HOLOPHONE®

H4 SUPERMINI

H4 SuperMINI
Surround Sound Microphone
User Guide

NOW I'M LISTENING

Contact us:

HOLOPHONE
Rising Sun Productions Limited
258 Adelaide Street East, Suite 200
Toronto, Ontario, Canada M5A 1N1

Telephone: (416) 362-7790 Fax: (416) 504-6500
Website: http://www.holophone.com
Email: info@holophone.com

Warranty contact:
(416) 362-7790
info@holophone.com

NOTE:
The term Holophone
as used in this manual
is a registered trade mark of
Rising Sun Productions Limited.

Terms and Conditions

1. Rising Sun Productions Limited “Rising Sun” warrants its products to be free of defects in material and workmanship for a period of one (1) year from the original date of receipt or retail purchase.
2. During the warranty period, Rising Sun shall, at its sole discretion, either repair or replace free of charge any product that proves to be defective.
3. This warranty does not cover claims for damage arising out of abuse, neglect, alteration or attempted repair by any unauthorized personnel, and is limited to failures arising during the course of normal use for the product.
4. Rising Sun does not authorize any person to create for it any other condition or liability in connection with this product. Any implied warranty or condition (including any implied warranty of merchantability or fitness for a particular purpose) is limited to the duration of this warranty. The performance of repairs and needed adjustments is the exclusive remedy under this written warranty or any implied warranty.
5. In the event that your jurisdiction provides rights to you through legislation or law, which are inconsistent with the rights set out in this warranty, this warranty does not exclude or limit those rights, but shall run concurrently with any applicable legislation law.
6. **Rising Sun shall in no event be liable for incidentals, economic, consequential or other losses or damages resulting from the breach of any express or implied warranty, law or statute, including, but not limited to, damage to property, damage based on inconvenience or on the loss of use of the product, and to the extent permitted by law, damages arising out of personal injury or death. In no event shall Rising Sun be held responsible for an amount exceeding the dollar value of the product(s) purchased.**
7. Some jurisdictions do not allow for the exclusions or limitation of some or all damages, so the above limitation or exclusion may not apply to you.
8. It is agreed that any dispute or claim arising out of the purchase, sale or use of the product(s) is to be decided within the exclusive jurisdiction of the courts of the Province of Ontario, Canada.

Warnings

Failure to heed these warnings could result in an electrical shock hazard, reduced service life or damage to your equipment.

- The Holophone SuperMINI is intended for professional use only.
- All safety and operating instructions should be read before the unit is operated and retained for future reference.
- Refer internal servicing to qualified personnel.

Table of Contents

Introducing the Holophone H4 SuperMINI

Congratulations. You are the proud owner of a truly ingenious piece of audio engineering. The Holophone H4 SuperMINI Surround Sound microphone system is a lightweight, portable, super-compact package that captures professional-quality 5.1 surround-sound audio for Electronic News Gathering (ENG), professional video and film production, or music recording. The H4 SuperMINI provides the ideal solution for all live event television broadcasters, live music producers and engineers, and film and video location crews who need real-time surround audio to satisfy the ever-expanding Home Theater audience.

The H4 SuperMINI System

The H4 SuperMINI system includes two major components:

- *H4 SuperMINI Head* with six microphone elements: five external elements and an internal Low Frequency Effects element (5.1);
- *Control Unit,* which carries out extensive processing and control functions during sound capture.

The H4 SuperMINI Head is mounted securely on the Control Unit, which can be mounted in turn on any professional-level video camera. It can also be mounted on a tripod, a boom, or simply held in the hand. Together, the Head and the Control Unit weigh less than 1 lb. (450 grams).

The sound captured by the six independent microphone elements can be output in two ways:

- Dolby ProLogic II, a matrix surround-encoded stereo analog output, or
- six line-level analog outputs (L, R, C, LFE, LS, RS) available through three stereo mini-plug jacks.

