Ringing Generator Module Break Out Board

Revision 0.2 10/07/2023

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This document describes the Ringing Generator Module Break Out Board and how to assemble and install it. This board provides a convenient mounting for several types of PowerDsine ™ and Black Magic ™ modules which produce 20Hz ringing signals from 5- or 12-volt DC inputs. As far as I can tell, these modules are all out of production, but they appear for sale on eBay and Telephone Collectors' lists from time to time. These are handy for demonstrations, model railroad dispatching systems and community theatre applications.

Revision History
V0.1 – first pass – September 17, 2023
V0.2 – minor changes – October 7, 2023

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1 INTRODUCTION

This document describes the Ringing Generator Module Break Out Board and how to assemble and install it. This board provides a convenient mounting for several types of PowerDsine ™ and Black Magic ™ modules which produce 20Hz sinewave ringing signals from 5- or 12-volt DC inputs. As far as I can tell, these modules are out of production, but they appear for sale on eBay and Telephone Collectors' lists from time to time. These are handy for demonstrations, model railroad dispatching systems and community theatre applications.

- Small Footprint 2 x 2.75" (5x7 CM) by ~ .5" high depending on module used.
- Fits in MRCS standard 7CM "Snap Track"
- Power connections on 2.54 mm screw terminals or 2.1mm Barrel Jack. One 12V "Wall Wart" can be daisy chained to power several adapters using the 12V screw terminal connections.
- Supports the Inhibit (INH) function on PowerDsine modules and a voltage divider provides a convenient 5V reference voltage so that an external contact (NC to inhibit) can gate ringing.
- Available as a panel of two bare boards, you supply the module. If you have modules but want us to assemble it, please contact us at sales@modelrailroadcontrolsystems.com

Schematic, circuit board layouts and CAD files are available on the product page on our website and on my GitHub page https://github.com/SethNeumann.

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2 IDENTIFICATION AND INFORMATION

