BrassHat™ Announcer & Sound Recorder Application Guide Models BH-21A, BH-21SR

The ***BrassHat*™ Announcer** and ***BrassHat*™ Sound Recorder** are extremely flexible and can reliably drive a variety of model railroad signals and receive inputs from assorted electronic systems. This guide goes beyond the Product Manual and demonstrates connections for many common applications.

All of the examples below are described for **Sound Recorder**. They apply equally to **Announcer**, noting that **Announcer** has 10 Trigger Inputs – two more than **Sound Recorder**.

1. Input and Output Summary

***BrassHat*™ Sound Recorder's** four terminal connection types are listed in Table 1.

Table 1: BrassHat™ Sound Recorder Connections

Label	Name	Function
0, 1, ... 7	Trigger Input	Grounding will trigger the specified on-demand sound track. (Note that **Announcer** has additional Trigger Inputs 8 and 9.)
P	Playing Output	Output pulled to Ground during playback of any sound track, including a Background Sound Track; Otherwise open circuit. **Do not exceed 12 volts or 200 mA.**
T	Triggered Output	Output pulled to Ground when a Trigger Input is detected at Ground; Otherwise open circuit. **Do not exceed 12 volts or 200 mA.**
G	Ground	Common with other connected electronics. There are three G terminals and all are internally connected on the circuit board.

These four connection types allow **Sound Recorder** to interact with the outside world.

2. Triggering Inputs from Switches

Switches, either push button or toggle, are the easiest way to trigger on-demand playback from **Sound Recorder**.

Using Normally Open (NO) switches, simply connect one switch terminal to Ground (G) and the other terminal to the desired Trigger Input. **Figure 1** shows push button switches for Trigger Inputs 0 and 1.

When a switch is closed, its Trigger Input will activate. Add additional switches for each Trigger Input you wish to activate.

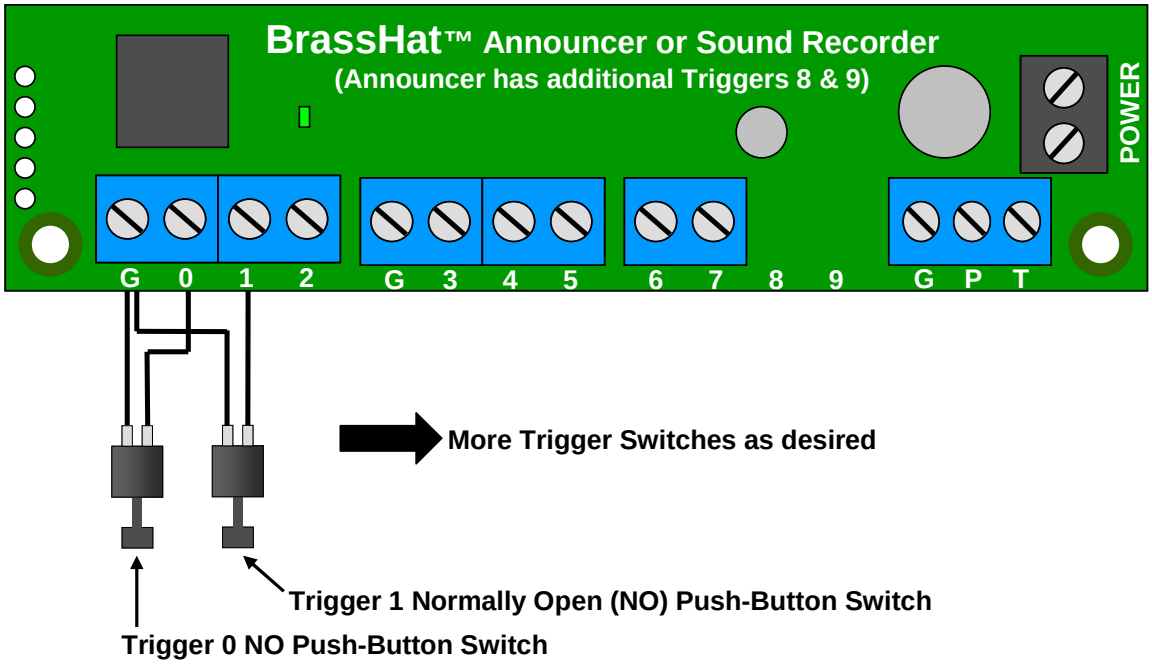


Figure 1: Push Button Switches for Trigger Inputs 0 & 1

You can have several switches activate the same Trigger Input. Connect each switch in parallel as shown in **Figure 2**. You can have as many switches in parallel as you wish. If any of the parallel switches are closed, the Trigger Input will activate.

