Full Speed operation.**)
2. Place the new firmware file in the "UPDATE" folder.
3. Verify HS-14 power is off and insert USB storage device prepared in steps 1 & 2.
4. Turn HS-14 power on.
5. When update menu appears, press "Select" button to choose file to use.
6. Select "Yes" to continue, or "No" to cancel load.
7. Wait for file to load.
8. Remove USB storage device.
9. Cycle power of unit, leaving it off for a minimum of 5 seconds.

5.0 CORRECTIVE MAINTENANCE & TROUBLESHOOTING

5.1. Status Indicators

Status indicators built into the HS-14 guide the operator in troubleshooting the device. Fault status of thermal protection, transducers, power supply, and amplifier assembly can be determined by looking at the status line of the LCD display. When there are no faults and the unit is ready to operate the status line will say "System Ready" and with a "R" in the upper left hand corner. When a fault arises, an "E" will appear in the upper left hand corner and the fault will appear in the top line of the LCD screen.
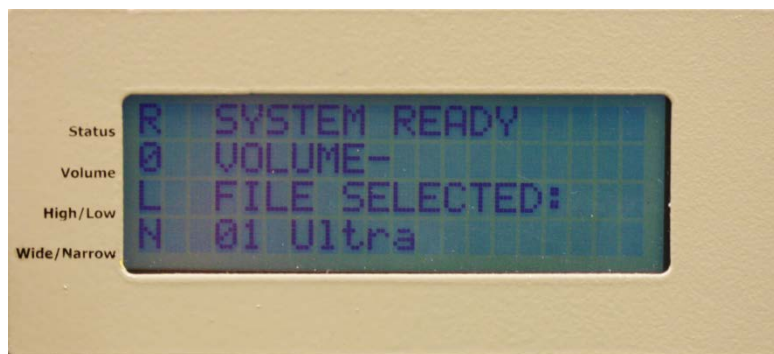
Figure 5.1-1 HS-14 Status Indicator Screen

5.2. Power Supply (Fault – Power Supply)

When the power supply fault has been triggered this means that either the power supply has a functional issue, or the batteries are low and need to be charged. Follow these steps:
1. Check batteries for charge level. If batteries are low, charge batteries.
2. Check power cord pins and HS-14 power connector for missing pins or damage.
3. Confirm power is available through the power cord.
4. Reconnect the power cable to the HS-14 connector. Turn on HS-14 to see if problem is solved.
5. If problem is not resolved, send unit back to manufacturer for repair.

5.3. Amplifier Malfunction (Fault – Amplifier)

The Amplifier has malfunctioned. The amplifier assembly is not replaceable by itself. To replace the amplifier assembly the rear section of the HS-14 will need to be replaced. Follow these steps below. Tools required are T15 Torx wrench and an 11/32" socket drive.

1. Disconnect MP3, microphone and power cables from the HS-14.
2. Remove the 8 button head screws (blue) from the connector panel on the back of HS-14 using the T15 Torx wrench, then remove the 4 lock nuts (yellow) using the 11/32" socket drive. See Figure 5.3-1.

Figure 5.3-1 Back Panel Screw Locations

3. Gently pull the rear section from the rest of the HS-14.
4. Disconnect the connector between the rear section and the body as shown in Figure 5.3-2.
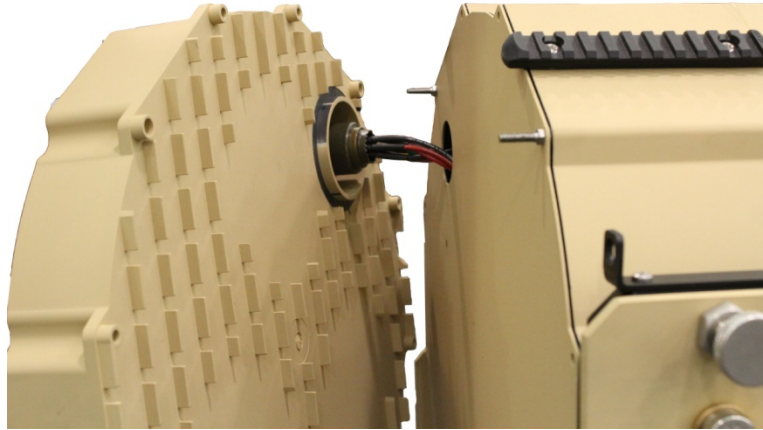
Figure 5.3-2 Rear Panel Connector