The H4 SuperMINI has additional capabilities that include an input for an external, center-channel placed shotgun or lavalier microphone to enhance sonic opportunity options and features a zoom button that increases the forward bias of the pick-up pattern. It also includes Virtual Surround Monitoring on headphones for real-time on-camera 3-D audio monitoring of the surround field.

The Holophone Breakthrough

The H-4 SuperMINI is based on the patented Holophone Surround technology that has revolutionized the capture of surround sound. Instead of using separate microphones to capture the multiple inputs required for surround sound, the Holophone system mounts the required microphone elements on a single "Head" – a spheroid that approximates the physical shape of the human head.

The placement of these elements captures the variations that the human mind uses to locate the source of sounds. The result is an extremely accurate reproduction of the ambiance of the venue being recorded, combined with great ease of use.

Until now, the breakthrough Holophone approach has been available in two implementations:

Holophone H2-PRO

- *Holophone H2-PRO*
  The senior member of the Holophone family, the H2-PRO has 7 microphone elements mounted on the surface of the Head and one in the interior to capture low frequency effects (LFE). It supports all consumer audio formats, including IMAX, Dolby Digital EX, DTS ES, Circle Surround II (CS II), Dolby Digital, Dolby ProLogic II, DTS, Circle Surround, AAC, WMA, SDDS and Dolby Stereo.

Holophone H3-D

- *Holophone H3-D*
  The H3-D, with 5 microphone elements mounted on its surface and one LFE mic in the interior, provides an economical solution for those standards that do not require the additional mic elements. These include Dolby Digital, Dolby ProLogic II, DTS, Circle Surround, AAC, WMA and Dolby Stereo.

The Holophone H4 SuperMINI

Holophone H4 SuperMINI is a further advance in the Holophone technology, designed principally for use by videographers requiring an integrated video and sound package. The unit is small enough to be mounted on top of a video camera.

H4 SuperMINI mounted on camera

Control Unit Functions

The H4 SuperMINI Head is only part of the story. Typically, in videography, the sound is captured in stereo, to be stored either in the camera or in a separate stereo recording unit. The H4 SuperMINI system converts the six surround channels to Dolby ProLogic II, encoding the 5.1 channels within two stereo channels. The result can be played (and edited) in stereo or decoded back into the original 5.1 channels.

The encoding is carried out within the Control Unit. The Head is mounted on the Control Unit and the two together can be mounted on the video camera using either a hot-shoe or cold-shoe mount. (SuperMINI can't be powered from hotshoe mount)

Despite its small size, the H4 SuperMINI is a highly versatile piece of equipment.

Here is what it can do:

- Encodes the input from the six microphone inputs in Dolby ProLogic II format, exporting the result as two channels of stereo audio.
- Provides simultaneous six-channel output, converting the six channels of audio from mic level to line level, making them available via three stereo outputs (six channels).
- Provides the ability to replace the center channel microphone with an external microphone (e.g., lavalier or shotgun), with an independent gain control. Supplies phantom power for the external microphone, if required. On playback, audio from (external) center mic is played out of center (dialogue) speaker.
- Provides virtual surround headphone output for monitoring, with a separate gain control.
- -12 db PAD switch
- Zoom button, to change the center bias of the inputs to match video close-ups.
- Two colored LED monitor for six input channels.
- Runs on 4 x AA batteries with over 6 hours of battery life. Alternatively, provides input for 5 V DC input converted from AC power.

H4 SuperMINI and Control Unit mounted on camera with external microphone

The Holophone System

The Holophone is a specially designed microphone system for capturing sound in three dimensions, while keeping signals discrete for surround sound playback.

Designed specifically to create sound tracks for surround sound playback systems, the Holophone's superb realism and ease of use make it the preferred choice for a wide range of other applications.

The 1990s witnessed an explosion of surround sound playback technology in the form of motion picture systems, HDTV and DVDs. The recording of natural and instantaneous surround sound was left behind, until the Holophone.