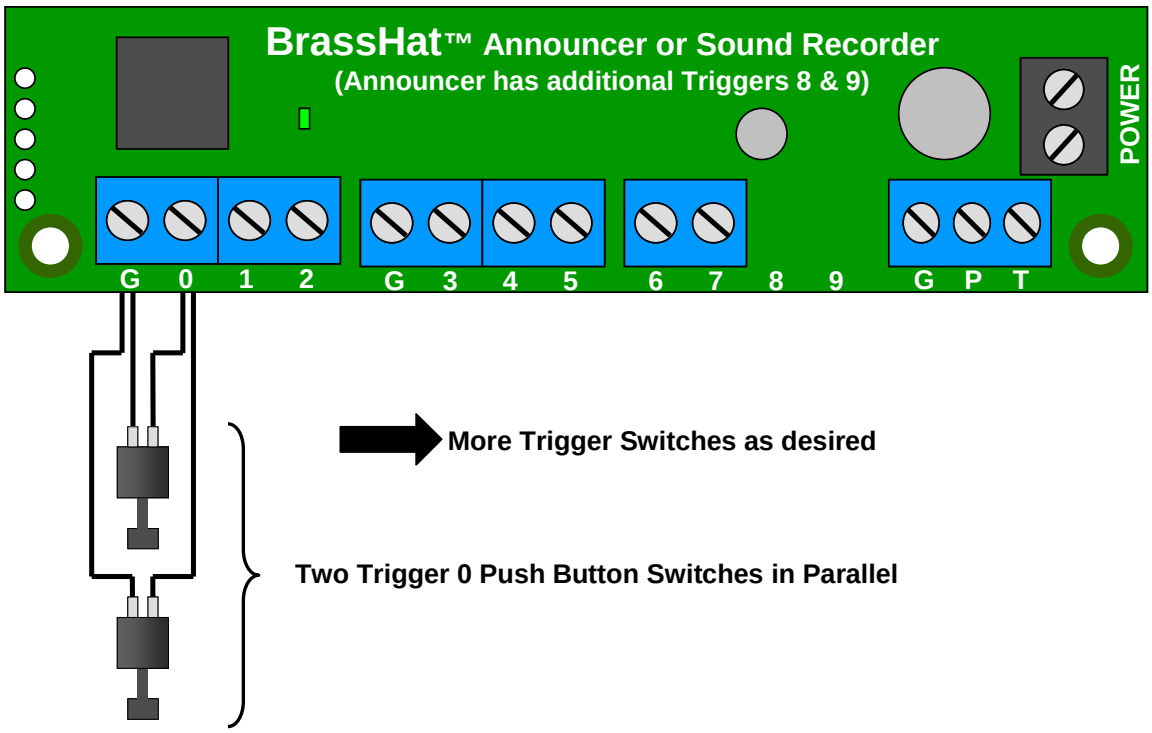


Figure 2: Push Button Triggers in Parallel for Trigger Input 0

3. Triggering Inputs from NightScope Infrared Detectors

NightScope™ Infrared Detectors can act as a switch, grounding a Trigger Input through its YELLOW wire when a train is detected. Connect the **Infrared Detector** as shown in **Figure 3**. Add additional **Infrared Detectors** for each Trigger Input you wish to activate.

You can have several **Infrared Detectors** activate the same Trigger Input. Connect each in parallel in the same way that switches were connected in parallel in **Figure 2**: connect each **Infrared Detector's** BLACK wire to Ground (G) and its YELLOW wire to the same Trigger Input. Each **Infrared Detector's** RED wire is connected to the Power Supply, and the Power Supply's Ground is connected to the **Sound Recorder's** Ground (G).

