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# MorseKOB Sounder Driver

Revision v1.0, 06/02/24

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## Introduction

This document describes the MorseKOB Sounder Driver board and how to assemble and install it.

## Revision History

V1.0 – first pass – June 3, 2014

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## 1 INTRODUCTION:

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My friend Jerry wanted to play messages from his prototype in American Morse as “audible scenery” in his dispatcher’s office. So I made this board for him. The MorseKOB Sounder Driver is a simple circuit board to drive a real telegraph sounder from the popular freeware American (“Railroad”) Morse code practice utility: MorseKOB. MorseKOB may be obtained at <https://sites.google.com/site/morsekob/home?authuser=0>. I developed this board from a sample circuit on the MorseKOB site at <https://sites.google.com/site/morsekob/morsekob25/interface?authuser=0>. The MorseKOB Sounder Driver is a compact board, about 2” x 2” that provides a single place to make all your connections for the RS232 Dongle, Power and a 0Sounder.



**Figure 1- MorseKOB Sounder Driver**

With this board and a suitable “RS 232 Dongle” (note that MorseKOB is using an “off-label” application of the RS-232 RTS – “Request to Send” line and some RS232 adapters won’t work, I used a Sabrent CB-FTDI USB to Serial Cable Adapter. As of this writing (June 2024) it was available from a major on-line marketplace for <\$15).

Schematic, circuit board layouts, CAD files and code are available on my GitHub page <https://github.com/SethNeumann/MRCS-MorseKOB-Sounder-Driver>

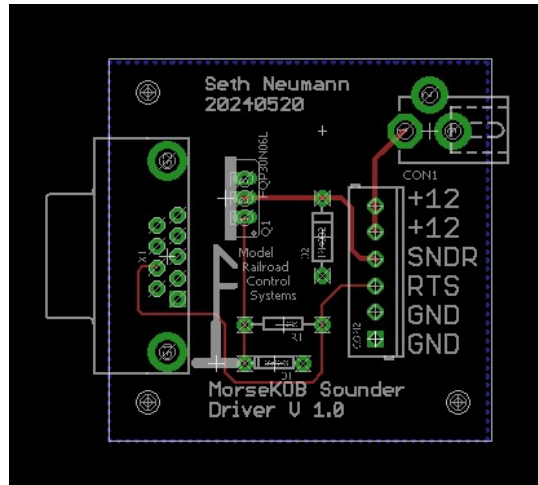
My friend Jerry wanted to play messages from his prototype in American Morse as “audible scenery” in his dispatcher’s office, so I made this board so he could type or paste his messages into MorseKOB and hear them on a vintage telegraph Sounder.

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## 2 IDENTIFICATION AND INFORMATION

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### 1.1. BOARD LAYOUT



**Figure 2 - Version 1.0 Board Layout**



**Figure 3 – MorseKOB Sounder Driver Board Top View**

This board is sold as a single unit, assembled, and tested or as bare board. If you are interested in alternate connectors, large quantities, or custom modifications please contact us at [sales@modelrailroadcontrolsystems.com](mailto:sales@modelrailroadcontrolsystems.com)

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### 3 BILL OF MATERIALS

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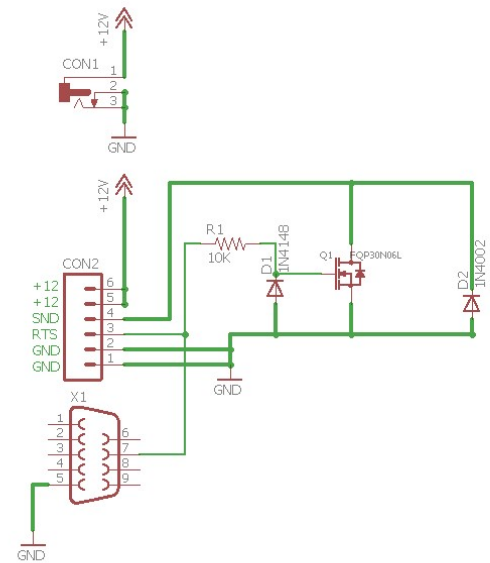
1	DB9FEMALE	DB9	X1	DB9 Connector	Jameco	DE09-SL-25
1	10K	RPTH04	R1	Resistor	Jameco	691104
1	1N4005	DIODEPTH	D2	Diode	Jameco	76988
1	1N4148	DIODE1N914	D1	Diode	Jameco	36311
1	TIP120	TIP120 Darlington	Q1A	Darlington	Jameco	32993
1	FQP30N06L	MOSFET-N--TO220V	Q1	CJ2302:SMD MOSFET N-CH 20V-2.1A DMN4468 - SO8 30v/10A	Jameco	669871
1	KOB Driver	PCB		Circuit board	MRCS	