5. Completely remove the rear section from the HS-14 unit.
6. Using the replacement electronics module, reconnect the wire from the rear section to the body.
7. Carefully install the rear section onto the body by lining up the 4 studs.
8. Install the 4 lock nuts and secure with 11/32" socket drive, then insert the 8 button head screws into the connector panel and secure with a T15 Torx wrench. Torque all nuts and screws to 15 in-lbs.
9. Connect the Power cable to the Power connector located on the side of the HS-14 and connect the DC Power cord plug to a 10-34 V power source.
10. Power on the HS-14 and wait 15 seconds for the HS-14 to initialize. If the problem has been resolved, the status line in the LCD display should read "Ready".
11. If the problem has not been resolved, return to manufacturer for repair.

5.4. Transducer Malfunction (Fault – Transducer)

When the transducer fault has been triggered, this means that one of the three transducers has registered either a short or an open. To trouble-shoot this fault, follow these steps below. Tools required are T15 Torx, 11/32" socket drive, ¼" socket drive, 3/16" allen wrench.

1. Remove the rear section of the HS-14 as described in section 5.3 steps 1 thru 5.
2. Remove housing rear panel by removing the 4 threaded studs using a ¼" socket drive. See Figure 5.4-1.
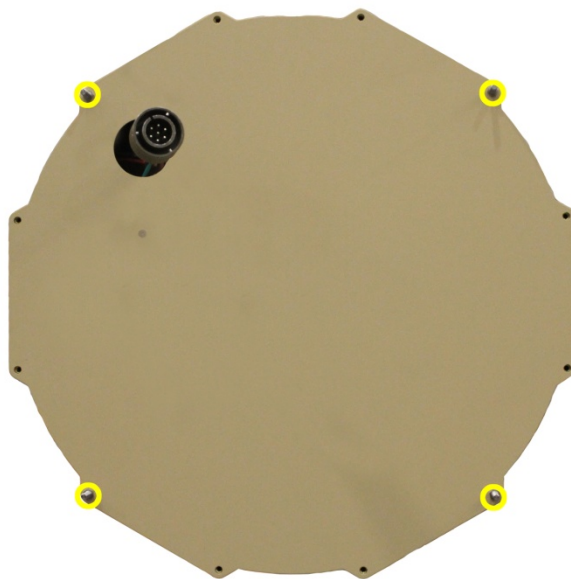
Figure 5.4-1 Housing Rear Panel Nut Locations

3. Verify that the transducers are securely wired and that the issue is not a result of a loose or missing connection rather than a faulty transducer.
4. If wiring is not the issue, unplug the faulty transducer (noting which wire is positive and which is negative) and use a 3/16" Allen wrench to remove the 4 socket head cap screws and pull the transducer from the speaker head. See Figure 5.4-2.

Figure 5.4-2 Transducer Screw Location

5. Replace with a new transducer and secure with 3/16" Allen wrench. Torque to 50 in-lbs max.
6. Replace the connectors to the terminals (noting which wire is positive and which is negative).
7. Replace the housing rear panel and secure with the four threaded studs.
8. Replace the rear section and secure with nuts and screws.

