

BrassHat™ Sound Recorder

Recordable Sound Module Model No. BH-21SR

8-Track On-Demand Recorder/Player

- Record up to 8 messages/sounds and play **automatically** or **on-demand**
- Easy recording of the prototype sounds **you want**
- Trigger playback with pushbutton switches (not included) or other connected electronics
- Automatic playback with fixed or random order, fixed or random timing
- Record unique **background** sounds to play between triggered messages
- Record with built-in microphone or LINE IN jack from PC, CD player, etc.
- 4 minute total recording capacity – erased sounds recycled to always maintain full capacity – no gaps!
- Speaker output or stereo jack for powered speakers (same audio on both stereo channels)
- Separate playback volume controls for messages and background sound
- 200 mA outputs drive LEDs, motors, relays on trigger or during playback

Simple Installation

- Screw terminals for all circuit board connections
- Power Supply: DC (9-12 V) or AC (7-9 V), 150 mA **required**
- 8-Ohm speaker or powered speakers **required**

Parts List

- **BrassHat™ Sound Recorder** Circuit Board
- Vinyl Tubing for Standoffs

Before You Install

- Your **BrassHat™ Sound Recorder** can be damaged by static electricity. Before removing the circuit board from its packaging, discharge static electricity by touching a bare metal surface.
- Do not install or make connections when circuits or track are powered.
- Insulate all exposed connections, preferably with heat shrink tubing.
- Prevent contact between the Sound Recorder and other wiring.
- Read through the rest of these instructions before beginning.
- Visit www.bouldercreekengineering.com for additional information.

1. Wiring Instructions

Figure 1 shows how to wire your **BrassHat™ Sound Recorder**, along with key features on the circuit board.

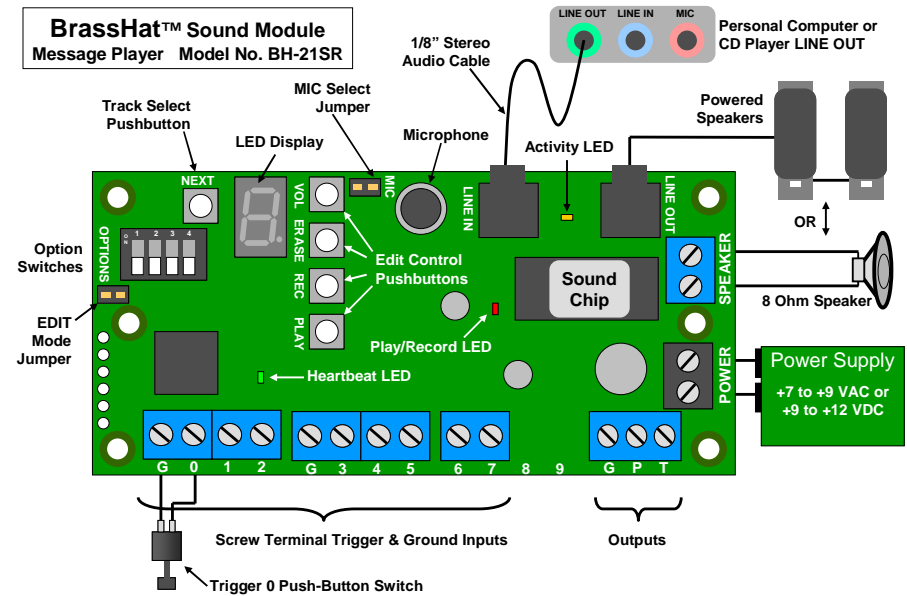


Figure 1: Circuit Board & Wiring Diagram

1. Connect two wires from your power supply to the Sound Recorder **gray** power terminals as shown in **Figure 1**. Polarity does not matter. The power supply must be 7 to 9 Volts AC or 9 to 12 Volts DC, with 150 mA capacity. Radio Shack sells an AC adapter (#273-314) that works well.

Warning: Do not exceed 9 Volts AC or 12 Volts DC as this will damage the circuit board.

Warning: Do not share an AC Adaptor with other electronics as this will cause humming or buzzing interference in the audio output.

2. Connect either an 8 ohm speaker to the SPEAKER terminal block or connect powered speakers with a 1/8" stereo plug to the LINE OUT jack. (Audio output is mono.) Powered speakers are highly recommended as they provide much better sound quality and are available for about \$10 from Amazon.com and other Internet sources. (**Speakers are not included.**)

Warning: Connecting a speaker rated less than 8 ohms to the SPEAKER terminal block will damage the circuit board.