Table 1- Bill of Materials Ver 1.0

#### 3.1. SUBSTITUTIONS

- Use either the Darlington or the MOSFET, they are more or less equivalent. I like the MOSFET, but the original design uses the Darlington. They are within a few cents of each other in price and the key specs are similar so use whatever is on your workbench.
- Diode D1 is “any small signal switching diode” so feel free to use a 1N4148 if you have one.
- Diode D2 is a 1N4005 but depending on the winding resistance of your sounder and the voltage you choose other members of the 1N400X family may work, too. 1N4005 is a safe value.

## 4 SCHEMATIC



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TITLE: MRCS-MorseKOB\_Sounder\_Driver

Design by: Seth Neumann

REV:  
1.0

Date: 5/28/2024 7:57 PM

Sheet: 1/1

Figure 4 - Version 1.0 Schematic

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## 5 OPTIONS

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### 5.1. CONNECTORS

- The 2.1mm x 5.5mm barrel jack (for a wall wart) provides a convenient connection to power the MorseKOB Sounder Driver directly from a wall wart or you can use a 2.1mm – screw terminal connect to power from your layout’s aux power bus as a handy quick disconnect. These connectors are available from major marketplaces for less than \$2.00 ea. in a set of male and female connectors.



**Figure 5 - Screw terminal to 2.5x5.5 mm plug**

- The board has a position 3.5mm screw terminal block. The pins are:
  - 12V (or whatever your sounder supply is)
  - 12V (or whatever your sounder supply is) – usually feeds the positive terminal of the sounder.
  - Output to Sounder
  - RTS (this is the input from the RS232 dongle) – if you prefer to cut up an old RS-232 cable.
  - GND – one of these MUST be connected to the same ground as the Sounder Power Supply
  - GND – spare terminal for daisy-chaining ground.You do not need to use all of these and may be able to use a smaller connector that just covers the pins you need.
- 9 Pin DB9 Female. This allows for an easy connection to an RS232 dongle.

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## 6 ASSEMBLY

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### 6.1. DETAILED ASSEMBLY INSTRUCTIONS

[ ] All of the components are through-hole technology with wire leads. A lead bender is a useful tool for forming the leads at 90 degrees for easy insertion into the pad holes. See “handy tools” below if you are new to circuit board 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. Most of the components will stay in place as you flip the board over to solder, but if not use a small piece of cardboard to hold them in place as you flip the board over. Use 0.015 solder unless otherwise indicated to help control the flow of solder onto the work.

#### [ ] Resistor

[ ] Install R1. Use your lead bender to make 0.400 bends. There is no polarity but for consistency I put the gold “tolerance” band towards the right while holding the board so the lettering on the silk screen is right side up.

#### [ ] Diodes

[ ] Install D1 (small signal switching diode) Use a piece of .250 square styrene or tube as bender for an 0.300 component. Observe polarity!

[ ] Install D2 (Power diode) Use your lead bender to make 0.400 bends. Observe polarity!

#### [ ] Screw Terminal

[ ] Install the 6 position (most 3.5mm terminals have slots to gang them so you may use 2 3-position screw terminals) screw terminal with wire openings pointing off the board.

#### [ ] Install the DC Power Jack (if used)

[ ] Use 0.031 solder for this. Fill the holes with solder so there are no gaps.

#### [ ] Install the DB9 female

[ ] Use fine solder for the 9 pins and 0.031 solder for the mounting prongs. Fill the holes with solder so there are no gaps.

#### [ ] Install the power device (MOSFET or Darlington)

[ ] The Darlington and FET use the same pinout: 1 is input (gate or base), 2 is output (drain or collector), 3 is ground (source or emitter). The “fin” side goes to the white line.