If any of the parallel **Infrared Detectors** detects a train, the Trigger Input will activate. You can have as many **Infrared Detectors** in parallel as you wish

Notice that a "Delayed Response" **Infrared Detector** is specified for this application. This prevents gaps between rail cars from triggering the **Sound Recorder** repeatedly – which will turn the on-demand sound track off and on.

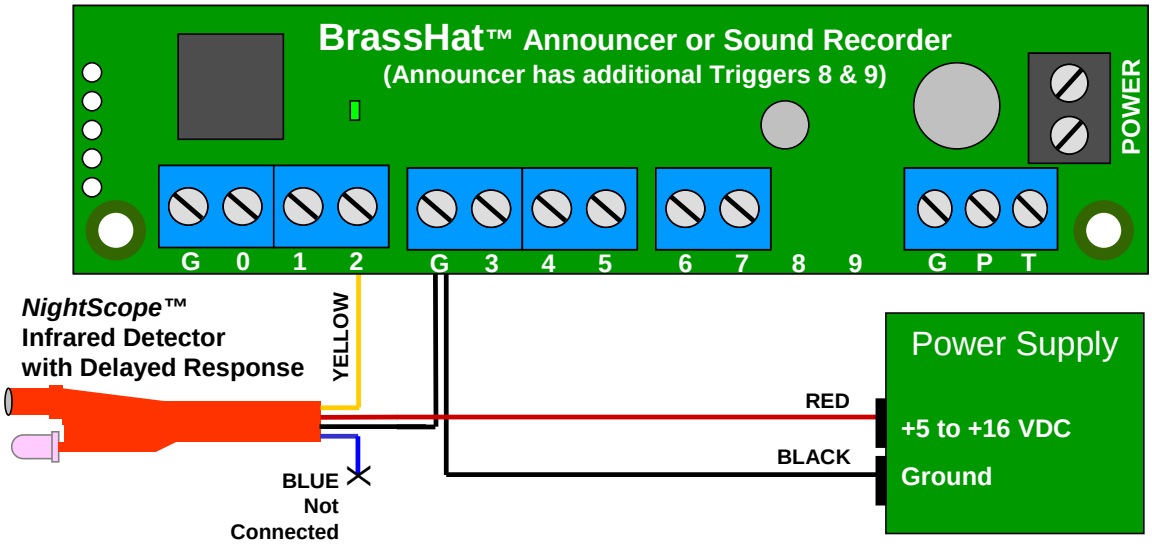


Figure 3: NightScope™ Infrared Detector for Trigger Input 2

4. Driving an LEDs During Playback

Turning one or more LEDs on and off during playback or when the **Sound Recorder** is triggered is very straightforward.

Figure 4 shows how the Playing Output (P) from the **Sound Recorder** circuit board can be wired to drive an LED. The Triggered Output (T) can be used similarly to drive a second LED. Resistor value R for common V+ voltages are shown.

You can drive more than one LED from the same output. Simply duplicate the LED and resistor connection between V+ and P (or T) for each LED you wish to light. **Sound Recorder** will light up to 20 LEDs from each output.

Warning: Do not exceed 200 mA LED current as this will damage the Sound Recorder circuit board.

Warning: V+ must not exceed 12 Volts as this will damage the Sound Recorder circuit board.

