

SERVICE REPAIR PROCEDURE

PURPOSE: Field service quality update of TOPO I

MATERIALS REQUIRED:

Description	Quantity/unit
Heat sink compound	
Loctite 242 or 262	
Mica washers	1
3amp slow blow fuse	2
Lugs size A .250	4
size B .188	4
Split lock washer #8	2
#10	6
Spring loaded relay clip	1
Plastic tubing for LED leads	

EQUIPMENT REQUIRED:

Phillips screw driver
 Nail or similar object to remove rivets
 Set of nut drivers
 Lug crimpers: two sizes
 Wire strippers 20 gauge
 Pliers
 DVM
 Torque driver set at 23lbs.
 Apple II (IIe or IIplus) with drive
 Monitor
 TOPO transmitter
 Apple II joystick
 Topo basic

SERVICE PROCEDURE:

I. BODY/BELLY PAN DISASSEMBLY

Remove all rivits from the belly pan (connecting the body to the base, 8 rivits in new rev. 4 rivits in old rev.) and using a nail or other similar object, push the center of the plastic rivit into the body and pull out the outer part of the rivit. Mark the belly pan to insure which is the front and rear (this will help when TOPO is put back together). Then remove the four screws from the legs (near the bottom of the body above the foot lights). Lift

the body up by grabbing on the legs above the foot lights on both sides, gently pull up and out until the body comes apart from the base. Reach into the backside of the body and disconnect all the cables connected to the battery monitor board. Also, disconnect both foot light cables. Continue to lift the body straight up and over the antenna (be careful not to poke your eye). Be sure to match up the right body with the right belly pan if more than one TOPO is being reworked. Remove the battery monitor board from the body by unscrewing the nuts on the outside of the body on the power jack and the two switches. The switch buttons must be removed first to get at the nut. To remove, carefully pull the board forward from the inside. Be careful with the LED's.

II. BATTERY MONITOR BOARD

Inspect the power jack. Look inside the jack for any possible shorts. You would be able to see a lead on the inside of the jack touching the center post if the jack was shorted. Resolder the power jack on the battery monitor board by applying jumper wires 1/3" on the top side of the board at each jack lead parallel on top of each trace. On the backside of the board apply additional solder to each lead for good board contact. Inspect the yellow and tri-color LED to be sure that the leads have the plastic tubing. If not, unsolder the leads and place the tubing on the leads, enough to cover the lead from the light to the board. Resolder the LED back onto the board. Next, inspect the relay clip. Be sure the clip is spring loaded. To check this - lightly move the relay to one side so that the leads on one side are partway out. If the wrong clip is on, the relay will remain there. If the correct relay clip is on, the relay will spring back into place. To remove the clip - pull out on the sides of the clip and pull out and off. To replace the clip, secure the ends into the holes on the relay socket and lift over the relay. Be sure the relay is secure and in place.

III. POWER TRANSISTOR

Taking the base, set it upside down on some foam (so as not to damage the controller board) remove the belly pan by unscrewing the 8 screws on the bottom and lift up. Set the belly pan aside and the base right side up. Locate the power transistor TIP125 which is connected to the side of the base and remove. Observe the transistor for any cracks or melting substances. If any of these are present replace the transistor. Remount using a new piece of mica washer. Apply heat sinking compound to both sides of the mica washer and loctite to the threads of the screw and remount, keeping the plastic washer between the screw head and the transistor heat sink. Tighten the screw and nut.

IV. CONTROLLER BOARD (FUSES)

Locate the two fuses on the controller board and remove any that are 3amp fast blow (determined by a straight line through the fuse). Replace with 3amp slow blow.

V. BATTERIES (battery and motor lugs)

Remove the battery brackets and disconnect the 4 battery lugs, then set the batteries aside. Take hold of the connectors and cut the existing lugs off near the end of the lug. Strip the wires a quarter of an inch using a 20 gauge wire stripper. Replace the lugs with the larger size (A .250) lugs and recrimp them onto the wires. Replace the batteries and push the lugs back onto the battery leads. Be sure to connect the red wires to the red battery leads and the black wires to the black battery leads. Gently pull on the wires to insure good crimping and a good battery connection. Put the batteries in place keeping the foam on either side of the batteries and replace the battery brackets.

Locate the two motors and remove the wires connected on the top of the motor. Using the same instructions from the above paragraph, remove the lugs and strip the wire. Replace the lugs with the smaller size lugs (B .188) and recrimp. Replace the wires back onto the motor with the red wires facing each other and the black wires facing out.

Take the other end of the two battery wires and using a DVM measure the voltage of each battery. Set the DVM to read 200volts DC. Insert the red DVM lead into the red battery lead and the black DVM lead into the black battery lead. Each battery should read no less than 11.1 volts. If a battery should read less than 11.1 volts it must be replaced with a new battery.

VI. WHEELS

Reposition the base on its back on top of the foam and remove the three outer screws on both aluminum wheel hubs. Next remove the start washers and replace with #10 split lock washer, then tighten the screws with a torque driver set at 23lbs. Remove the center screws and add a #8 split lock washer between the screw

head and the flat washer. Add loctite 242 or 262 to the threads of the screws and tighten the screw down with a 23lb. torque driver.