2.1. BOARD LAYOUT

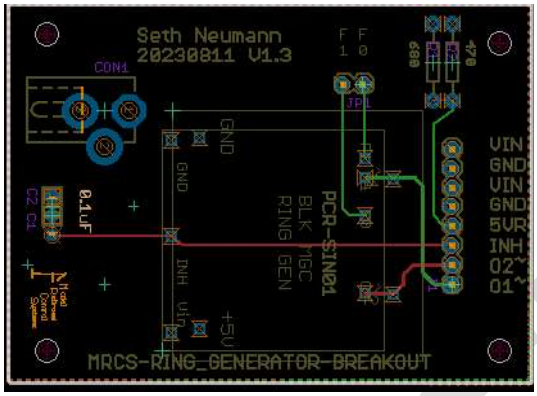

Figure 1 - Rev 1.3 Board Layout

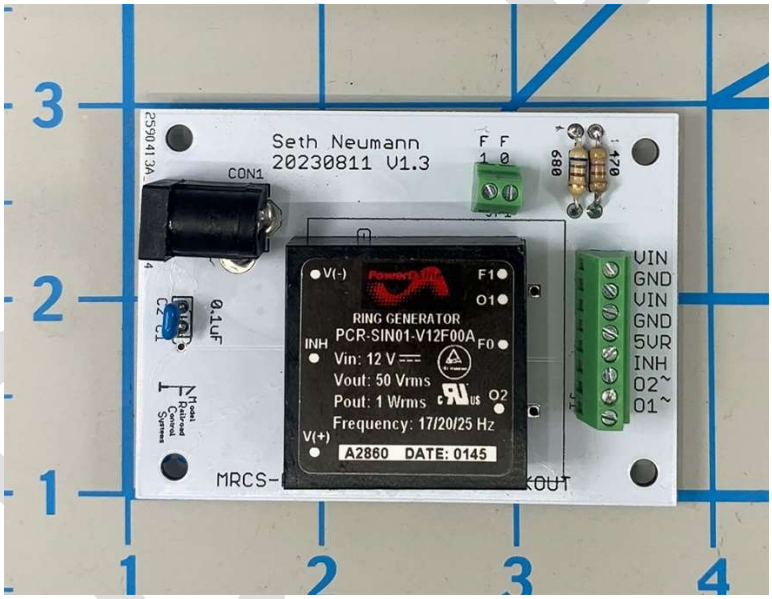

Figure 2 – Rev 1.3 Board with PowerDsine SIN01 Module

This board is sold as a panel of 2. If you are interested in alternate connectors, large quantities, or custom modifications please contact us at sales@modelrailroadcontrolsystems.com.

2.2. BILL OF MATERIALS

Qty	Value	Device	Package	Parts	Description
1		CONNECTOR-DC-POWER-RA	DCJ0202	CON1	DC POWER JACK
1		CONNECTOR-M08LOCK	1X08_LOCK	J1	Header 8
1		JUMPER-2PTH_LOCK	1X02_LOCK	JP1	Jumper
1	0.1uF	CAPPTH1	C050-024X044	C1	monolithic C1 OR C2)
0	0.1uF	CAPPTH2	C-PTH-0.100	C2	
1	470	RPTH04	AXIAL-0.4-RES	R2	Resistor
1	680	RPTH04	AXIAL-0.4-RES	R1	Resistor
1	PCB-MRCS-RING-GEN	PCB-MRCS-RING-GEN	1/2 of panel of 2		

Table 1- Bill of Materials Rev 1.3

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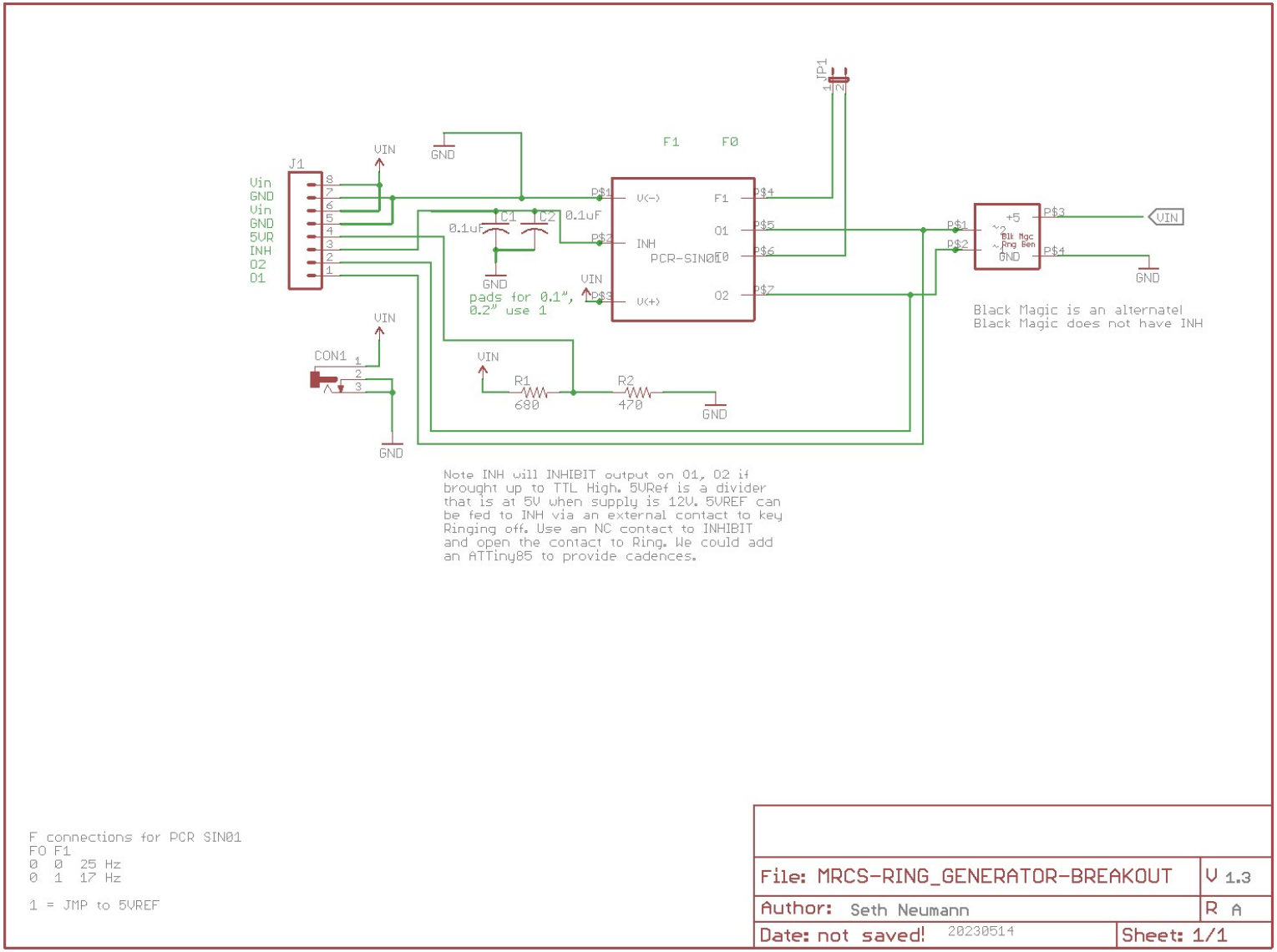

