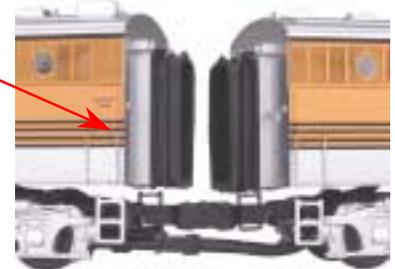
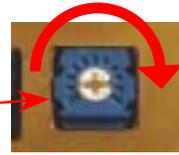


Conventional Troubleshooting Proto-Sound 2.0 Diesel AA & ABA

Testing Procedure

1. On the underside of the A Unit(s), make sure the smoke switch is turned to the “ON” position.
2. On the underside of the A Unit, verify the volume adjustment knob is rotated clockwise to the Full ON position.
3. Place the AA or ABA units on the rails. Connect the harness(es), making sure each connector is plugged in correctly. The 10 pin connector will fit only one way with the mating connector. Connect the couplers to the trailing units.
4. Turn the transformer throttle on so that 10 to 11 volts are placed on the track. This will cause the engine to power up in neutral.
 - If the transformer indicates a high current draw (meters read above 2 amps or the breaker trips), proceed to the section **Short at Power On.**
5. Perform a Reset to Default Settings. This is done with the combination signal 1 Whistle + 5 Bells in neutral.
 - If the engine does not respond to voltage on the track (no lights or sound), proceed to the section **No Response.**
 - If the engine lights are not showing, proceed to the section **No Lights.**
 - If the engine sounds are not heard, proceed to the section **No Sounds.**
 - If the engine does not smoke, proceed to the section **No Smoke.**
6. Trigger the rear coupler with the signal 1 Bell + 3 Whistles.
 - If the sound plays but the coupler does not open, repeat the signal. If the same results are found, try 1 Bell + 4 Whistles. If this causes the rear coupler to open, reprogram the engine sound file.
 - If the sound does not play and the coupler does not open, repeat the signal. If the same results are found, and the signal timing is correct, **Contact MTH Service** for a new sound file or further instructions.
7. Interrupt track power for a count of “one thousand one” so that the engine cycles into Forward. The engine should begin to roll forward slowly.
 - If the transformer indicates a high current draw (meters read above 5 amps or the breaker trips), proceed to the section **Short with Forward/Reverse Operation.**
 - If the engine does not move, increase track voltage to 14 – 15 volts. If the engine does not move proceed to the section **Engine Will Not Move.**
 - If the engine runs fast, there is no engine rpm sound and the smoke stops, proceed to the section **No Speed Control.**
8. Interrupt power so that the engine cycles into Neutral. The engine should come to a stop.
 - If the trailing unit’s back-up light does not light, proceed to the section **No Lights.**
9. Interrupt power so that the engine cycles into Reverse. The engine should begin to roll backwards.
 - See the notes for Number 7 above.
10. Remove power from the track.
 - Sounds should continue for about 10 – 13 seconds. If the sounds do not play for 10-13 seconds, recharge or replace the battery. If the sound continues to play, or the start-up sounds begin cycling, **Contact MTH Service** for further instructions.



Short at Power On

1. Disconnect the Trailing Units from the Lead A unit and power up the Lead A unit only. If no short is present connect the next unit(s) to the Lead A unit one at a time. If short returns when one unit is connected, remove the shell on that unit and check for pinched/cut wires scorch marks, etc.. Correct problem or **Contact MTH Service** for further instructions.
2. Turn smoke unit switch to OFF position in the Lead A unit. Place chassis on rails and power up. If no short is present, remove the shell and examine the smoke unit for shorts or **Contact MTH Service.** Be sure to remove smoke unit circuit board and inspect the heating elements to make sure they are not

touching the smoke unit casting. Also check the smoke unit switch and wires leading to the smoke unit for shorts in the ON position.

3. Remove the shell(s) and inspect for obvious shorts – pinched/cut wires, scorch marks, etc. Check insulators on the voltage regulator mounting. There should be a mica insulator between the back of the regulator and its mount, and a shouldered insulating washer on the screw. If either mica insulator or insulating washer are nicked or damaged, replace insulator. Also examine the shell for anything that may be shorting on the boards when installed.
4. Disconnect 7-pin connector from boards. Place engine back on rails and power up. If short is no longer present, replace the PS2 boards.
5. If short remains with boards disconnected, inspect all wiring and insulators (especially on the pick-up assemblies) for any shorts.
6. If the problem persists, **Contact MTH Service** for further instructions.

