

MODEL 852B PWM MODEL RAILROAD THROTTLE KIT ASSEMBLY INSTRUCTIONS

Before you start to assemble this kit be sure you have the following tools;

- Needle nose pliers
- Diagonal wire cutters
- Wire stripper
- Soldering iron – between 25W to 40W
- Electronics rosin core solder – **DO NOT USE ACID CORE SOLDER!**
- 8mm open end wrench
- #1 Phillips screwdriver
- 1/16" slot screwdriver
- 1/8" slot screwdriver

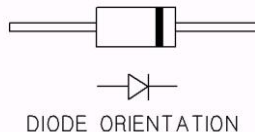
These instructions assume that the reader is familiar with printed circuit board soldering practices. If you are not familiar with electronics assembly please get some help. Install all parts in the order presented. Be sure the parts you are installing follow the indicated orientation. Do not attempt to de-solder parts without the aid of a de-soldering device or de-soldering braid otherwise irreparable damage to the PCB assembly may result. Be sure to read the assembly instruction set fully prior to beginning assembly.

PRINTED CIRCUIT BOARD (PCB) ASSEMBLY

RESISTORS - Install the following components into the printed circuit board. Bend both leads at a right angle to the body of the component and insert in the places indicated on the printed circuit board. Solder the leads on the underside of the printed circuit board and trim the leads flush with the printed circuit board.

PCB DESIGNATION	PART DESCRIPTION
241	Resistor – 240R – red – yellow - brown
303	Resistor – 30K – orange – black - orange
102	Resistor – 1K0 – brown – black - red
PGM (scale programming resistor) Value determines top speed of throttle – use one of the indicated values	Z – resistor – 1K6 – brown – blue – red N – resistor – 2K0 – red –black – red HO – resistor – 2K7 – red – violet - red

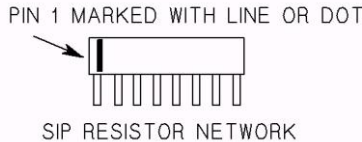
DIODES - Install the following components into the printed circuit board. Bend both leads at a right angle to the body of the component and insert in the places indicated on the printed circuit board. Solder the leads on the underside of the printed circuit board and trim the leads flush with the printed circuit board. Part orientation is critical. Refer to the following diagram for part orientation. Component band must face the indicated direction.



PCB DESIGNATION	PART DESCRIPTION
1N4148	Small glass diode – reddish body
1N4003	Small black diode
1N5402 – 2 places	Large black diode

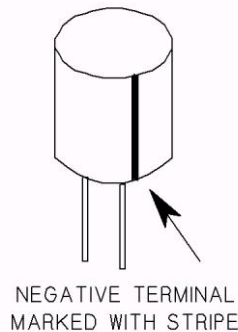
INTEGRATED CIRCUIT - Install the LM358 – 8 pin integrated circuit into the printed circuit board at the symbol marked “**358N**”. Solder the leads on the underside of the printed circuit board. Do not trim the leads. Orientation is critical. Note the “V” printed on the symbol on the PCB. The corresponding mark on the component will align with the “V”. If this component is installed wrong it will be destroyed on power-up.

RESISTOR NETWORK – Install the 8 pin SIP resistor network at the symbol marked “**103X4**”. Pin 1 must align with the diagonal line on the PCB symbol. Solder the leads on the underside of the printed circuit board. Do not trim the leads. Orientation is critical.



TRANSISTOR – Install the transistor MPSA13 at the symbol marked “A13” (small black 3 lead device). Follow the symbol orientation. Solder the leads on the underside of the printed circuit board and trim the leads flush with the printed circuit board. Part orientation is critical.

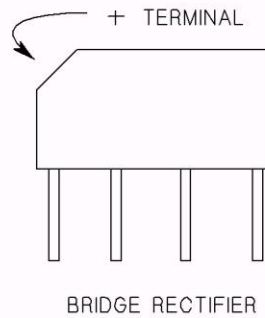
CAPACITORS – Insert in the places indicated on the printed circuit board. Solder the leads on the underside of the printed circuit board and trim the leads flush with the printed circuit board. Part orientation is critical. Refer to the following diagram for part orientation. Component stripe must face the direction of the dot beside each component symbol on the PCB.



PCB DESIGNATION	PART DESCRIPTION
224	0.22uF aluminum electrolytic capacitor
1U	1.0 uF aluminum electrolytic capacitor
22U – 2 places	22 uF aluminum electrolytic capacitor
470U	470uF aluminum electrolytic capacitor

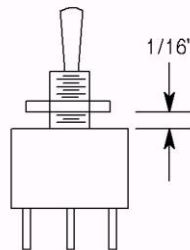
TRIMPOTS – Install 2 trimpots marked “**104**” (momentum) and “**102**” (zero) into their respective symbols. Note – in some kits the trimpot marked “**102**” may be substituted with a trimpot marked “**202**”. In either case this component is installed in the symbol marked “**102**”. Solder the leads on the underside of the printed circuit board. Do not trim the leads.