Your **BrassHat™ Sound Recorder** is now ready to use with its onboard microphone as audio source, and Edit Control Pushbuttons for control.

For additional features, you may want to make the following connections:

3. You can wire switches or other electronics to trigger the Sound Recorder. Grounding and releasing a Trigger Input begins playback of the selected Track. **Figure 1** shows a normally open (NO) pushbutton switch wired to trigger Track 0. See **Section 4**.

Pushbutton switches are not included. Radio Shack has NO pushbutton switches in 4-packs (#275-1547).

Visit www.bouldercreekengineering.com/manuals.php for more information.

4. If you want to record from a personal computer, CD player or other audio source, you can connect that source's LINE OUT to the Sound Recorder's LINE IN jack as shown in **Figure 1**. Male-to-male 1/8-inch stereo audio cables are available from Radio Shack (#42-890) and other retailers.
5. Sound Recorder Output T is grounded when a Trigger Input is detected. Output P is grounded during playback. You can connect Outputs to other electronics as in **Figure 1**. For more information, visit www.bouldercreekengineering.com/manuals.php.

2. Testing Your Wiring

1. Set all Option Switches to the **OFF** position.
2. Check that both EDIT and MIC jumpers are in place.
3. Apply power to your **BrassHat™ Sound Recorder**. The Heartbeat LED should blink once every second. Check your power wiring if it does not.
4. **Congratulations**, your Sound Recorder is now operational!

3. Edit Mode Operation

3.1 Entering Edit Mode

Remove the EDIT Mode Jumper to enter Edit Mode. See **Figure 1**. To avoid misplacing the jumper, reconnect it over just one of the gold pins.

When in Edit Mode, the green Heartbeat LED is on. The red Play/Record LED flashes when the Sound Recorder is recording or playing messages. The yellow Activity LED is on when playing.

When working with the **BrassHat™ Sound Recorder** circuit board, especially in Edit Mode, we recommend placing the Sound Recorder on a soft surface such as a foam pad or folded cloth.

3.2 Memory Capacity

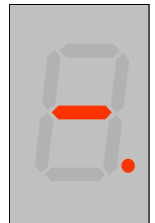
BrassHat™ Sound Recorder can store up to 4 minutes of recorded messages or sounds. The Sound Recorder recycles erased message space and always maintains this capacity. This eliminates unusable gaps that can occur with tape, CD, and memory card recordings.

LED Display	Remaining Capacity
9	more than 90%
8	80% – 90%
7	70% - 80%
6	60% - 70%
5	50% - 60%
4	40% - 50%
3	30% - 40%
2	20% - 30%
1	10% - 20%
0	less than 10%

During recording and also when requested, the Sound Recorder displays its remaining unrecorded capacity. The number shown on the LED display is the remaining capacity rounded down to the nearest 10% as in the table.

If recording completely fills all 4 minutes of capacity, recording stops and the ERROR TONE plays. The Sound Recorder displays a dash and the decimal

point lights up on the LED Display as shown here. The decimal point remains lit until an erase frees up memory.



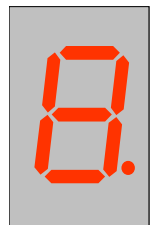
Memory Full

3.3 Selecting Sound Tracks

BrassHat™ Sound Recorder has 8 recordable sound tracks (numbered 0 – 7) that can be triggered to play on demand. In addition, Track 8 is a recordable Background Track.

The LED Display shows Track 8 as the selected Track.

Press and release the NEXT Pushbutton to advance to the next Track. Advancing wraps around from Track 8 back to Track 0.



Track 8, Memory Full

3.4 Recording

Each Track is empty until recorded. Any Track can be recorded to any length, up to the Sound Recorder’s full memory capacity.

For recording from the built-in Microphone, remove the MIC Select Jumper. See **Figure 1**. Reconnect it over just one of the gold pins for safe keeping.

To record from electronic sound sources (such as a PC, CD player or tape deck) through the Sound Recorder’s LINE IN jack, connect the two gold MIC pins with the MIC Select Jumper. See **Figure 1**.

When LINE IN is selected, you will hear the source playing through the Sound Recorder’s speaker (connected in Step 2 of **Section 1**). You will hear a change in the source sound when recording is started.

Select the Track you wish to record as described in **Section 3.3**.

Press and hold the RECORD Pushbutton to start recording. Release the RECORD Pushbutton to stop recording. While recording, the Play/Record LED will flash and the LED Display will show the remaining memory capacity as described in **Section 3.2**.