### THIS WOULD BE A GOOD TIME TO MAKE SURE YOU DON'T HAVE ANY SHORTS!

Use your bench supply with a 2.1 mm power adapter and apply 12V. (a 12V wall wart with your voltammeter in series will do also, a few clip leads will be handy.) You should not be drawing any current and the output of the supply should hold at 12V. If it is drawing current, look for solder



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bridges. The 12V input is just a tie point so all connections can be made to the MorseKOB Sounder Driver for a neat, clean installation.

## 6.2. LIST OF HANDY TOOLS FOR THE ASSEMBLER

- Lead Bender
- Side Cutters
- Small Needle nose Pliers
- Temperature controlled solder iron. Do not skimp here: this is an extremely useful tool for everything you do in model railroad electronics, get one with replaceable tips, the finer the better! Weller (such as WE1010 NA) and Hako (FX888D) make very nice irons that balance well in your hand for <\$150 both [are](#) available from Digikey and Amazon.
- 0.015 solder for fine pitch items like the DB9 connector (also handy on decoders)
- 0.031 solder for larger items like the power connector
- Isopropyl alcohol (91% or 99%) for cleaning left over flux off the board
- Bench power supply – this gives you precise control of the voltage and allows you to measure and limit current as you test. You can see if you are drawing the correct amount of current (if not, that is your first indication that something is wrong). I like these: [https://www.banggood.com/Topshak-NPS3010W-110V-or-220V-Digital-Adjustable-DC-Power-Supply-0-30V-0-10A-300W-Regulated-Laboratory-Switching-Power-Supply-p-1474957.html?cur\\_warehouse=CN&rmmds=search](https://www.banggood.com/Topshak-NPS3010W-110V-or-220V-Digital-Adjustable-DC-Power-Supply-0-30V-0-10A-300W-Regulated-Laboratory-Switching-Power-Supply-p-1474957.html?cur_warehouse=CN&rmmds=search) Equivalent units are available from many suppliers.
- Digital Volt-Ohm-Milliamp meter. There are many available from the marketplaces. Your choice will depend on features like quality of the probes and how the stand works, for example Harbor Freight has very functional meters for as little as \$10 but the probes are not very rugged.

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## 7 INSTALLATION AND CONNECTIONS

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### 7.1. POWER

Power is nominally 12 Volts DC, but the sounders are getting to be 100 years old or more, so check the DC resistance of the coil with Volt/Ohm meter. I'd be a little suspicious of anything with a coil of less than 40ohms! In general, the lower the coil resistance, the higher the voltage to make it work. Start with a low voltage and increase until it sounds crisp.

Major market places offer “desktop” supplies with adjustable outputs, such as [https://www.amazon.com/SHNITPWR-Adjustable-Universal-100V-240V-3-5x1-35mm/dp/B08BL4QMGM/ref=sr\\_1\\_3?crid=DOAS1FP841FW&dib=eyJ2IjojMSJ9.I1DyHCxfNM9wELjuDk22wpQ-nVgli6IznmrGB29HyS8ouJs454QqIcOOIQ\\_hu89oI2qnbiL5CdVYAWRsbznislj6DWT5FPHomOIFsuldkkvUb\\_8BV3bl\\_tcVjkFBeG9LDeIkQ3i-ZxQyRZb06h-R1B2UeTJbD6Zd8lFCmtaqY0zFa\\_kOdISmyjjZtX5XsvYpXnRLQrTN2NoIcaq4Eo9zqHcCcDA6MBYJY\\_bk\\_evEE.NxshCEZwmPomGcKrrdd-88VaNQ3JC2Kcjni7Snu\\_I7s&dib\\_tag=se&keywords=universal%2Blaptop%2Bpower%2Bsupply%2Badjustable&qid=1717369803&sprifix=adjustable%2Blaptop%2Bpower%2B%2Caps%2C238&sr=8-3&th=1](https://www.amazon.com/SHNITPWR-Adjustable-Universal-100V-240V-3-5x1-35mm/dp/B08BL4QMGM/ref=sr_1_3?crid=DOAS1FP841FW&dib=eyJ2IjojMSJ9.I1DyHCxfNM9wELjuDk22wpQ-nVgli6IznmrGB29HyS8ouJs454QqIcOOIQ_hu89oI2qnbiL5CdVYAWRsbznislj6DWT5FPHomOIFsuldkkvUb_8BV3bl_tcVjkFBeG9LDeIkQ3i-ZxQyRZb06h-R1B2UeTJbD6Zd8lFCmtaqY0zFa_kOdISmyjjZtX5XsvYpXnRLQrTN2NoIcaq4Eo9zqHcCcDA6MBYJY_bk_evEE.NxshCEZwmPomGcKrrdd-88VaNQ3JC2Kcjni7Snu_I7s&dib_tag=se&keywords=universal%2Blaptop%2Bpower%2Bsupply%2Badjustable&qid=1717369803&sprifix=adjustable%2Blaptop%2Bpower%2B%2Caps%2C238&sr=8-3&th=1)