Three-dimensional sound is based on the brain's amazing ability to decode subtle differences in timing and volume of sounds coming from different directions as the waves bend around our head.

Surround sound has traditionally been created by mixing sounds recorded from multiple sources. The sound engineer controls the mix to simulate what a person sitting in a particular space would hear. The mixing approach is costly and time consuming, and the results are inconsistent.

The Holophone solution is to place multiple discrete microphones on the surface of a specially-designed *Head*. These microphones capture the sounds that come from various directions. An internal microphone captures low frequency sounds.

The Holophone's Head is actually an ellipsoid. It looks more like a pointy football than a real human head. Acoustically, however, it performs remarkably like the real thing.

Holophone SuperMINI

Without the Head, each microphone would have an omnidirectional response field. The Holophone Head provides a spherical boundary layer of varying proportions between each microphone, which effectively divides the incoming sound into sectors so that each microphone picks up sound primarily from one direction. The shape of the Head also ensures that one microphone's response does not bleed directly into another, but will bleed enough to ensure a smooth transition from channel to channel. These channels relate directly to the channels in a standard surround-equipped audio playback system. Small differences in the time it takes for a sound to be picked up by the various microphones are interpreted by the brain to determine where the sound is located.

Home theatre setup showing binary localization

Our real head performs in a similar way, shielding each ear from sound waves that are picked up by the other. Small differences in timing are interpreted as position. This phenomenon is known as *binary localization*. The output from all the speakers arrives at our ears with the same small differences in timing, and we hear as we would if our own head was in the same position as the Holophone when it recorded the sounds.

This simple principle governs the recording process, and determines where to position the Holophone. Recording is very subjective. Different positions produce different effects for different purposes. The best guide is simply to ask yourself "where does it sound best?" and put the Holophone there.

The primary advantage of the Holophone system over all other existing approaches is that no signal manipulation is required. The output of the Holophone itself can be used directly, and in most situations this will produce the best results.

The initial design was completed and a patent application filed for the new system in 1994. When it became apparent in late1996 that the patent would issue, the first prototype was built. The Canadian government's National Research Council became interested in the technology and joined in a collaborative research agreement to fine-tune the system and build a prototype that was compatible with industry requirements.

Holophone H2-PRO

The Holophone surround system is now available for professionals wishing to optimize their surround sound recording projects.

The top-of-the-line Holophone model is the H2-PRO, with eight microphone elements: center, left, right, left surround, right surround, overhead, center rear, low frequency (inside the Head). Compatible with all consumer formats, including 7.1 systems, the H2-PRO can be readily connected with industry-standard preamplifiers and sound recording devices. The H2-PRO is now recognized as setting the standard for professional surround sound recording.

Holophone H4 SuperMINI

However, there are many recording situations that do not require the full capabilities of the H2-PRO. With that in mind, the H4 SuperMINI has been designed to provide all the functionality needed for 5.1 recording in a package that can be integrated with ENG-style videography. Lightweight, versatile, and affordable, the H4 SuperMINI does not compromise on quality.

A Brief Overview of Surround Sound

Mono

In the beginning there was mono. No matter how many speakers there were, the sound coming from each speaker was the same. In monaural recording, the effect was as if all the sound was recorded from the same single location, and for the most part this was how it was recorded.

First Surround Sound: Disney's Fantasia

In 1940, Disney introduced surround sound to cinemas with the movie *Fantasia*, using three channels behind the movie screen, with additional speakers on either side and at the rear. Implementation was expensive, and the results were demonstrated in only two theaters — one in New York and one in Los Angeles.

Stereo

In the 1950s, stereo recording was introduced to the mass consumer market. Stereo is based on the premise that we have two ears. If the sound is recorded from two sources, we get a better image of where the sound is coming from. Through the 1960s, stereo sound swept monaural out of the marketplace.

Quad

Throughout the seventies there were a number of experiments with quadraphonic sound for the home market. Quad sound failed to catch on for a variety of reasons — lack of material, high cost of systems and lack of consumer demand.