If the selected Track is already recorded, the ERROR TONE plays when you press RECORD. You must erase the Track before recording.

If recording completely fills all memory, recording stops and the ERROR TONE plays. The Sound Recorder turns on the decimal point on the LED Display.

3.5 Playing

Select the Track you wish to play as described in **Section 3.3**.

Press and release the PLAY Pushbutton to begin playing. If the selected Track is not recorded, the ERROR TONE plays.

While playing, the Play/Record LED will flash and the LED Display will continue to show the selected Track. The selected Track will play to the end and stop.

While a Track is playing, press and release the PLAY Pushbutton to stop.

3.6 Erasing a Track

Select the Track you wish to erase as described in **Section 3.3**.

Press and release the ERASE Pushbutton to erase the Track.

The OK TONE plays when the Track has been erased. Long recordings take more time to erase than short recordings.

Note: Once erased, recordings cannot be retrieved.

3.7 Erasing All Tracks

Press and hold the ERASE Pushbutton. Continue to hold and press and hold the PLAY Pushbutton. The Sound Recorder will play a WARNING TONE and show a big “E” on the Display.

After both Pushbuttons have been held for four seconds, the Sound Recorder will erase all Tracks, including the Background Track.

The OK TONE plays when all tracks have been erased. Now release both Pushbuttons.

Note: Once erased, recordings cannot be retrieved.



Erasing All Tracks

3.8 Checking Remaining Memory

Press and hold the NEXT Pushbutton. After two seconds, the OK Tone plays and the LED Display will show the remaining memory capacity as described in **Section 3.2**.

3.9 Adjusting Run Mode Volume

To adjust the Run Mode playback volume for all on-demand sound tracks (0 – 7), select any on-demand Track. To adjust the playback volume for the Background Tracks, select the Background Track (8).

Press and release the VOLUME Pushbutton to change the sound volume.

Each press and release increases or decreases volume between 8 levels. Volume increases to maximum sound volume (8), then decreases to minimum sound volume (1), then increases again. The LED Display shows the new volume level after each press and release.

3.10 Changing Automatic Playback Timing

To select the delay between Tracks during Automatic Playback, select the Value (Track) with the LED Display matching the desired delay as shown in the table. For example, select “5” for 60 seconds.

Selecting 7 or 8 will randomly vary the delay between 0 to 15 or 0 to 120 seconds during Automatic Playback.

To change the delay, press and hold the NEXT Pushbutton. While holding the NEXT Pushbutton, immediately press the PLAY Pushbutton. The OK TONE will play when the change is completed.

Selected Value	Auto Play Delay (seconds)
8	Random (0 – 120)
7	Random (0 – 15)
6	120
5	60
4	30
3	15
2	8
1	4
0	0

4. Run Mode Operation

4.1 Entering Run Mode

To enter Run Mode, connect the two gold pins with the EDIT Mode Jumper. See **Figure 1**.

When in Run Mode with no Background Track playing, the green Heartbeat LED blinks once per second. When the Background Track is playing, the green Heartbeat LED is steadily on.

The red Play/Record LED flashes when the Sound Recorder is playing sound. The yellow Activity LED is lit when playing a triggered (on-demand) Track.

4.2 Setting Options for Run Mode

Setting Option Switches on or off (see **Figure 1**) will change Run Mode Options as defined below.

OPTION SWITCH DEFINITIONS

1	2	3	4
Background	Unused	Auto Playback	

Switch 1 **Background**

- ON** Background Track plays between Triggered Tracks
- OFF** Background Track does not play between Triggered Tracks

Switch 2 **Unused**

Switches 3, 4 **Automatic Playback**

- 3 OFF, 4 OFF** **No Auto Play.** Automatic Playback is disabled
- 3 OFF, 4 ON** **Track Order.** Tracks play in order, Track 0 first
- 3 ON, 4 OFF** **Shuffled.** All Tracks play in random order, then in another random order – all Tracks play once before reshuffle
- 3 ON, 4 ON** **Random.** Tracks play in random order; a Track may repeat before another Track plays even once; a particular Track may play twice in a row

4.3 Triggering Playback on Demand

To begin playing a Track, connect the corresponding Terminal Trigger Input (0 – 7) to Ground (G). Two Ground Terminals are provided nearby for convenience. See **Figure 1**.

To play the Track **once**, release the connection when playback begins.