Figure 3 - Rev 1.3 Schematic

3 OPTIONS

3.1. CONNECTORS

The main (J1) Connector is on 2.54mm (0.100”) centers. The +V and GND inputs are in parallel with the 2.1 x 5.5 mm. barrel jack and may be used to daisy chain power among multiple Ring Generator breakouts or other 12V loads, subject to the capacity of the 12V wall wart. Note that some Black Magic ™ devices require 5V, so check, also check the current requirements of your module (see table below), if so just use a 5V power supply.

You can omit the barrel jack if wiring directly from a 12VDC auxiliary bus. You can also use a “CATV Power adapter” to plug power from an power auxiliary bus into the barrel jack.

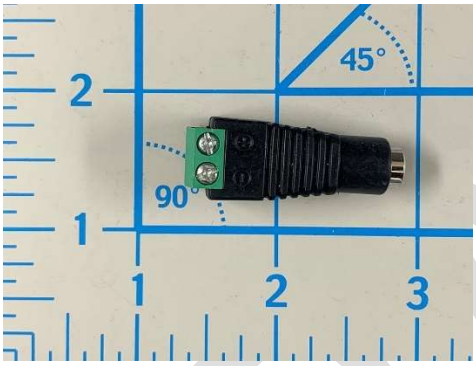

Figure 4 - "CATV Power adapter”

Designation	Comment
VIN	Input Voltage – select for your module, in parallel with DC Power Jack
GND	Negative connection, usually ground
VIN	Input Voltage – select for your module, in parallel with DC Power Jack
GND	Negative connection, usually ground
5VR	For PowerDsine modules – center of voltage divider to INHibit ringing
INH	INHIBIT: Apply 5V here to inhibit ringing, can also use external logic level device such as an Arduino to generate arbitrary ring cadences. Be sure to ground the Arduino and ringing generator breakout together.
O2~	AC output 20/25~ at 50-85V depending on module
O1~	AC output 20/25~ at 50-85V depending on module

Table 2 - Main Connector

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3.2. FREQUENCY SELECTION (PCR-SIN01ONLY)

The PCR-SIN01 states on the case that it can operate at 16.7/20/25 Hz. Perusal of SIN06 (I don't have an example to test) documentation suggests that tying F0/F1 to 5V will result in other frequencies. I found that the SIN01 with F0/F1 left floating will produce 25 Hz ringing (works fine for a straight-line ringer) and tying F1 to 5VR results in 16.7 Hz. I wasn't able to get F0 to do anything. Interestingly, grounding F1 produced the same (16.7Hz) result, but the DC position was offset slightly. Connecting both to 5VR also produced 16.7 Hz. My sample(s) may have been defective or there may be some other function of F0 that I am unaware of. Please contact me at the email address above if you have any insight.