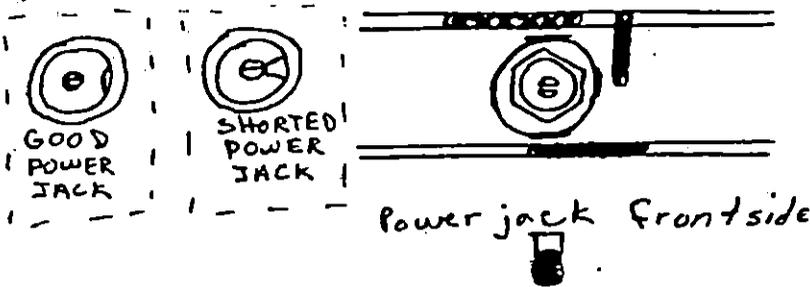
VII. REASSEMBLY - FINAL CHECK

Give the controller board and battery monitor board one close look before putting it back together. Keep an eye out for any missing, loose, or damaged parts. Look also at the footlight board and the other 4 LED's to insure proper mounting and existence (be sure lights are still mounted). The head switch cable should still be tie wrapped near the battery monitor board mount, on the body (with no strain on the cable). Before remounting the belly pan look at the two coasters for any cracks or rust (replace as needed). Keeping the base on its backside on the foam, mount the belly pan and reassemble it to the base. Next place the battery monitor board onto the body and remount using the same nuts on the power jack and switches (DO NOT OVER TIGHTEN THE POWER JACK). Put the correct switch button on the right switch. The green switch should be next to the amber LED and the red switch next to the white LED. Set the body over the antenna making sure the antenna goes through the neck hole for maximum transmitting distance. Match up the front of the belly pan to the front of the body. When the body gets close enough to the base, reconnect all connectors (head switch, batteries and main cable from the battery monitor board to the main CPU, and all LED's) into their proper connector. Set the body gently over the base holding onto the legs. Make sure that the base flaps go outside the body flaps and the front and rear body flaps overlap the base flaps. Line up the 4 screw holes and insert. Next, line up the rivet holes, insert the rivets, and using a hard blunt object push all the rivet posts into the body doing the ones on the front and rear of the body then going to the ones on the sides. Check the decals on the body and remove any smudges with a damp cloth. This completes the rework mode.

VIII. FUNCTIONAL TEST

With TOPO back together do a short functional test to determine correct operation. Turn on the TOPO transmitter and boot up TOPO BASIC on the Apple II and type in "gosub 6000" return and "gosub 5000" return. Now TOPO can be run using the Apple II joystick. Have TOPO run forwards and backwards observing the footlight operation. All green lights should come on in the forward position and all red lights should come on in the reverse position. When TOPO is going forwards or backwards, look to make sure TOPO is not turning in any direction. This can determine if the motors are running at the same speed. Be sure TOPO can function in all directions of turning. Also, plug in the charger to insure that TOPO can take a charge with the Tri-color LED turning green and that the charger does work.

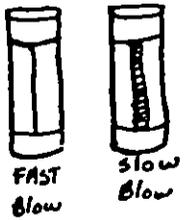
RESOLDER POWER JACK
Power jack backside



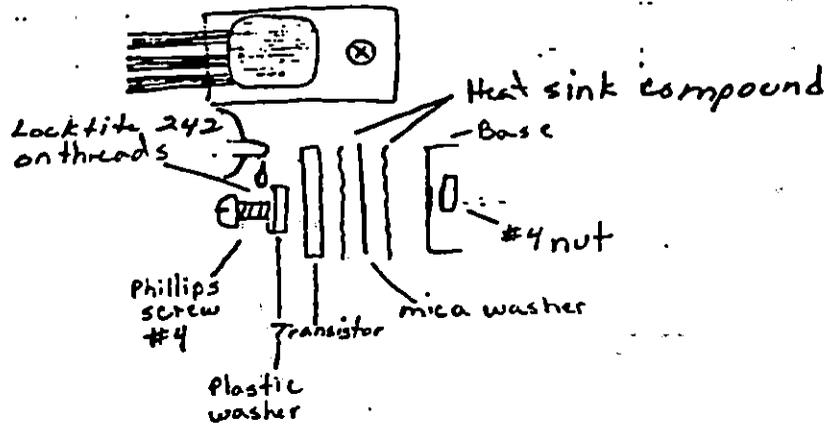
➤ → solder added
⊠ → solder with a wire jump

Power jack frontside

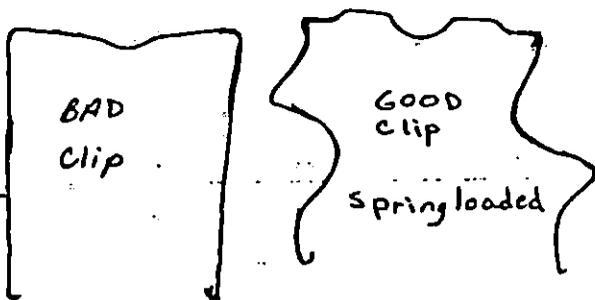
CORRECT FUSES
3amp fuses



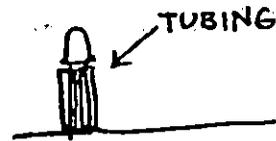
REMount POWER TRANSISTOR
Front view



Relay Clips



LED TUBING



CORRECT BATTERY/MOTOR LUGS

