Advanced troubleshooting techniques – order post and wiring tests

This documents Ohm meter troubleshooting techniques for problems with a SpeedThru system with long wire runs in conduit. In all diagrams, the wires to the meter are not shown for clarity, but they must be connected to the meter properly. It's recommended to set the meter to Ohms and touch the terminals together to make sure the meter works before you get started. It should read very close to 0 Ohms.

This document covers microphones, speakers, and in ground loop failures such as open and short circuits as well as component failures.

Wentworth's SpeedThru standard wiring consists of dual shielded 2 conductor pairs in a gray sleeved cable. The green and white wires and shield/drain wire are used for the microphone, the red and black pair must NOT be used, if they are used electrical noise will be injected on the microphone signal. The black cable consists of a shielded red/black pair used for the speaker. The black cable's green/white pair can be used for the vehicle detect loop if required.

To test the post microphone:
-Make sure base station is NOT in speed team, set inbound volume to 4
-Make sure headset speaker works by swiping volume and listening for beep
Try microphone again (make sure call button is pressed on headset- boom light red)

-Power off the base station and remove the mic wires from the base. Set meter to Ohms and measure across the two mic wires as shown in Figure 1.

1. It should read approximately 140-220 Ohms and have a steady reading.
2. If it reads less than 140 Ohms there is a short in the wiring or microphone.
3. If it reads greater than 220 Ohms, there is a break in the wire or the mic is bad.

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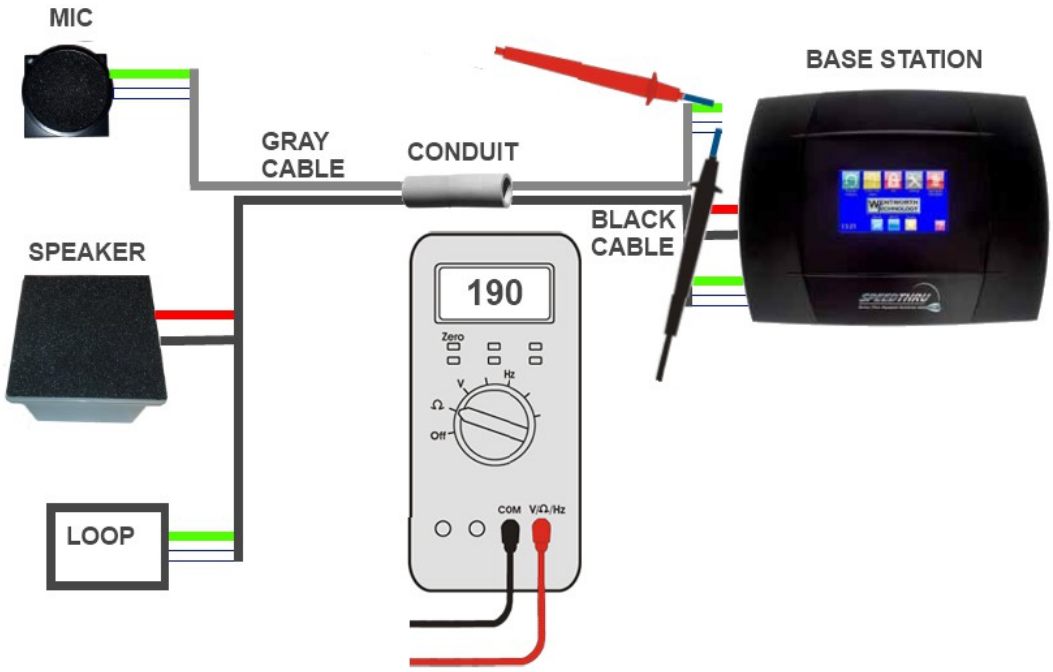

Figure 1: Testing the microphone at the base station (power off base for testing)

4. Go to the post, and disconnect the microphone wires from the cable. Set meter to Ohms and test across the mic wires as shown in Figure 2. It should read between 140-220 Ohms. Wiggle the wires and make sure the reading is steady. If not, replace the microphone. Otherwise, test the cable.