## 7.2. SYSTEM CONNECTIONS:

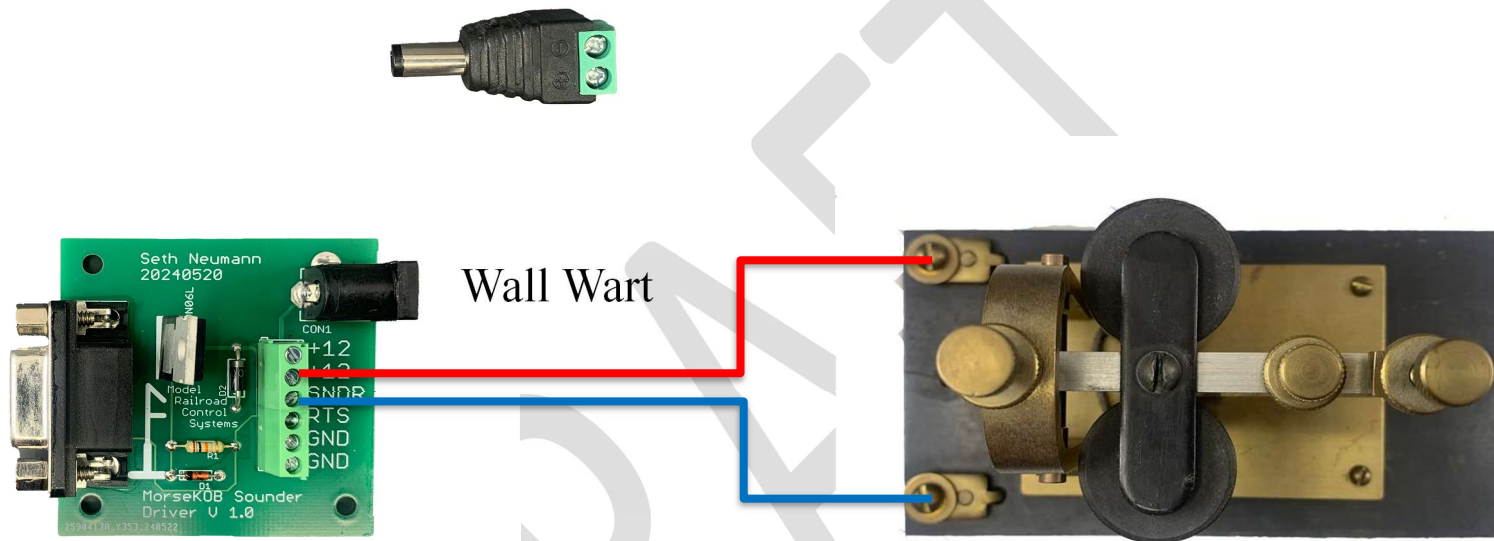
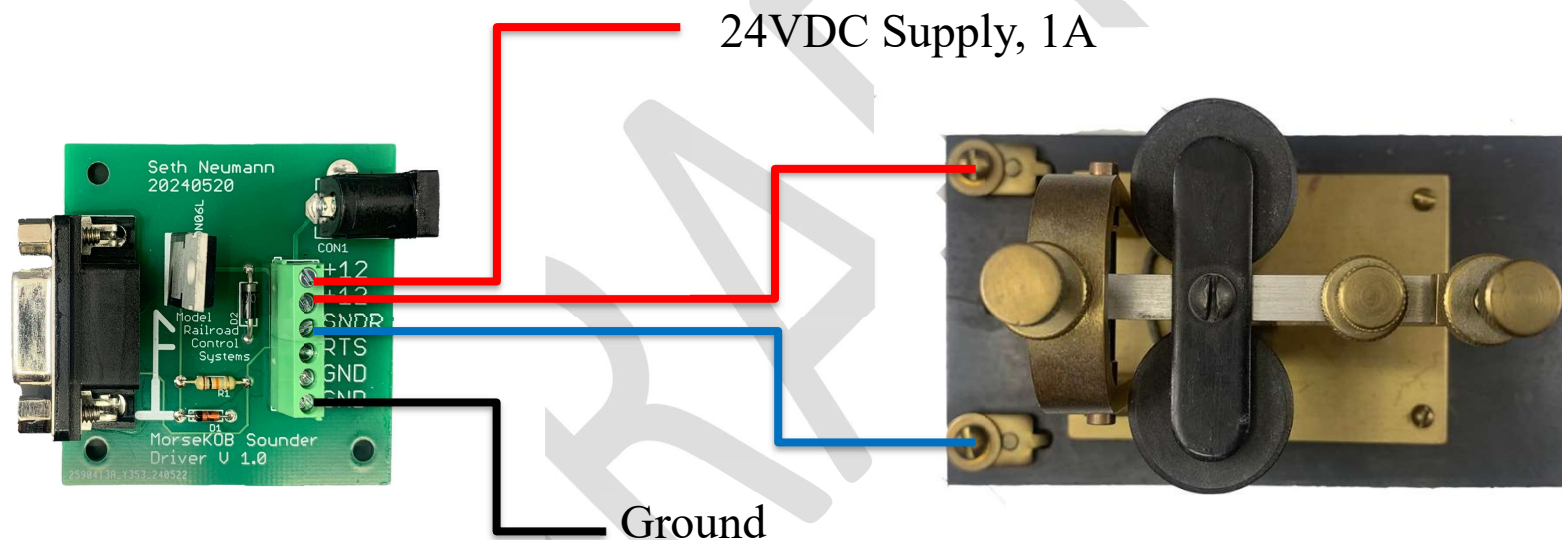