Short with Forward/Reverse Operation

1. Disconnect the Trailing Units from the Lead A unit and power up and cycle the Lead A unit only to forward/reverse direction. If no short is present connect the next unit(s) to the Lead A unit one at a time. If short returns when one unit is connected, remove the shell on that unit and check for pinched/cut wires scorch marks, etc. Consult the wiring diagram and check the continuity of the wires between harnesses on each unit. Inspect for solder bridges at the connector printed circuit board (pcb).
2. Remove the shell and disconnect 5 pin motor harness from the PS2 board and try running the engine. If short remains, **Contact MTH Service** for further instructions.
3. If no short, check motor wires for damage (pinch or cut, wire rub on flywheel). If found, repair or replace the damaged wire(s).
4. Check motor for binding or damage. Smell the motor to check for heat damage, turn flywheel and check for resistance. Replace motor if defect found.
5. Check the drive system for binding or damage. Make sure the motor and motor mount are firmly seated in the drive block and installed properly, screws are tightened, and truck wheels move freely when flywheel is rotated. Check for any debris in external gearing. Replace any damaged drive system component such as the drive block assembly.
6. If the problem persists, **Contact MTH Service** for further instructions.

Engine Will Not Move

1. If sounds cut out immediately (or within less than 10 seconds) after track power is removed, check that the battery is charged and correctly installed. A regular 9-volt battery can be used as a temporary substitute for testing. Order MTH replacement part BG-4000001.
2. Try unlock procedure (with voltage at 9.5 to 10 VAC, press 1 Whistle + 3 Bell combination).
3. Check the pins in all the harness connectors (accepts trailing unit harness) for any damage. If bent, carefully straighten before reconnecting the harness.
4. Make sure the harness is plugged in correctly and tight. Check orientation of harness plugs by aligning slots and tabs on plugs (disregard word "TOP" printed on the plug). Check all harness connections (Lead A-Trailing A or Lead A-B and B-Trailing A). If sound cuts in and out when wiggling the plug, check the solder joints on the connector pcb for cold solder joints or cracks.
5. Remove the Lead A unit shell and verify the motor leads are plugged into the PS2 board (5-pin connector) and wires (yellow and white) are connected to the motor terminals.
6. Check to see if the trailing A unit motors move when the lead A unit motors move. Verify the trailing A unit motors turn the truck wheels in the same direction as the Lead A unit. If the trailing A moves in opposite direction as the Lead A unit, reverse the motor Leads in the trailing A unit. If the motors in the trailing A unit do not move, make sure the motor leads are plugged into the Trailing A unit slave board and that there is continuity in the wires from the Lead A unit to the trailing A unit (see step 7). If the trailing A unit motors do no turn and there is a signal to the Slave board from the PS2 board, replace the slave board, (MTH part number AE-0000011).
7. With all shells removed, connect A-A or A-B-A units together properly. Test for continuity between all harness wires for the Lead A unit to the Trailing A unit. Replace any harness that does not have

continuity. Remove and solder wires to connector pcb as required to obtain correct wire configuration between A-A or A-B-A units.

8. If still no movement, see section **Short with Forward/Reverse Operation.**

No Sounds

1. Check to see that the volume pot is turned up (clockwise for higher volume). See Testing Procedure #2 **above**. Make sure harness is plugged in correctly and tight. See Testing Procedure #3 **above**.
2. Try to reset to defaults by using 1 Whistle + 5 Bell combination.
3. Remove the Lead A unit shell and check the speaker. Measure resistance across the coil using an Ohmmeter. For PS-2, it should measure 16 ohms. Replace speaker if “open” or 8 ohm speaker measurement is found.
4. Check the wiring connections to the volume pot and speaker for broken wires or bad solder joints. Reconnect plug connections or replace volume pot assemblies if found defective.
5. If engine runs, but lights, smoke and sound are off it may be a programming issue. Reset the engine sound to factory default (combination signal 1 whistle + 5 Bells).
6. If still no sounds, reprogram engine sound file.
7. If none of these correct the audio, replace the PS2 board..