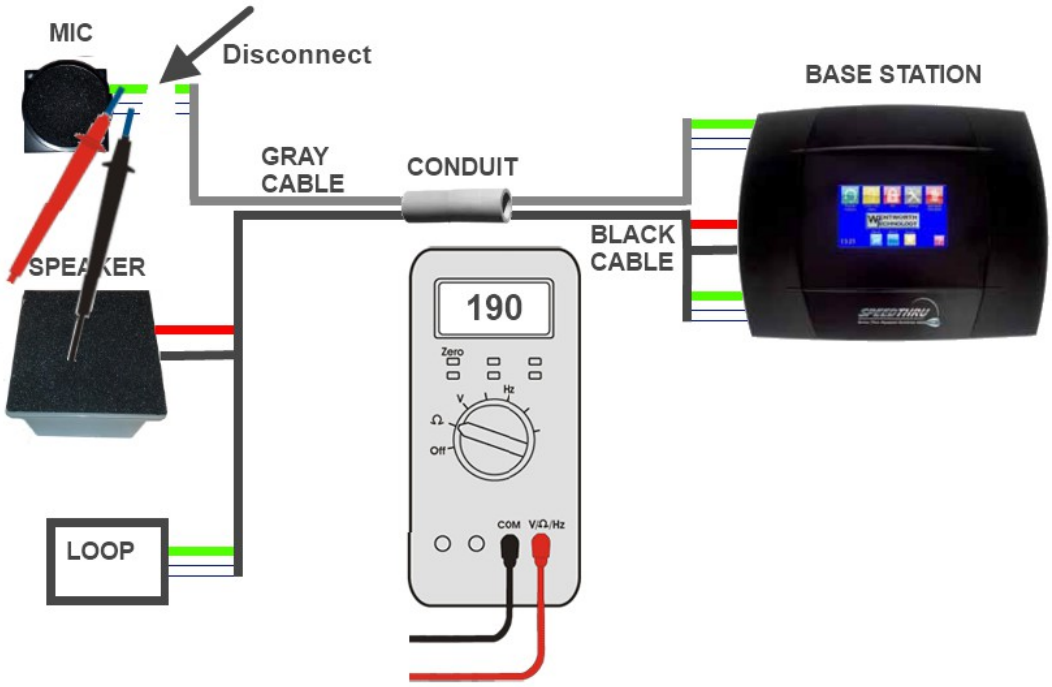

Figure 2: Testing the microphone at the order post (power off base for testing)

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If there is radio interference check that the mic wires are not shared with any other wires in its cable. Make sure the drain (shield) wire is securely connected to pin O (GND) on the base. The drain wire can't be connected to or touching anything on the other end of the cable. Make sure there are no excess loops of cable coiled somewhere that could act as an antenna.

To test the post speaker:
-Check to make sure base station is NOT in speed team, set day AND night volume to 6.
-Make sure the test headset works by talking to another person wearing a headset.
Try speaker again.

-Power off the base and remove speaker wires from the base. Set meter to Ohms and measure across the two speaker wires as shown in Figure 3.

1. It should read approximately between 3 and 12 Ohms, and have a steady reading.
2. If it reads less than 3 Ohms there is a short in the wiring or speaker.
3. If it reads greater than 12 Ohms, there is a break in the wire or the speaker is bad.