Dolby Stereo: 4 channels

In 1970, George Lucas's *Star Wars* introduced Dolby Stereo to movie theaters, and within a few years it became the most common audio format. Contrary to its name, Dolby Stereo can actually deliver four sound sources, thanks to an ingenious principle called *matrixing*: left, right, center and rear.

A decoder/processor "unfolds" the sound into the original 4.0 surround—left and right, center, and a single limited frequency-range mono rear channel—while systems lacking the decoder play back the audio as standard Stereo.

Dolby Surround, Dolby ProLogic: 4-2-4

Dolby Surround and Dolby ProLogic are home cinema versions of Dolby Stereo. For television home video, the four signals are compressed into two conventional stereo tracks, and then decompressed into four if the home equipment supports surround sound. This compression is referred to as *4-2-4*.

Dolby Digital: 5.1 configuration

5.1 configuration

Today, surround sound in theaters is delivered most commonly by Dolby Digital systems, including Dolby Digital 5.1, Dolby AC-3 and Dolby SR-D (Spectral Recording Digital). Dolby Digital employs six sound sources, as follows:

- Center
- Left
- Right
- Left surround
- Right surround
- LFE (or Low Frequency Effects)

This configuration is known as 5.1, with the ".1" referring to the LFE source (also known as a *subwoofer*). Dolby Surround Digital is the home video version, available on digital video disks (DVDs).

Other 5.1 Systems

A competing system called DTS (Digital Theater Systems), introduced with *Jurassic Park*, also uses the 5.1 configuration. Circle Surround analog decoding system also supports 5.1.

All models of the Holophone (H2-PRO, H3-D, H4 SuperMINI) support 5.1 surround systems.

Dolby ProLogic II: Encoded 5.1

Dolby ProLogic II is an advanced implementation of Dolby Pro Logic that processes any high quality stereo signal into 5.1 surround sound. (It can also decode 5.1 channels from 4-channel Dolby Surround.)

The Holophone H4 SuperMINI takes advantage of Dolby ProLogic II encoding (or any other stereo media) to create stereo signals that can be stored on a video camera, and decoded later for 5.1 stereo sound. (The H4 SuperMINI can also deliver 5.1 channels without encoding, to be stored or delivered directly.)

6.1 and 7.1 formats

IMAX uses a 6.1 system, adding a top channel to the 5.1 standard.

This configuration was supported by the original Holophone H-1 (now discontinued). It is currently supported by the H2-PRO.

Dolby, DTS and SRS Labs (among others) introduced extended surround formats that use a 6.1 configuration. These are Dolby Digital EX, DTS ES (Extended Surround) and Circle Surround II (CS II). However, instead of a top channel, these standards add a center rear channel.

Sony has introduced a standard, SDDS (Sony Dynamic Digital Sound), which has a 7.1 configuration. However, it does not use either the rear channel or the top channel. Instead, it adds a *left center* and a *right center* channel.

All 6.1 and 7.1 formats are supported by the Holophone H2-PRO.

The Holophone H4 SuperMINI supports the following formats:

5.1 **Dolby Digital**
Dolby ProLogic II
DTS
Circle Surround
AAC (Advanced Audio Coding – MPEG 4)
WMA (Windows Media Audio)

4-2-4 **Dolby Stereo**
Direct support for center, left and right channels. Left surround and right surround are combined into one mono output.

Stereo Surround sound recorded using Dolby ProLogic II encoding can be played back as stereo.

Note: Dolby, Dolby Stereo, Dolby Surround, Dolby ProLogic, Dolby Digital, IMAX, DTS (Digital Theater Systems), Circle Surround, AAC, WMA, SDDS (Sony Dynamic Digital Sound) are trade-marked terms.

The Holophone SuperMINI

SuperMINI Microphone Head

Five omni-directional microphone elements are mounted externally on the H4 SuperMINI (L, R, C, LS, RS) Each element has a bandwidth of 20Hz-20Khz.

