Stall Motor to MP Motor Adapter

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Introduction

This document describes the Stall Motor to MO Motor board and how to assemble and install it.

Revision History

V0.1 – first pass – May 31, 2023

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1   INTRODUCTION

Sometimes the handy way to control a turnout is to use a segment of an accessory decoder like an NCE Switchit or Switch 8 or a segment of Dr. Chubb's SMC-12, but you've got an MP series motor which draws 100mA (when moving only) which draws a lot more than op-amp based decoders can supply. The "Stall Motor Control Adapter for MP motor" is a simple and inexpensive board that connects to the output of the stall motor control device and switches auxiliary 12V power to drive the MP Motor.

- Small Footprint 1.25" x 1.75" x 0.5" high
- Power connections on 3.5mm screw terminals or 2.1mm Barrel Jack. One 12V "Wall Wart" can be daisy chained to power several adapters.
- Uses a miniature relay with spike suppression diode.
- Available assembled and tested or a panel of 6 bare boards.

Output connection pads are on 3.5mm centers.

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.

2 IDENTIFICATION AND INFORMATION
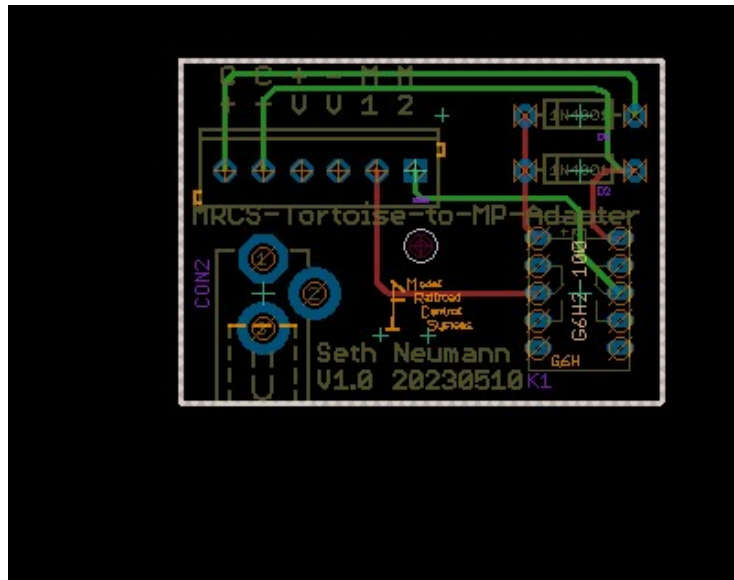
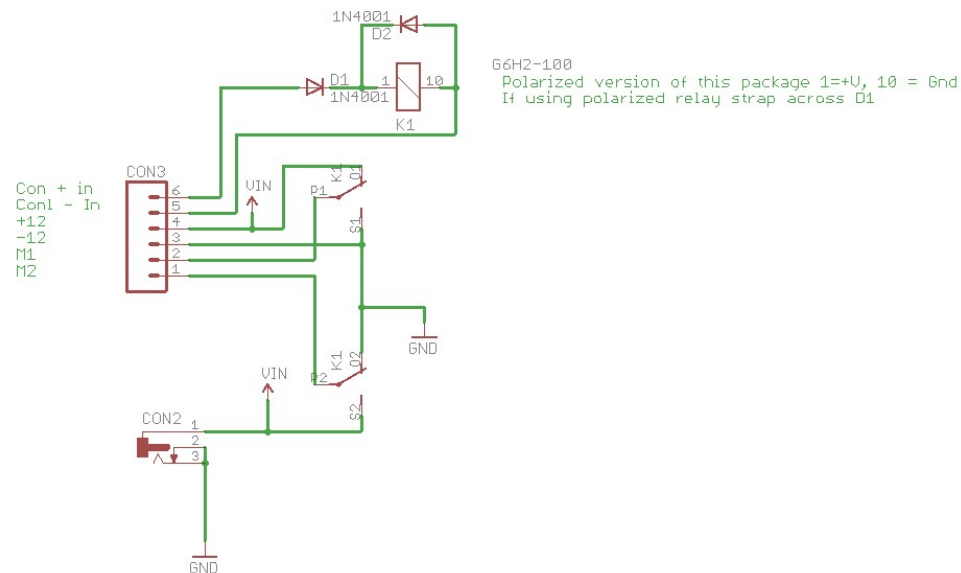### 2.1. BOARD LAYOUT