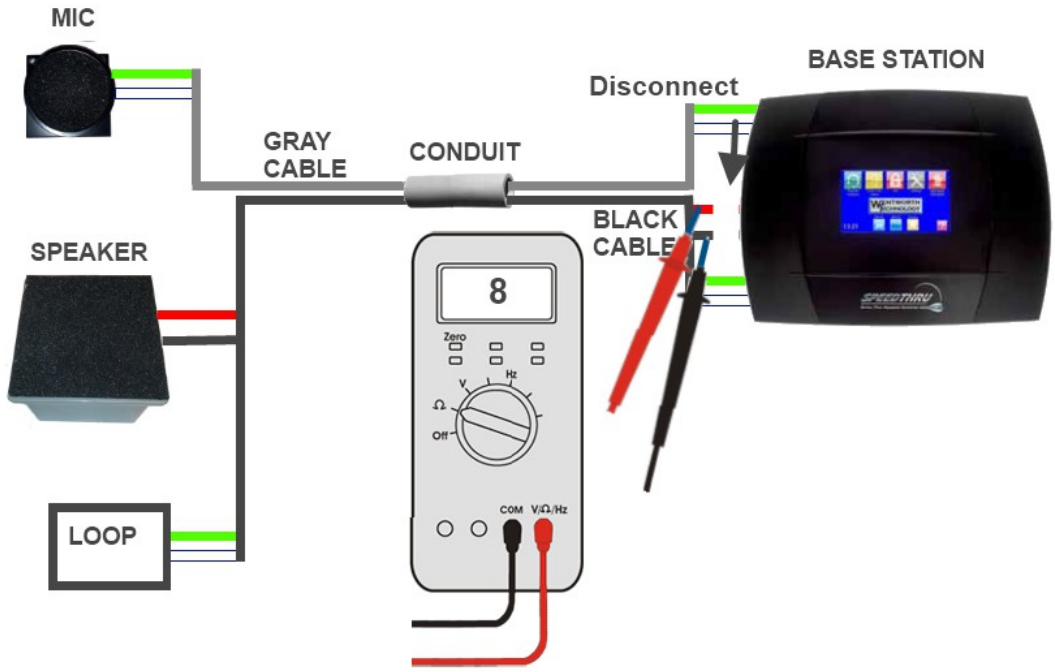

Figure 3: Testing the speaker at the base station (power off base for testing)

4. Go to the post and disconnect the speaker wires from the cable. Set meter to Ohms and test across the speaker wires as shown in Figure 4. It should read between 3-12 Ohms. Wiggle the wires and make sure the reading is steady. If not, replace the speaker. Otherwise, test the cable.

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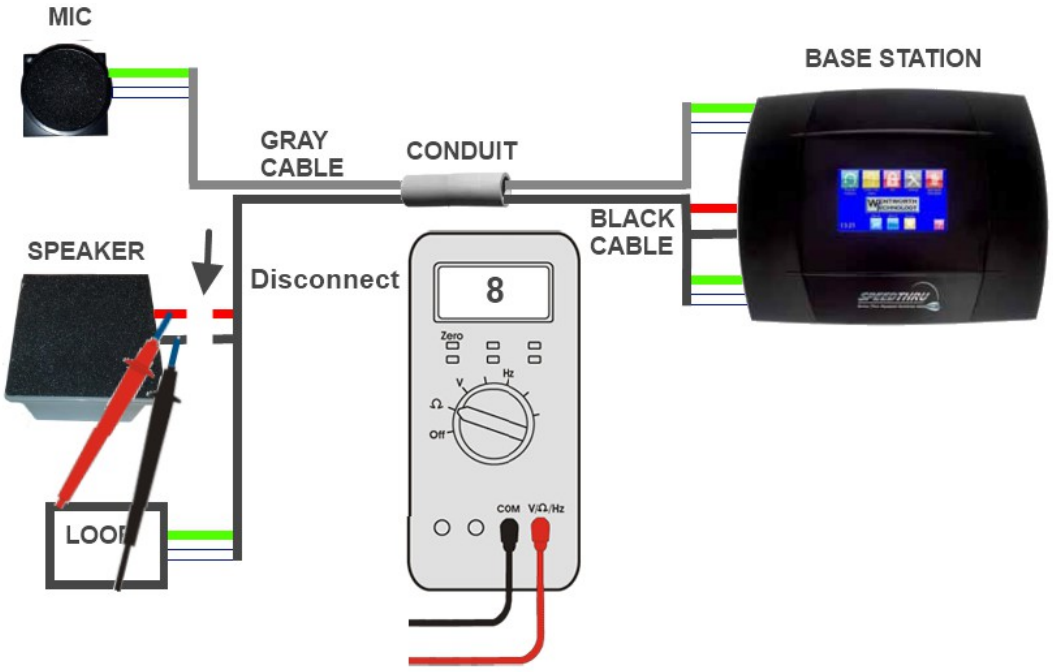

Figure 4: Testing the speaker at the order post (power off base for testing)

To test the wires in the cable:

1. Disconnect the wires from the base station AND mic, speaker, or loop. Ohm across the cable. It should read as an open circuit (infinite or very high Ohms). If not it is shorted, find the short or replace the cable. Figure 5 shows how to test the speaker cable.