5.5. Excessive Heat (Fault – Thermal Protection Mode)

The HS-14 comes equipped with a thermal monitoring system that monitors the health status of the various components of the electron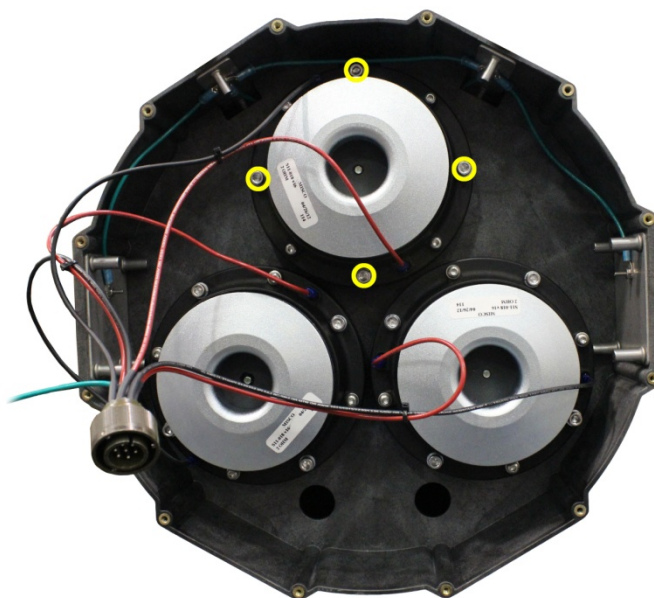ics to determine when to thermally protect the device. When the thermal protection mode is active, the unit will still operate normally at a reduced output level. This reduced output level will allow the sensitive electronic components to cool down to manageable temperature before coming back on line. When the temperature of the electronics has reached a safe level, the HS-14 will automatically return to a higher power level, giving the end user higher acoustic output.

5.6. No Audio Output

If audio messages are not being emitted, follow these steps:

1. Ensure that Power Switch is ON.
2. Ensure that 10 - 34 VDC is present at the outlet.
3. Ensure that Volume Level Control is above minimum.
4. If using an external MP3 player, ensure the MP3 volume is set at maximum.
5. Ensure that the microphone is a dynamic microphone and not a condenser microphone.
6. If there is still no output, check all input cables for nicks, cuts, crimps or tears. Check all canon plugs for bent, missing or damaged pins.
7. If device status does not change after steps 1-6, refer to section 12.0 for technical support.

If noise is being emitted instead of audio, the problem is most likely an individual device.

1. Individually unplug each device to see if the noise stops.
2. Speak into the microphone and play a message from the line level input devices separately to determine if a device is faulty.
3. The faulty device should be replaced.

5.7. Reference Pin-Outs

If there is a failure with the accessories, Figure 5.7-1, Figure 5.7-2 & Figure 5.7-3 provides pin outs for the HS-14 connectors.

<div style="border:2px solid orange; padding:10px;">

CAUTION:
Connector pins may be damaged
Improper equipment storage may cause damage

Always replace connector caps when storing the unit.
Never force covers onto connectors.

</div>

	Amphenol Pins						
	Pin A	**Pin B**	**Pin C**	**Pin D**	**Pin E**	**Pin F**	**Pin G**
Power Cable	-	-	-	-	-	-	-
Record/Play Microphone	Red	Brown	Black	White	Green	Blue	-
Std Microphone Cable	White	Shield	Yellow	Black	Blue	Red	-
MP3 Cable (Amphenol)	-	Red	Black	-	-	-	-

Figure 5.7-1 Wire Color To Amphenol Pins

MP3 Cable (TRS)	Red to Tip	Black to Sleeve

Figure 5.7-2 MP3 TRS Connector Pin Out

POWER	LINE IN	MIC
A – Channel 1 + B – Channel 2 + C – Channel 3 + D – Channel 1 – E – Channel 2 – F – Channel 3 – G – Ground	0dBv input (1.0 VRMS) A – +5V B – Audio C – Ground D – Shield Any "mix" or type of signal, such as from a sound system, must go into this input, **NOT** the mic input	A – Mic - B – Mic + C – Ground D - +5V E - Alert F - PTT

Figure 5.7-3 HS-14 Pin Outs

6.0 PREVENTATIVE MAINTENANCE & CLEANING

The HS-14 is a multi-environment device. As a result, maintenance should be performed based upon the conditions that exist where the unit is in use. The following preventive maintenance actions are the minimum methods needed to keep the unit functioning at optimal capacity.

WARNING:
LIFE THREATENING ELECTRIC SHOCK OR DEATH DUE TO ELECTROCUTION
10-34 VDC IS PRESENT WHEN SYSTEM IS ENERGIZED

Ensure power is disconnected from device before performing maintenance.

Remember to always inspect the HS-14 before powering up the unit. Also, check all cables for frays, tears, and rips. If a cable is damaged, do not use it. If the unit or cables require service beyond the methods described in this section, refer to the warranty information in Section 12.0.