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4 ASSEMBLY

All components are through-hole technology with wire leads for ease of DIY assembly. The general rule is to install the lowest components first, working towards components that are higher off the board. This enables you to support the low components as you solder them. The suggested order assumes you are using the barrel connector. If you choose to use different connectors, check the heights, and vary the build order accordingly.

[ ] Resistors

[ ] Install resistors R1, R2, these are voltage divider that yields ~5V with a 12V input. If you are using Black Magic ™ modules, not using the inhibit function or are using an Arduino or other logic level device to control the output, you can omit the resistors.

[ ] Screw Terminals

[ ] Install J1. This is an 8 position 2.54 mm screw terminal. Note that only the O1~ and O2~ terminals are required. If you aren't using the INHibit function and don't need to daisy chain power, the other positions can be left open and a 2 position terminal may be used.
[ ] Install the 2 position jumper or screw terminal for F0/F1. This is used by the PowerDsine PCR-SIN01-V12F00A. Most users will omit this connector.

[ ] Capacitors

C1 and C2 are alternates at 0.1" or 0.2" spacing and provide noise protection on the INHibit line. You can omit them for Black Magic ™ modules. I use monolithic caps for this application, and they come in both footprints

[ ] Barrel Jack

[ ] Install the DC Power barrel jack, if used

[ ] Ring Generator Module

[ ] Install your ringing generator module with pads provided. (I made EAGLE CAD "Library models" of the various modules I have. Contact me if you have something different and I can probably make a model for it and make a board version using it).

Module	INH?	Input V	Input Current Idle	Input Current Active	Ring Volts Out	Nominal Freq/Func
PowerDsine PCR SIN01	Y	12 VDC	52 mA @ 12V	270 mA	50 VAC	25 Hz Sine
PowerDsine PCR SQR05	Y	12 VDC	63 mA @ 12V	325 mA	70 VAC	20 Hz Square
Black Magic	N	5VDC	165 mA @ 5V	1.05 A @ 5V	86 VAC	20 Hz Square

Table 3 - Modules Supported

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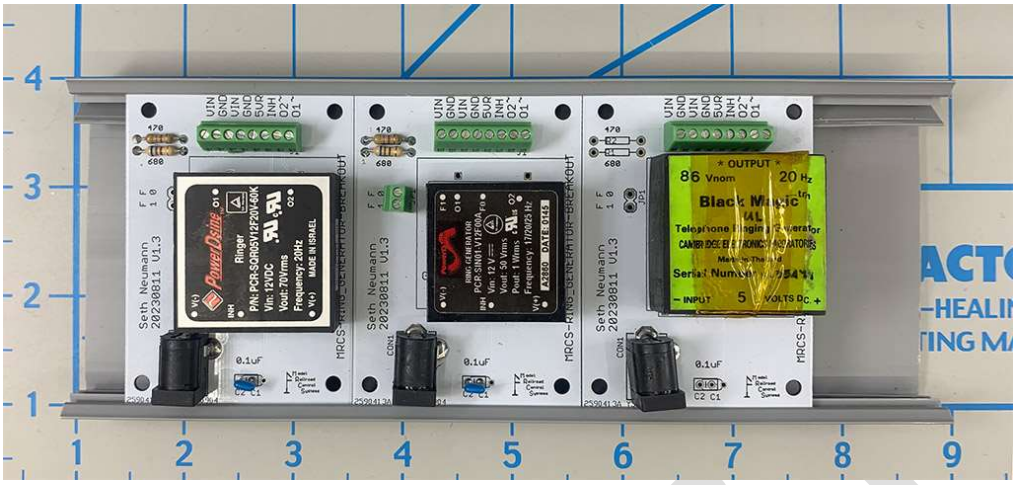