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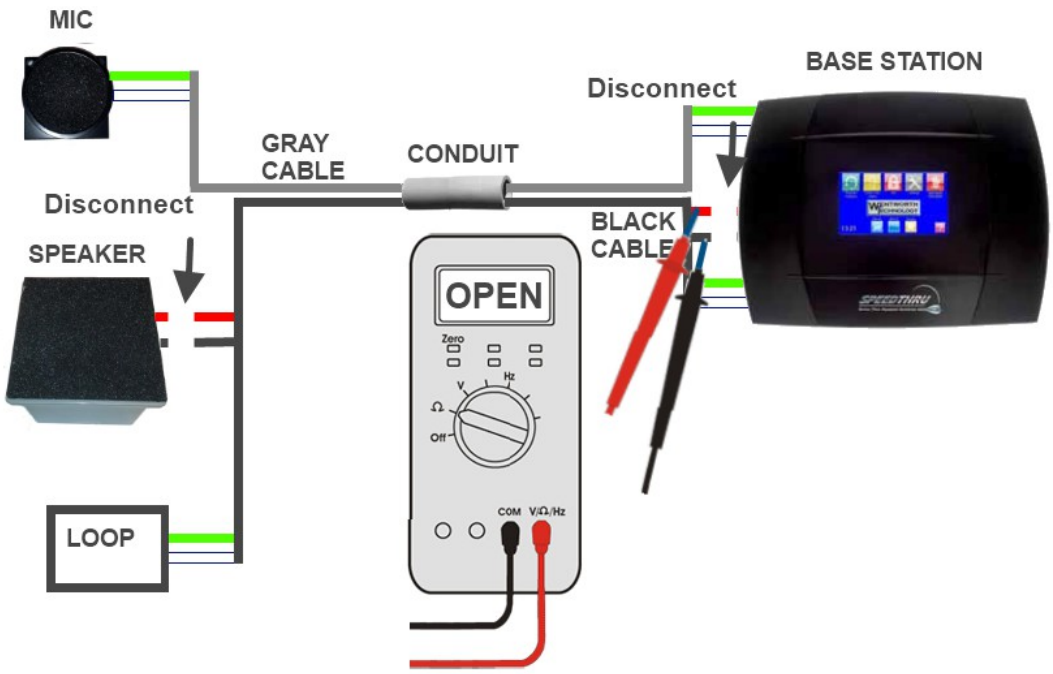

Figure 5: Testing wiring for a short

2. Disconnect the wires from the base station AND mic, speaker, or loop. Strip and twist the two wires together one end of the cable so they are connected. Go to the other end and read Ohms across the two wires as shown in Figure 6. It should read less than 10 Ohms. If not, the wire is broken, find and repair the break, or replace it.