6.1. Ground Operations and Sandy Environments

1. Point the HS-14 with the front facing the ground.
2. Gently tap and shake the unit to remove sand that may have entered during normal operation. For severely clogged units, a vacuum can be used. Place the hose directly against the unit's emitter head.
3. Wipe down all painted surfaces and canon plugs/connectors with a lint-free cloth soaked in clean water.

Perform these measures once a week or as needed to ensure a long operational life.
When the unit is not in use, cover or store it in a protective box or the transit case in a dry, secure area.

CAUTION:
HS-14 can be damaged by pressurized air or pressurized water.

Never use pressurized air or pressurized water to clean the HS-14.

6.2. Salt Water Environments

Underway/Operational: Wipe down all painted surfaces and canon plugs/connectors with a lint-free cloth soaked in clean water. Perform this task daily and after inclement weather.

In Port: Remove and wipe down the HS-14 and all accessories with a lint-free cloth soaked in clean water. Ensure all connector covers are in place. Cover the HS-14 with a Maritime cover or store it in a dry place. Also, dry and stow accessories.

Note: These recommended preventive maintenance actions should be added to the shipboard equipment preventive maintenance schedule.

7.0   SOFTWARE

The HS-14 is shipped with the HS Audio Optimizer software to create custom messages. Please refer to the HS Audio Optimizer Software manual for detailed operating instructions.

8.0   PREPARATION FOR SHIPMENT

> **WARNING:**
>
> **Due to lithium content the HS-14 battery pack must be shipped as a Class 9 Hazardous Material. This product cannot be shipped via passenger aircraft.**

When shipping the HS-14:
1   Pack the unit with three inches of protective material on all sides to prevent damage during transit.
2   If shipping the unit in the custom Transit Case, be sure to secure all locks/fasteners on the case to prevent the case from opening during transit. Also, be sure to remove any installed casters from the transit case before shipping.
3   Finally, ensure the package is properly labeled to expedite the repair and return process if shipping the unit back to the manufacturer.

9.0   STORAGE

To protect the HS-14 from damage, the unit should be stored in environments ranging in temperature from -40° to + 80°.

10.0 PARTS LIST

10.1. HS-14 Parts List

Figure 10.1-1 provides a list of HS-14 service kits and accessories that can be ordered or replaced.

Description	Part Number(s)
RP Microphone	90099A-801
Maritime Cover	92032A-1
Dust Cover	92038A-1
MP3 Cable	42020A-801
HS-File Player	90146A-801
Operations Manual	90110A-MAN-HS14
Battery Pack	54046A-801
Power Cable (Pack)	42095A-802
Power Cable (Lug)	42115A-801
Battery Pack Charger	CH0002
Electronics Module	90110A-SK02
Ship Rail Mount (stainless steel)	92011A-6
Transit Case	90110A-PKG-802
Tripod - Heavy Duty (with transit bag)	92010A-801
Transducer	90110A-SK03
AC Power Adapter	90147A-801