A sixth is enclosed in the Head, and records Low Frequency Effects (LFE). Its bandwith is 20Hz to 100Hz for outstanding Low Frequency performance.

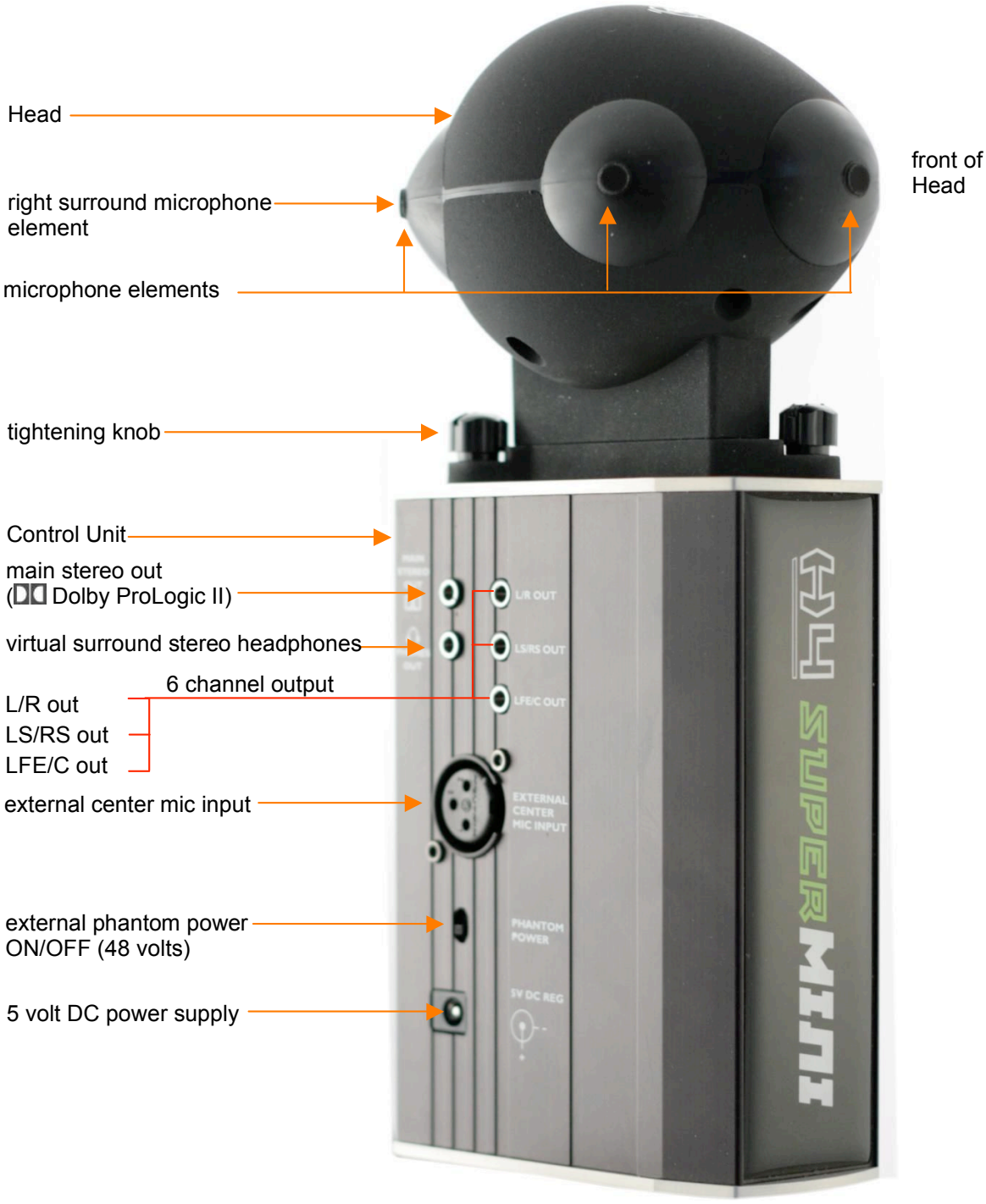
The Head is mounted securely on the Preamp/Monitor/Encoder by tightening two PEM bolts at the base.