Figure 6 - Connection with 2.1mm Plug (Wall Wart)

The easiest way to connect is:

1. Plug the 9-pin male end of the dongle into the female connector on the left of the MorseKOB Sounder Driver
2. Connect one terminal of the Sounder to one of the “12V” terminals on the green connecting block.
3. Connect the other terminal (blue wire in this diagram) to the “SNDR” terminal on the MorseKOB Sounder Driver.
4. Plug a suitable wall wart with a 2.1mmx5.5mm plug into the “barrel jack” on the upper right of the MorseKOB Sounder Driver. block (note mine worked better with a 24V supply; the board will handle any voltage up to 48VDC) Try the search term “24V wall wart” in your favorite marketplace.

5. Plug your USB dongle into a USB Port on your computer (Morse KOB 3.0 runs on Mac OS and Linux, in addition to Windows)
6. You may want to add a “snubber” across the terminals of the sounder (on the sender, NOT at the Sounder Driver board or the leads will act like a big transmitting antenna. See <https://sites.google.com/site/morsekob/morsekob25/interface?authuser=0#h.83d580pbt4d1>. I like the 1N4005 approach but some people think it makes the sounder release too slowly. Since I can barely hear anyway it doesn't make much difference to me!
7. Configure Morse KOB (see next section)

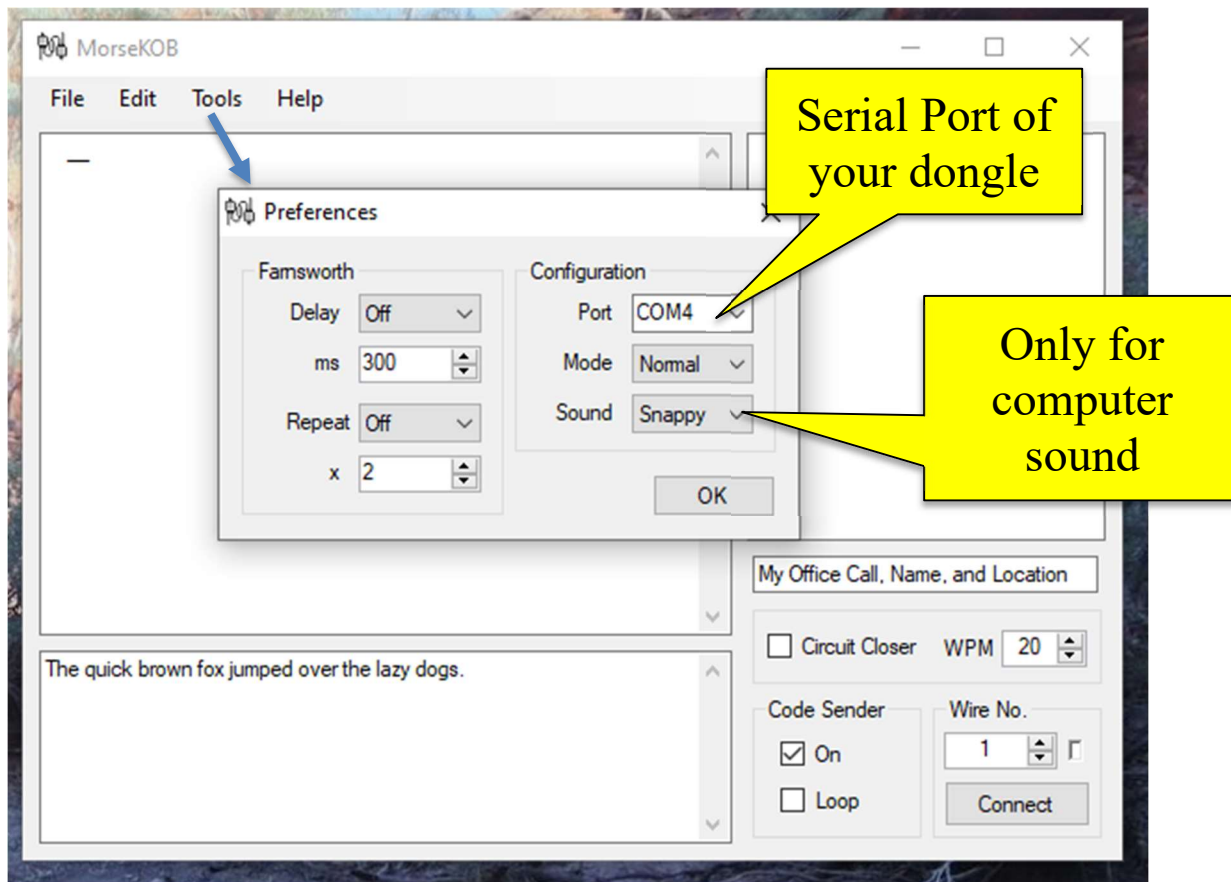


**Figure 7 - Alternate Connection using Screw Terminals**

If you don't want to use barrel plug (note they are available – see diagram above – with screw terminals) you can connect directly to the MorseKOB Sounder driver. The “12V” terminals are bussed together and the Ground (GND) terminals are bussed together. RTS is also brought to the screw terminal, if you'd prefer to make your own DB9 cable

## Configuration:

Once you've got MorseKOB loaded, you'll need to set a few things up. These instructions are not exhaustive, so check the MorseKOB documentation, but this worked for me:



**Figure 8 - MorseKOB Control Panel**

Go to FILE/TOOLS/PREFERENCES

Find your Dongle's serial port (hint: it is almost certainly NOT COM1) and select it under "Configuration." Mode should be Normal and Sound should be normal, it will play through your computer speakers, so just mute the computer sound when using MorseKOB with your sounder.

Type, paste or open a file, which will appear in the lower left. Click Code Sender On. Leave loop off and circuit closer off.

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### 7.3. TESTING:

Testing your MorseKOB Board is straight forward: A 12VDC buzzer or even a big LED will work fine as a check of your output. Connect the positive end to the “12V” terminal and the negative end to SNDR. Connect your MorseKOB Sounder Driver to your dongle (See installation, below), Apply power and send a message you should see the LED flash or hear the buzzer buzz.

### 7.4. QUESTIONS:

Check the MorseKOB documentation, especially the tutorial, for general setup. For hardware issues contact [sales@modelrailroadcontrolsystems.com](mailto:sales@modelrailroadcontrolsystems.com)

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