Figure 10.1-1 HS-14 Accessories and Service Kit Part Numbers

11.0 ILLUSTRATIONS AND DIAGRAMS

11.1. HS-14 Overview

Figure 11.1-1 through Figure 11.1-5 illustrate the HS-14 component parts significant to operation and maintenance.
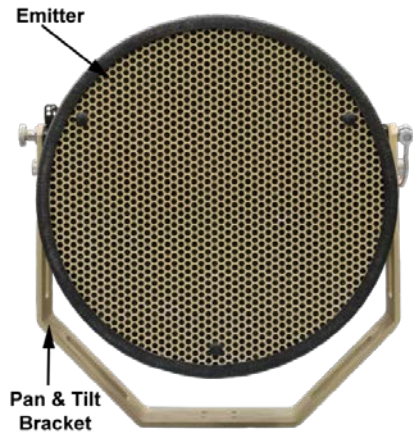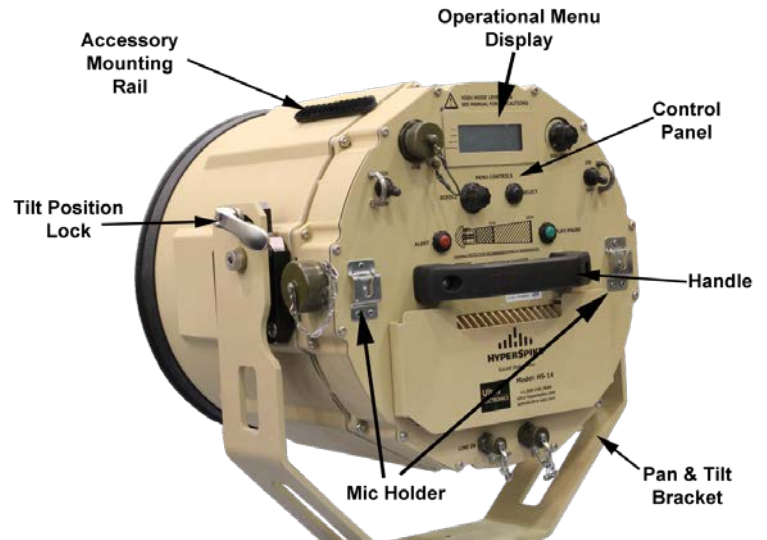

Figure 11.1-1 HS-14 Front View
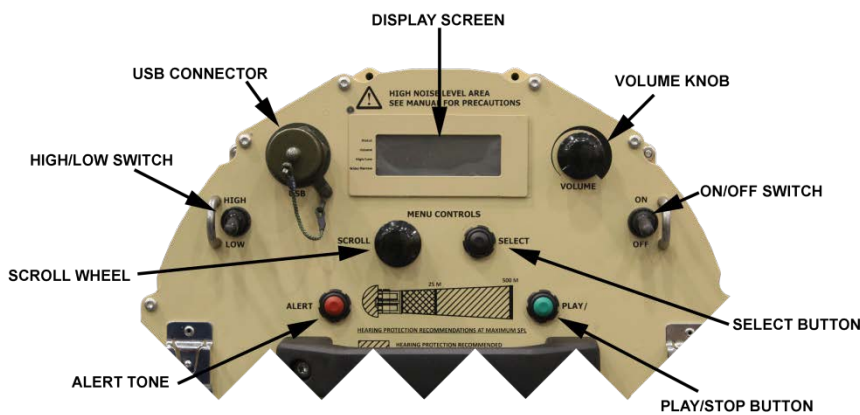

Figure 11.1-2 HS-14 Back View

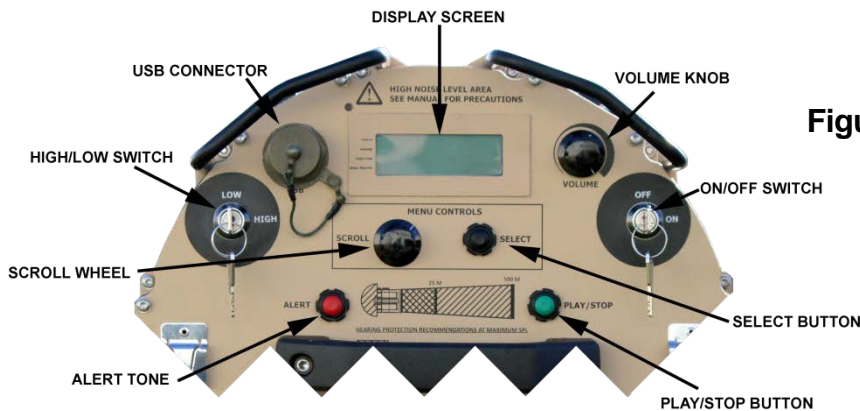**Figure 11.1-3 HS-14 Control Panel w/ Standard Switches**

Figure 11.1-5 HS-14 Control Panel w/ Key Switches

Figure 11.1-4 HS-14 Line & Mic Inputs

12.0 WARRANTY

Ultra Electronics USSI warrants its products to be free from defects in material and workmanship for a period of one (1) year from the date of shipment. This warranty is extended to the original purchaser and all subsequent owners, provided a copy of the original dated bill of sale is presented when service is requested under warranty.