Figure 1 - Rev 1.0 Board Layout

Figure 2 – Rev 1.0 Board with components

This board is sold as a single unit, assembled, and tested or as bare board, panel of 6. 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	CON2	DC POWER JACK
1		CONNECTOR-M063.5MM-6	SCREWTERMINAL-3.5MM-6	CON3	Header 6 Standard 6-pin 0.1 header"
2	1N4001	DIODEPTH	DIODE-1N4001	D1, D2	Diode
1	G6H2-100	G6H2-100/HFD31	G6H2-100	K1	RELAY
1	Tort Adapter				PCB

Table 1- Bill of Materials Rev 1.0

1N4001
D2

G6H2-100
Polarized version of this package 1=+V, 10 = Gnd
If using polarized relay strap across D1

D1
1N4001
K1

CON3
Con + in
Conl - In
+12
-12
M1
M2

VIN
P1

VIN
P2

CON2
GND

GND

A Template for Eagle Projects

File: MRCS-Tortoise-to-MP-Adapter	V 1.0
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Figure 3 - Rev 1.2 Schematic

3   OPTIONS

3.1. CONNECTORS

Connectors are on 3.5mm centers. The +V and -V inputs are in parallel with the 2.1 x 5.5 mm. barrel jack and may be used to daisy chain power among multiple "Stall Motor Control Adapter for MP motors" or other 12V loads, subject to the capacity of the 12V wall wart. 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 auxiliary bus into the stall motor adapter.
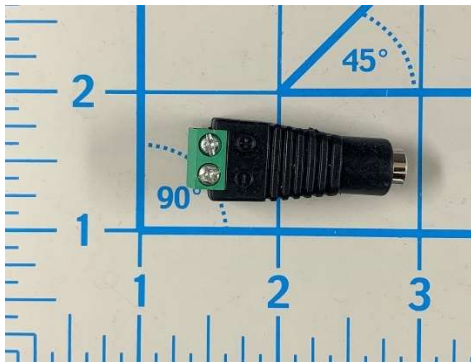

Figure 4 - "CATV Power adapter"

The C+/C- terminals go to the device that expects to control a stall motor (Switchit/Switch8/SMC-12 etc)/

The M1/M2 terminals go to Poz1/Poz2 on an MP1/MP5 or M1/M2 on an MP10. See figure 5 below for 3 wire operation.

4   ASSEMBLY

All components are through-hole technology with wire leads for ease of DIY assmebly. 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.

[ ] Diodes

[ ] Install Diodes D1, D2
Note that some of the relays with the OMRON G6H2-100 footprint (like Kemet EA-2/EB-2) are available as a polarized relay. The board is layed out so that the internal diode is in the correct orientation, and in that case you can omit D1. D2 is a clamp to control spikes when the relay releases and should be used in all cases.

[ ] Relay

Install the relay, generally you will use a single coil (no latch) version, see comments on internal diodes above.

[ ] Screw Terminals

[ ] Install CON2. This is a 6 position 3.5mm screw terminal. 6 terminal version are sometimes hard to find but 2 and 3 position terminals have alignment slots so they can be ganged together.

[ ] Barrel Jack

[ ] Install the barrel jack, if used

5   TESTING

Testing your Stall Motor to MP motor board is quick and simple:

1. Connect C+ and C- across the stall motor controller you're using (such as 1A/1B on an NCE Switch8 Mk2)
2. Send a command to the decoder or stall motor controller. You should hear a faint click from the Stall motor to MP adapter as it changes status.
3. Wire M1 to M1 or Poz1 on the MP motor, Wire M2 to M@ or Poz2 on the MP motor. If you're controlling an MP1, connect +COM to +V on the Stall Motor to MP board. If the motor moves in the wrong direction, just reverse the inputs or outputs.
4. The MP motor should follow the commands to the stall motor controller.