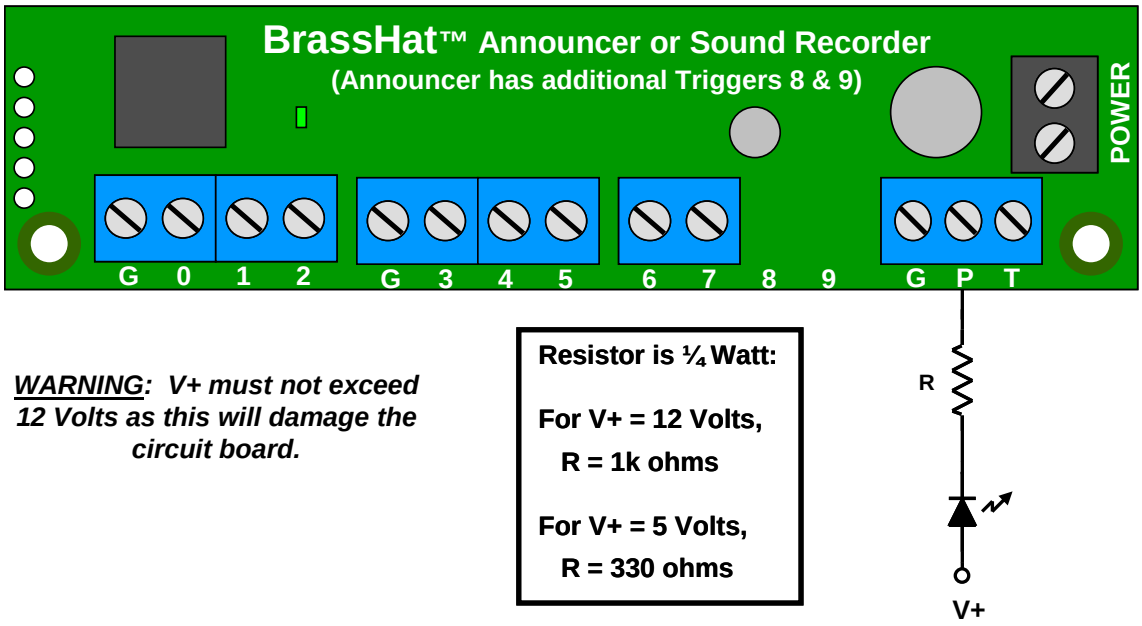


Figure 4: Driving an LED During Playback

5. Driving Relays During Playback

For controlling very high currents or control signals such as DCC track signals, a relay is hard to beat.

Figure 5 shows how the Playing Output (P) from the **Sound Recorder** circuit board can be wired to drive a relay. The Triggered Output (T) can be used similarly to drive a second relay. The V- connection to the Relay Coil Power Supply can be to any of the "G" inputs on the **Sound Recorder**.

You can drive more than one relay from the same output. Simply duplicate the relay and diode connection between V+ and P (or T) for each relay you wish to control. **Sound Recorder** will drive up to 200 mA of relay current from P and another 200 mA from T.

Warning: Do not* exceed *200 mA coil current for a given output as this will damage the Sound Recorder circuit board.

Warning: Do* not exceed 12 Volts for *the relay coil power supply as this will damage the Sound Recorder circuit board.