If your product should require service, write, phone, fax or e-mail Ultra Electronics USSI at:

Ultra Electronics USSI
4868 E Park 30 Drive
Columbia City, IN 46725
Phone: 260-248-3666
Fax: 260-248-3510
E-mail: apservicedepartment@ultra-ussi.com
URL: www.ultra-HyperSpike.com

We will either direct you to a local service agency or provide you with a Return Material Authorization (RMA) number so that you can ship the product to our factory. Do not ship the product to us without first obtaining an RMA number. Place the RMA number on all boxes returned to the factory to prevent equipment from being lost or mishandled. Merchandise returned to us for service under warranty must be accompanied by a copy of the original bill of sale, and shipped prepaid. You are responsible for transporting your product to our factory. We will pay the return shipping charges on all products repaired under warranty.

12.1. Failures Not Covered by This Warranty

This warranty covers manufacturing defects. The warranty **DOES NOT** cover:

1. Damage caused by accident, misuse, abuse, product modification or neglect.
2. Damage incurred during shipment (you must claim these damages from the carrier).
3. Damage resulting from failure to operate the product in accordance with the instruction manual.
4. Damage resulting from attempted repairs by unauthorized personnel.
5. Claims based on any perceived agreement not explicitly stated in this warranty such as conversations with service personnel or sales representatives.

12.2. Limitation of Implied Warranties

All implied warranties, including warranties of merchantability, are limited in duration to a period of one (1) year from the date of shipment from Ultra Electronics USSI.

12.3. Exclusion of Certain Damages

Ultra's liability is limited to the repair or replacement, at our option, of any defective product, and shall in no event include incidental or consequential commercial damages of any kind. Some states do not allow the exclusion or limitation of incidental or consequential damages, so the preceding limitation or exclusion may not apply to you.

For further information regarding this warranty, parts, or service, please contact Ultra Electronics USSI through one of the methods listed at the beginning of this warranty section.

13.0 Appendix A: CH0002 Battery Charger

The provided UltraLife battery charger is intended to be used with compatible UltraLife batteries only!

Ultralife Corporation
2000 Technology Parkway
Newark, NY 14513
USA

www.ultralifecorporation.com

CH0002 Battery Charger
Operation Manual

Use only with UBI-2590 (UBBL02, UBBL10, UBBL13) Lithium-ion batteries

1. **Before You Begin**
   1.1. The charger consists of three parts: a line cord, a power supply (PS2524), and a charge control module that has a charge cable attached. Make certain the line cord is the proper type for your application (i.e. the plug is correct for your wall outlet).
   1.2. The charger is designed for use between 0C and 45C (32F and 113F). Failure to operate charger in this range will result in reduced battery capacity and/or ability of safety devices to activate.

2. **Function**
   2.1. The charger is designed to charge each section of any UBI-2590 battery independently. This assures that the two sections of the battery are both fully charged and assists in maintaining proper charge balance within the battery.

3. **Connection Instructions**
   3.1. Connect the line cord to the power supply.
   3.2. Connect the power supply to the charge control module.
   3.3. The charge control module has a built-in mating connector that will connect to any of the UBI-2590 batteries. Carefully orient the connector so that Pin 1 matches Pin 1 on the battery connector. Press the connector firmly into the battery.

      Note: Although the connector is keyed, failure to orient it properly can cause damage to battery and/or charger.

   3.4. The charger will automatically detect the presence of a connected battery and initate the charging sequence. This is identified by the blinking green lights on the charger.

4. Charging
4.1. The charger will charge both battery sections until each section is fully charged. The green lights will blink during charging.

4.2. Once charging is completed, the green lights will stop flashing and remain solid.

4.3. Each battery section may complete charging at different times, which is due to small differences in capacity between the battery sections. Wait for both green lights to remain solid before removing the battery from the charger.

5. Maintenance Charging
5.1. If left connected to the battery, the charger will initiate a low rate charge every 24 hours to maintain a fully charged battery.

6. Error Conditions
6.1. If an error condition is detected the red light will blink.

7. Status Light Indications
7.1. Off – No battery detected

7.2. Green blinking – Charging

7.3. Green steady on – Charging complete

7.4. Red blinking error – Shorted terminals or invalid battery chemistry

8. Charger Specifications
8.1. See UBI5134

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