6 INSTALLATION AND CONNECTIONS

6.1 TYPICAL CONNECTIONS

Most of the "stall motor decoders" use a device called a comparator or an operational amplifier ("op amp") to drive the stall motor. This is a reliable and inexpensive circuit and you can usually identify them by devices labelled LM324 or LM358 near the connections to the stall motor. The limitation of this circuit is that it's good for at most 30 or 40 mA, but it can provide that current indefinitely. This is great for Tortoise by Circuitron ™ or Hankscraft type stall motors but doesn't work for MPx motors which draw about 100mA while moving (about 3 seconds) but shut off at the end of travel. The op amp will happily drive the relay in the adapter.
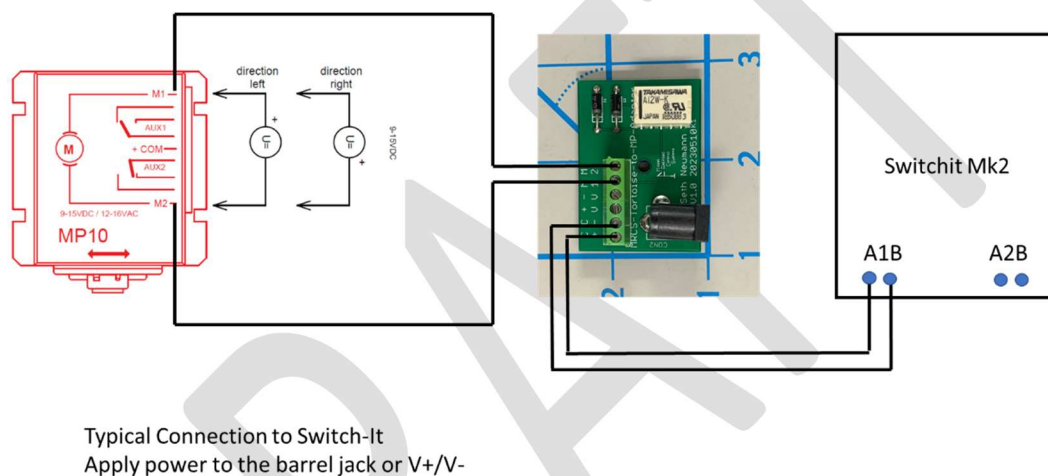

Typical Connection to Switch-It
Apply power to the barrel jack or V+/V-

Figure 5 - Connections for MP5 or MP10

MP1 Operation is similar but you must connect +V from the adapter to COM+ on the MP1
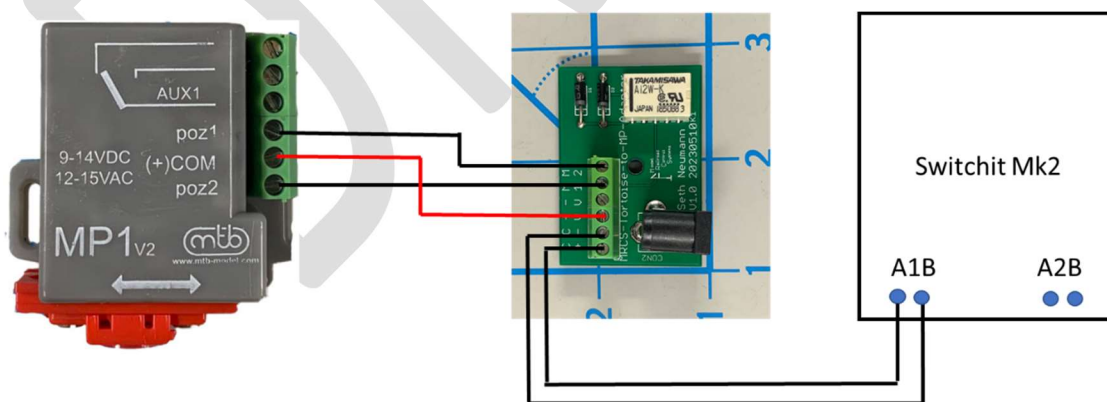
Figure 6 - Connections for MP1

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