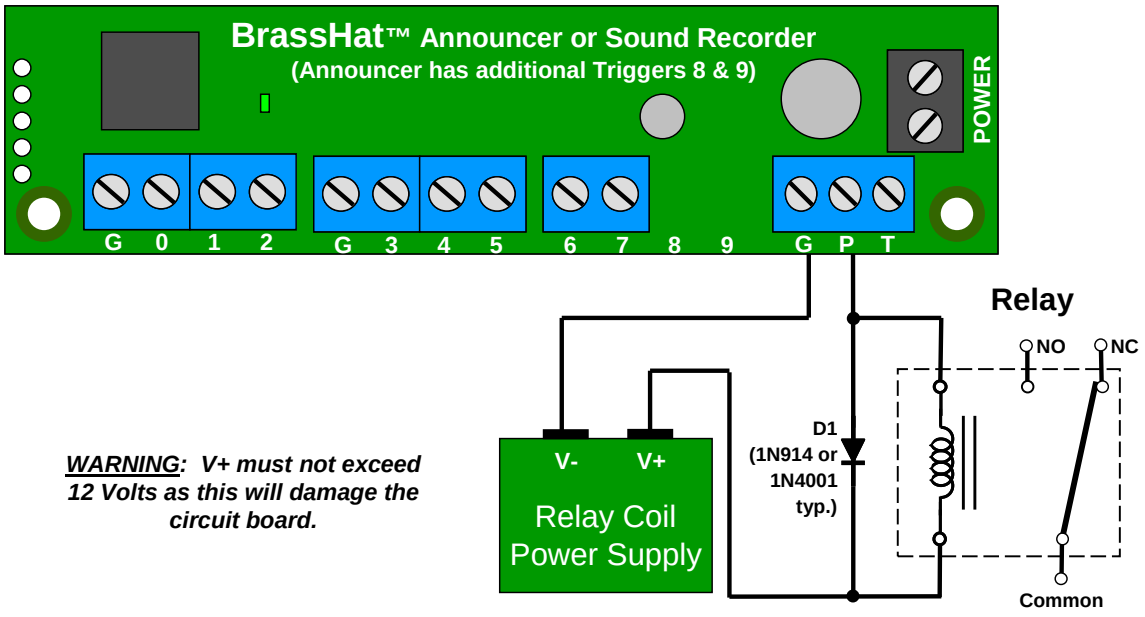


Figure 5: Driving a Relay During Playback

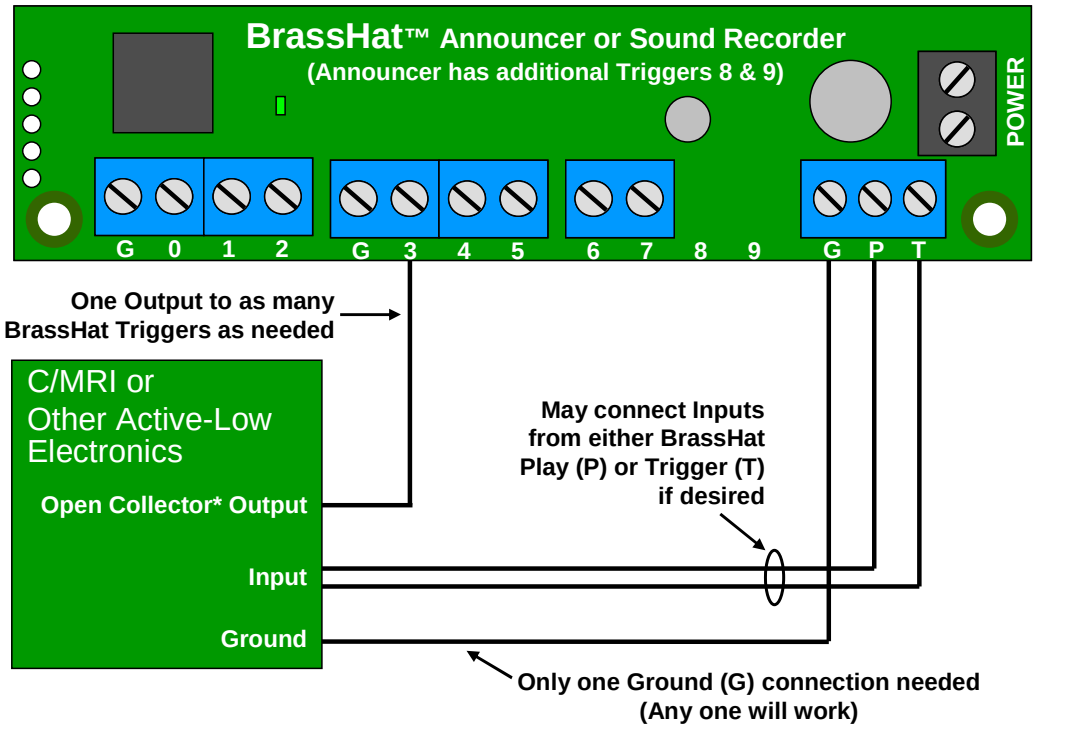
6. Connecting with C/MRI

Sound Recorder can be controlled through its Trigger Inputs and P and T Outputs by external systems like C/MRI. Connect C/MRI as shown in **Figure 6** to control Trigger Input 3. Connect other or additional Trigger Inputs to other C/MRI outputs as desired.

Trigger Inputs are wired to open collector outputs from C/MRI. Open collector outputs pull to Ground when they are active and are open circuits when inactive. These are also named "current sinking" outputs by C/MRI manuals.