Top View

Front View

H4 SuperMINI and Control Unit

Mount the Control Unit on the camera, using either a hot-shoe or cold-shoe mount, the front of the Head pointing in the same direction as the camera. (There is no connection to the camera through the shoe.) You can also hand-hold the H4 SuperMINI, or mount it on a microphone stand or tripod.



The right side of the Control Unit (as you hold the camera) has the output ports for the captured sound.

Main Stereo Out

Records direct to the media in the camera, eliminating synchronization issues. Outputs two channels via a stereo connection. The stereo signals are encoded using Dolby ProLogic II to support the 5.1 mic inputs. They may be played back as stereo or decoded for surround sound.

The direct connection to the video camera enables on-camera surround sound capture from multiple points and perspectives within a venue.

Stereo Headphone Out

Virtual surround headphone output with gain control on 3.5mm mini stereo jack for live and instantaneous on-camera monitoring of the surround field.

Although the headphones are stereo, a virtual surround processor inside the Control Unit takes the six channels of audio and virtualizes them through the headphones. You will hear a close approximation to the surround sound being recorded.

There is a gain control for the headphone output on the rear of the Control Unit. (*See below.*)

Six Channel Output

Three stereo jacks provide six line-level analog outputs, using the left and right channels of each jack. You can run these directly into the console or into any other type of device that captures six or more channels of audio.

The output is line level (rather than mic level) to eliminate the need for an external pre-amplifier. You can capture 5.1 channels on a wide variety of recording devices.

Use this six-channel option if you prefer not to have the sound capture encoded as stereo. You can also use the main stereo out and six channel output options simultaneously.

External Center Microphone Input

Auxiliary Center channel microphone input (XLR) for attaching external lavalier or shotgun microphone. Selector switch, gain control and phantom power selectable.

This input port allows you to replace the center microphone in the H4 SuperMINI Head with a separate microphone of your own choosing. It can be any type of microphone: shotgun, hand-held, lavalier, wireless.

You can adjust the input level using the External Microphone Gain Control on the rear of the Control Unit (*see below*).

The use of an external center microphone is particularly useful for dialogue, interviews, and Electronic News Gathering (ENG). Traditionally, in these applications, on playback, a center channel speaker is used for the dialogue and the surround speakers provide ambience. It is perfect for on the spot interviews to separate the dialogue from the ambiance instantly on camera.

Phantom Power The Phantom Power Switch provides phantom power (48 volts) for the external center microphone. Press to toggle phantom power on and off.

5 volt DC Power Supply External 5 volt input.

The H4 SuperMINI operates on 4 x AA batteries and lasts for more than 6 hours. You can bypasss the batteries by plugging in the included AC adapter with a 5 volt output into this port.

Control Unit—Rear View

Zoom Indicator

LED display indicating whether Audio Zoom has been activated. (*See Zoom Button below.*)

Two-color LED Monitor

LED display indicating the sound pressure for each microphone element. The display provides the operator with an intuitive indication of relative levels.

green: the channel is active
red: clipping

Mic Gain

Controls the input level of all six (5.1) microphone elements in the H4 SuperMINI Head.

This should be adjusted only *after* setting the input level on the camera or external storage device.

Zoom Button

Audio Zoom Button increases the forward bias of microphone pickup pattern to match the video zoom for a close-up camera shot.

back zoom button →

There are two zoom buttons – one on the back of the Control Unit and one on the left side (operator's viewpoint).

left side zoom button →

When you press either of the zoom buttons, the decibel levels of the mic inputs change as follows:

Center: plus 6 db
R & L: plus 3 db
SR & SL: minus 3 db

-12 db PAD LED

LED indicates that the -12 db PAD has been activated (*see below*).