To play the Track **continuously**, hold the connection for as long as desired. Release the connection and the Track will then play to completion and stop.

Triggering the same Track while a triggered Track is playing will stop play.

Triggering a different Track while a triggered Track is playing will stop play of the original Track and start play of the newly-selected Track.

Triggering a Track while a Background or Auto Play Track is playing will stop play and start playing the selected Track.

The yellow Activity LED illuminates when a Trigger is detected by **BrassHat™ Sound Recorder**. The Activity LED remains lit while the selected Track plays.

A Normally Open (NO) pushbutton switch (not provided) connected between Ground and the desired Trigger can be used to make connections as shown in **Figure 1**. Use an additional switch for each Trigger.

Trigger connections can also be made with relays, transistors, and other electronics. Visit www.bouldercreekengineering.com/manuals.php for more information on Trigger Input connections to other model railroad electronics.

4.4 Automatic Playback of Recorded Tracks

Selecting Automatic Playback with Option Switches 3 and 4 will play all recorded Tracks in the pattern selected as in **Section 4.2**. Unrecorded tracks are skipped.

Playback will pause between Tracks with the delay selected in **Section 3.10**.

4.5 Playing the Background Track

If selected, the Background Track will play when no other Track is playing. See **Section 4.2**.

If you select Background before it's recorded, the ERROR TONE will play.

5. Installing the Circuit Board

Mount the **BrassHat™ Sound Recorder** circuit board under your layout as shown in **Figure 2**. Slice 1/4" standoffs from the vinyl tubing provided. The screw holes in the circuit board are for No. 4 pan-head screws (not included).

Warning: Do not enlarge the circuit board holes or over-tighten the mounting screws as this will damage the circuit board.

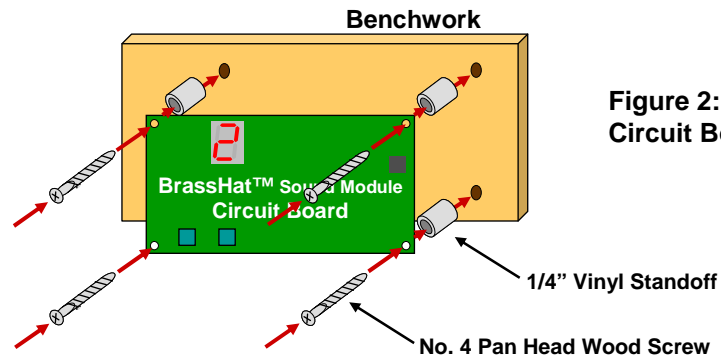


Figure 2:
Circuit Board Installation

6. Helpful Hints

6.1 Microphone Recording

- Gently press and release the RECORD Pushbutton when recording from the Microphone. This will reduce the sound of the Pushbutton clicks in your recording.

6.2 Line In Recording

- If the volume of the audio source (PC, CD player, etc.) is too high or too low, recording through the LINE IN Jack will be distorted or difficult to hear. Lower the source volume to eliminate distortion. Raise the source volume if the recording is hard to hear.

6.3 Triggering Playback

- Rapidly making and breaking the Ground connection with Trigger Inputs can cause the Sound Recorder to miss the Trigger. Hold the Trigger for a half second for best results.
- Watch for the yellow Activity LED to light as you make and break the Ground connection to gain a sense of timing. When the LED lights, the Sound Recorder has detected the connection.

Support & Service

If you have problems with your **BrassHat™ Sound Recorder**, please consult our website www.bouldercreekengineering.com. If you need additional help, please contact us at support@bouldercreekengineering.com.

Your Sound Recorder can be repaired with a charge for parts and labor. Please contact support@bouldercreekengineering.com for a cost estimate on non-warranty repairs before sending product to us.

Limited Warranty

Boulder Creek Engineering, LLC warrants its products to be free of defects in materials and workmanship for a period of **one (1) year** from the purchase date. Defective product received by Boulder Creek Engineering during the warranty period will be repaired or replaced at our option. You must pay shipping to and from Boulder Creek Engineering.

This warranty does not cover damage resulting from negligent installation, improper operation, or unauthorized repair or modification. Removal of the heat shrink voids this warranty. Boulder Creek Engineering makes no other warranty of any kind, expressed or implied. In no event shall Boulder Creek Engineering be liable for incidental or consequential damages.

For warranty service, please contact Boulder Creek Engineering for a Return Merchandise Authorization (RMA) number. Product must be shipped to Boulder Creek Engineering with dated proof of purchase (your receipt).



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