Depending on the desired control, one or both P and T Outputs from **Sound Recorder** can be connected to C/MRI inputs.

Note that only one (any one) Ground connection is required between **Sound Recorder** and C/MRI.



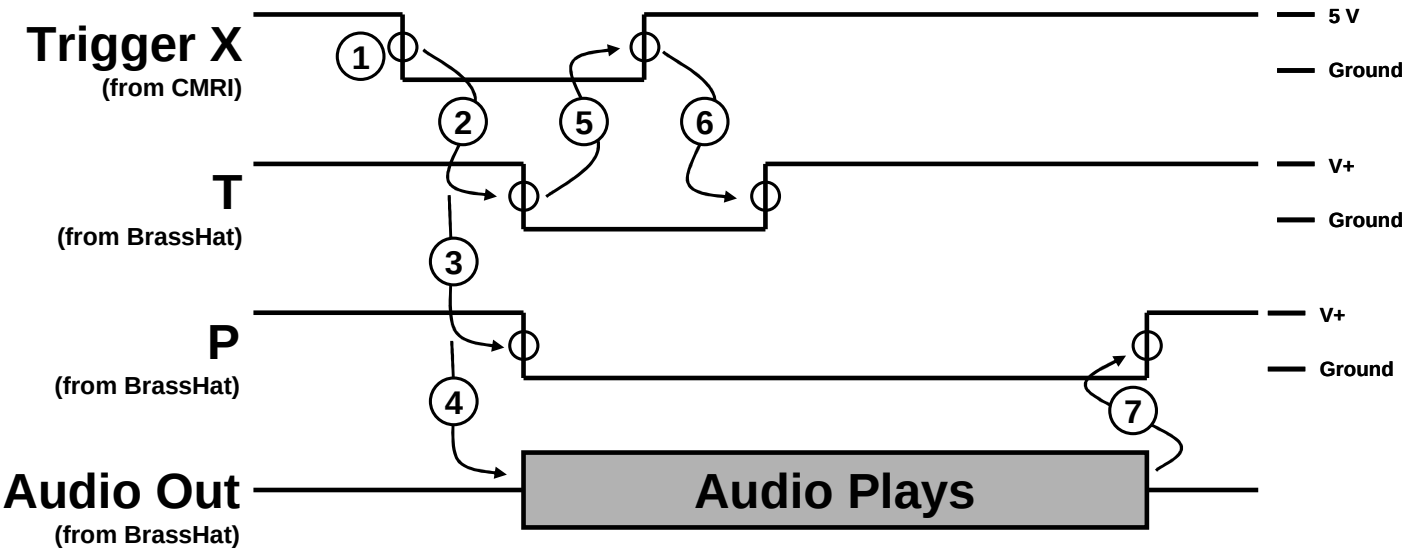
***Open Collector Output connects Output to Ground when active, Open Circuit when inactive.**

WARNING*: *System power must not exceed 12 Volts as this will damage the circuit board.

Figure 6: Connecting C/MRI (Trigger Input 3 as example)

Timing relationships between these **Sound Recorder** inputs and outputs (I/O signals) and audio output are shown in **Figure 7**. In the figure, time progresses from left to right and signal levels are shown between +5 Volts and Ground or V+ and Ground.

Warning: Voltage V+ is set by C/MRI (or other connected system). V+ must not exceed 12 Volts as this will damage the Sound Recorder circuit board.



WARNING: ***V+ must not exceed 12 Volts as this will damage the circuit board.***

Figure 7: Trigger & Playback Handshake

As shown in **Figure** 7, the signal handshake sequence is as follows:

1. C/MRI pulls any Trigger Input (Trigger X) to Ground.
2. **Sound Recorder** detects the drop in Trigger X and pulls T to ground.
3. **Sound Recorder** pulls P to ground.
4. **Sound Recorder** begins audio playback.
5. C/MRI detects the drop in T and releases Trigger X.
6. **Sound Recorder** detects the rise in Trigger X and releases T.
7. When audio playback finishes, **Sound Recorder** releases P.

C/MRI software can use this signal handshake for complete control of **Sound Recorder**.