No Speed Control

1. Remove power to the track for 30 seconds to reset the engine and retry.
2. Check the striping on the flywheel for damage. If striping is applied as a sticker, make sure the sticker is secure. Replacement striping as required.
3. Make sure the tach board is positioned properly, fully seated in the plastic retaining bracket. Reposition as required.
4. Check to make sure there is no debris between the sensor and the flywheel. Remove any foreign objects and or wipe sensor with a cotton swab dipped in denatured alcohol.
5. Verify the wiring to the tach board is correct (Grey to pin 1, orange to pin 2 and blue to pin 3) or (Blue 1, orange to pin 2, and Grey to pin 3).. Make sure all wires are attached and undamaged.
6. If the problem persists, replace the tach board.

No Lights

1. If no lights at all, try reset to defaults (1 Whistle + 5 Bell combination).
2. Check to see the bulb is installed correctly and is not damaged. Correct installation or replace damaged bulb as required.
3. Check wiring between the bulb(s) and the boards, including any spring contacts. Look for 6 volts to contact pad. If there is not 6 volts to the contact pad, be sure engine direction is correct for directional lighting, otherwise go to step 5.
4. Check bulb by supplying 6 volts to bulb. If it does not light up, replace defective bulb.
5. If all lights are out, check the purple wire coming from pin 2 of the 12-pin connector. This lead should feed to all lights and couplers.
6. If lights are out in the Trailing A unit only, check the harness connections from the Lead A to Trailing A unit and the Slave board. Replace the slave board if bulbs and harness connections are all good, (MTH part number AE-0000011)
7. If the problem persists, **Contact MTH Service** for further instructions.

No Smoke

1. Verify the smoke switch is in the proper position as stated above in testing section. Try turning smoke switch to OFF position. Rewire switch if smoke comes ON when switch is in the OFF position. If no smoke, return smoke switch to ON position.
2. Check wiring between the smoke unit and the 4 wire harness connection to the boards for damage.
3. Check the smoke unit switch and the wires from the switch to the boards for damage.
4. If heat is present but no fan, remove the smoke unit circuit board and make sure the fan spins freely, remove any obstructions.

5. Verify fan fits snugly on fan motor shaft and does not spin around a stationary motor shaft. If fan spins on stationary shaft, replace fan impeller. Make sure the impeller spins the in the correct direction, if fan spins in the opposite direction, change the leads to the smoke unit fan motor. If still no fan operation with track power, replace the fan motor (MTH part # BE-0000041).
6. If fan runs but no heat is present, check smoke wick for charred areas and replaced smoke wick (prime smoke unit with 25 drops of ProtoSmoke fluid before operation).
7. If still no heat, check the heating elements. Reposition or replace defective heating elements (MTH part # AI-0000018)
8. If power is present from the PS2 board to the smoke unit board and the heating elements still do no heat, replace the smoke unit circuit board. If no power output from PS2 board, reprogram engine sound file.
9. If no smoke is present in Trailing A unit, make sure the trailing A unit is equipped with a smoke unit and all the harness connections from the Lead A to Trailing A unit and the Slave board are good. Check the smoke unit connection to the PS2 board in the Lead A unit, make sure there is continuity all the way back to the Slave board. If the problem persists, **Contact MTH Service** for further instructions.

No Response

1. Check that power is present on the track from the transformer.
2. Remove the boiler and check the wiring from the pick-up assemblies to the board, especially check the connections at any wire nuts in the engine.
3. Check that all wiring connections to the boards are in place and tight, especially the 7-pin harness.
4. Check that the harness from the boards to the voltage regulator is in place and tight. Correct orientation is Red to pin 1 (marked with a “dot” on the component), Black to pin 2 (center) and Yellow to pin 3.
5. If the problem persists, **Contact MTH Service** for further instructions.

Contact MTH Service

1. Call MTH Service, 410 381-2580 Monday – Friday between 12 noon and 5 PM EST, or email with description of problem.
2. Provide Train Model Number
3. Describe problem and actions taken to troubleshoot along with observations.