External Center LED

LED indicates that an external center microphone is in use.

External Center Switch

Hold down this switch for one second to activate an External Center Microphone that has been attached to the Control Unit via the XLR input on the right side (*see External Center Microphone Input above.*) The External Center LED illuminates.

To switch from an External Center Microphone back to the built-in SuperMINI center microphone, hold down the switch for one second. The LED is extinguished.

Phone Level	This gain control sets the overall sound level in the headphones. Used for monitoring the sound that is being captured. **Important Note**: The Phone Level control does not set the record level. It simply determines what you hear in the earphones, not what is being stored. Set the input level first on the storage device, and listen to the sound through the device if possible. You can then adjust the sound slightly using the Mic Gain dial, if necessary.
-12 db PAD	The -12 db PAD is used in situations where there is an excessive Sound Pressure Level (SPL), to ensure that the sound is not distorted. Press and hold the switch for one second to activate the PAD. The sound levels are reduced by 12 decibels. (To turn the PAD off again, hold the switch for one second.)
Power Button	Toggle switch to turn on the battery power for the H4 SuperMINI. (Four AA batteries will provide at least 6 hours of continuous use.)
Power Indicator	LED indicates that the power is turned on and the H4 SuperMINI is in use.

Using the Holophone H4 SuperMINI

The Holophone SuperMINI is remarkably simple to use, because it accurately reproduces in three dimensions what you would hear at a particular location in space. In most cases, if you have experience recording sound with traditional microphones, you can rely on your ear and your intuition as to the appropriate placement for a particular event or venue.

The Virtual Surround Sound Headphone capability provides quite an accurate impression of the sound that is being captured and enables monitoring in three dimensions.

Setting Levels

First listen to source material through the headphones with the jack in the H4 SuperMINI Control Unit. Then check the levels on the two coloured LEDs on the H4. The greens should be lighting with very occasional reds. If the red LED is lighting consistently, your gain is too high, and must be reduced using the gain knob.

Next look at the recording device‘s audio display to confirm that input from the H4 SuperMINI is at the optimal level for the specific device. Move the headphone monitor to the recording device to confirm the device’s recording level.

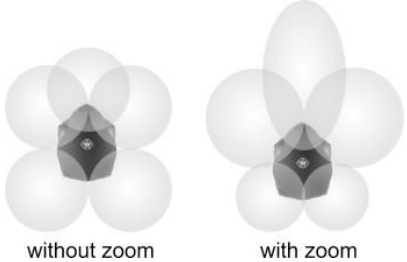
Monitoring from either source is optional once the optimal levels have been achieved.

The Mic Gain Dial should be used only for minor adjustments. This is because it is possible to overload the recording device without being aware of it.

Audio Zoom

Audio zoom increases the forward bias of the surround sound. It does not “zoom” incrementally, but simply adjusts the levels of the channels to a second set of values:

Center: plus 6 db
R & L: plus 3 db
SR & SL: minus 3 db



With this in mind, you should decide whether your video shot is a close-up that would be complemented by the use of audio zoom, or whether the standard configuration is appropriate.

External Center Microphone

The H4 SuperMINI provides the ability to replace the center mic element on the Head with an external microphone, with an independent gain control. Almost any type of microphone can be used, depending on the result required. The possibilities are limitless.

This is most useful for ENG work and other situations a core channel or dialogue mic is desirable. Both lavalier and shotgun mics can be used.

The Virtual Surround Sound Headphone capability of the H4 SuperMINI system is very useful in providing an accurate impression of what is being captured. (Remember, however, that the recording levels should be set on the recording device first.)

In general, bear in mind that in using an external center microphone, you will be creating a more center-weighted (dialogue) surround-sound picture. You will be trying for clear front sound capture with good dialogue separation, with the H4 SuperMINI's other channels providing ambient sound.

For current tips and tricks in using the Holophone, visit our website: http://www.holophone.com/inaction.html

Enjoy!