Figure 5 - Examples of 3 Boards with 3 different Modules Mounted in Snap Track

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5 TESTING

Testing your Ringing Generator board is quick and simple:

1. Connect a suitable ringer (say a C4A from a 500 set or just put a 500 set) across the O1~ and O2~ terminals.
2. Prepare a jumper wire with one end in the 5VR terminal and the other stripped.
3. Apply power (as determined by your module) to either the barrel jack or the screw terminal.
4. The ringer should start ringing.
5. Apply the jumper from 5VR to INH (PowerDsine modules only) and ringing should stop until you remove the jumper.

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6 INSTALLATION AND CONNECTIONS

6.1 TYPICAL CONNECTIONS

Figure 6 - Simple Power Switching - interrupt input power

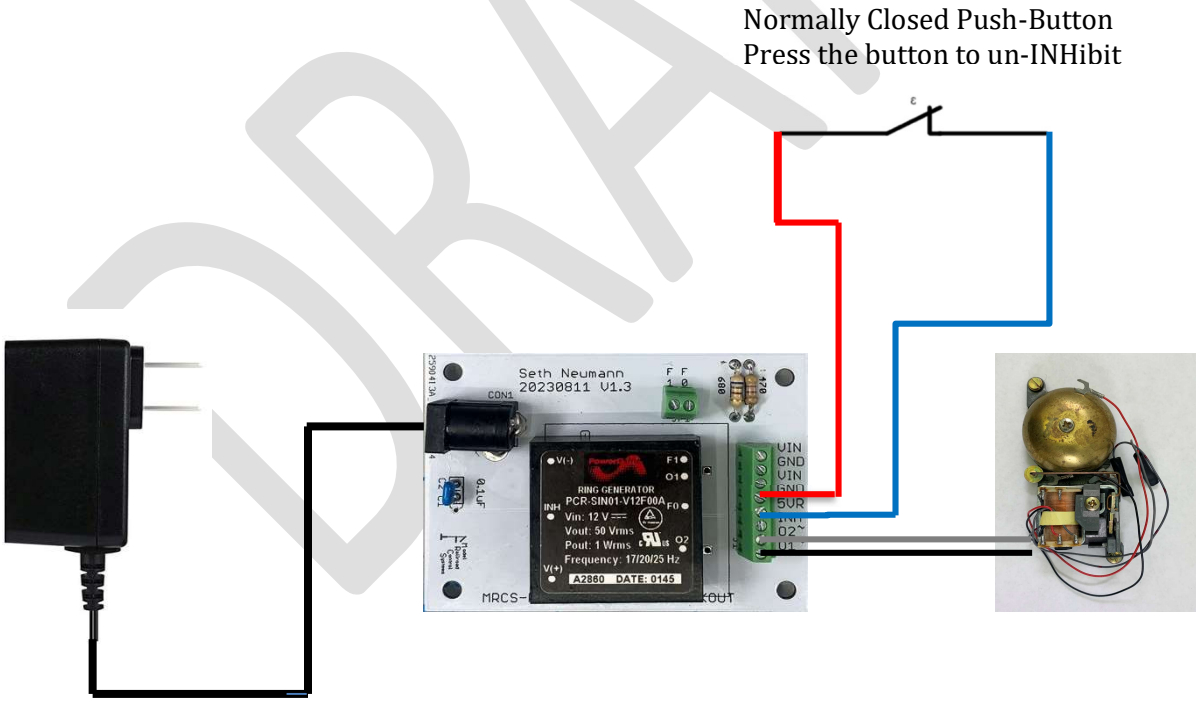

Figure 7 - Power Always On - Release INHibit (PowerDsine only)

If in doubt, contact us! sales@modelrailroadcontrolsystem.com