BRIDGE RECTIFIER – Install the 4 lead bridge rectifier at the symbol marked “**BRIDGE**”. Note the positive terminal is marked on the component and must be oriented to the “+” mark on the PCB. Solder the leads on the underside of the printed circuit board and trim the leads flush with the printed circuit board.



SPEED CONTROL – The speed control potentiometer should now be inserted into the PCB and soldered into place. Be sure to seat the control so that it is perfectly perpendicular to the PCB and that the metal tabs are fully engaged in their respective holes. The metal bracket above the PCB should sit tightly against the PCB. Be sure to solder the metal tabs as these will provide the required rigidity for the speed control potentiometer.

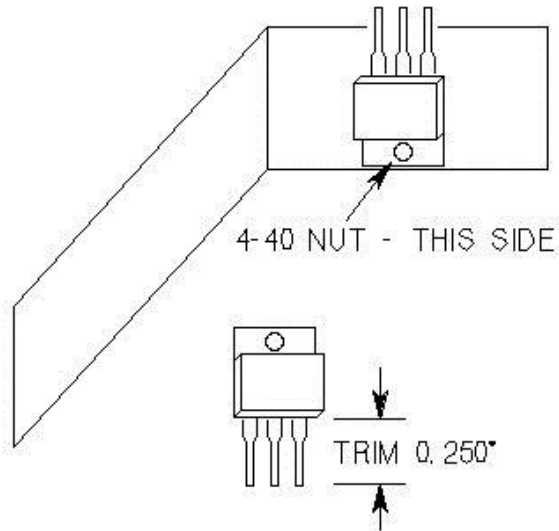
DIRECTION SWITCH – Install the **DIRECTION** switch into the PCB – **DO NOT SOLDER AT THIS TIME!** This component will be soldered in place at a later stage of assembly. Remove one bushing nut, the lock washer, and the indexed back-up washer. Discard the back-up washer. Adjust the remaining bushing nut so there is 1/16” between the nut and the body of the switch. Place the lock washer back on the switch bushing.



THIS COMPLETES ASSEMBLY OF THE PRINTED CIRCUIT BOARD. The next few steps will complete the assembly and then your new 852B throttle will be ready to use!

Insert the printed circuit board into the casing so the **DIRECTION** switch bushing and the **SPEED** control shaft protrude through the top surface of the throttle casing. Be careful that you don't lose the lock washer on the switch bushing. Install the remaining **DIRECTION** switch bushing nut and tighten using a 8mm open end wrench. The printed circuit board should be aligned so that the solder side of the PCB is level with the edge of the throttle casing. The PCB can be gently rocked until the board is level. One you are satisfied the board is level you may solder the **DIRECTION** switch pins to the PCB.

Refer to the diagram on page 4. Locate the **LM317T** output device and trim the leads to 1/4” length. Fasten the **LM317T** to the aluminum heatsink using the 4-40 nut and bolt provided. Follow the diagram below for the correct part to heatsink orientation.



Once complete, slip the heatsink/output assembly into the case so the 3 leads of the output device are aligned adjacent to the 3 rectangular solder pads at the front edge of the PCB. Slip the body of the output device under the printed circuit board. Carefully bend the 3 leads, one by one, over the solder pads and solder each lead in place. Be careful not to bridge these connections.

It's time to attach the control knob to the **SPEED** control shaft. Use the 1/8" slotted screwdriver to tighten the knob onto the shaft. Hint – space the knob about 1/16" above the control body to avoid scraping the plastic. Optionally, install a circular felt pad (not provided) to dampen the control and prevent scraping.

Prepare the tail cable by stripping away 2" of the outer sheathing at each end. Cut the bare wire and aluminum foil back to the outer sheathing. This will show a **RED, GREEN, BLACK and WHITE** wire. At one end of the cable strip about 1/8" of each conductor and tin the exposed wire by flowing solder onto the wire. Tie this end into a single knot on the sheathed portion of the cable approximately 1/2" from where the outer sheath was stripped.

Solder the **RED, BLACK, WHITE, and GREEN** conductors to the pads on the circuit board marked for these wires. The marking will be on the lettered surface of the PCB. It's best to note the order of these terminals prior to assembly. Lay the exposed tinned portion of the wire flat on the pads and flow some fresh solder on the connection. You'll need to hold these wires in place, one by one, with a steady hand, while allowing the freshly flowed solder to cool and harden.

The remaining wires at the other end should be stripped back by 1/2" and tinned. These will connect to AC supply voltage and to your tracks. Refer to the 852B user instruction set for connection information.

Slip the tail cable into the casing so the knot is inside the casing. The cable will exit the casing through the notch. The knot will prevent the tail cable from being pulled out of the casing during operation.

Finally, place the cover over the bottom of the casing. The hole in the cover should allow access to the **MOMENTUM** trimpot through the hole in the PCB for adjustment. Insert and tighten the 4 screws.

Congratulations! You are now ready to test your 852B throttle! Proceed to the user instructions!