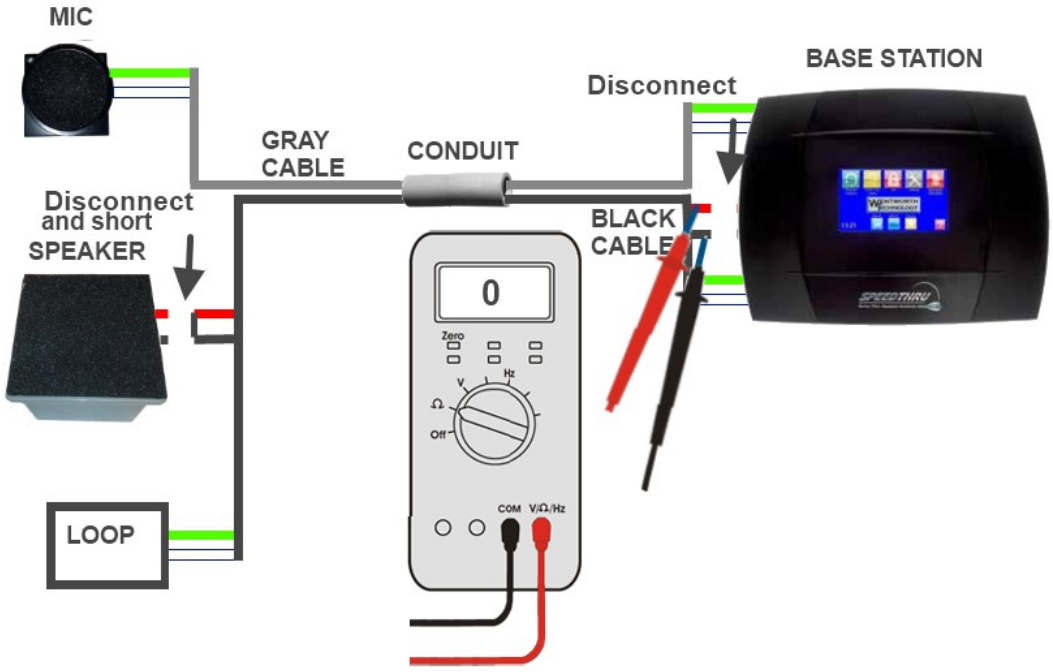

Figure 6: Testing wiring for an open circuit

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3. Disconnect the wires and shield from the base station AND mic, speaker, or loop. Ohm each wire to the shield as you did in Figure 5. It should measure as an open circuit (greater than 1 megaOhm). If not, the wire is shorted to shield somewhere, find/repair or replace the cable.

To test an in ground loop:

1. Disconnect the loop from the conduit wires/detector at the post or wherever it comes out of the ground.
2. Ohm across the two wires in the loop, it should be less than 10 Ohms. If it is greater than 10 Ohms the loop is likely bad and needs to be replaced.
3. Connect one lead of the Ohm meter on one of the loop wires, and the other to (earth) ground as shown in Figure 7. If the resistance is less than 50 Megaohms then it's likely the loop wires are damaged/shorted to ground and should be replaced.

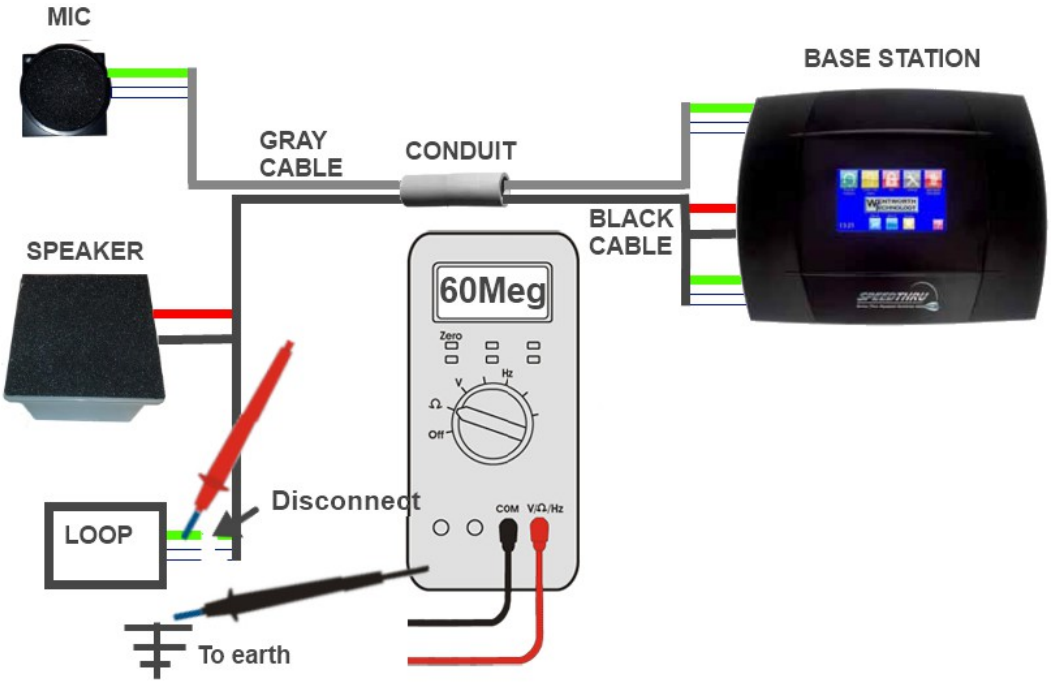

Figure 7: Testing an inground loop for a short to ground

4. Put your meter on inductance and measure across the two loop terminals. It should be within 20 to 2500 micro Henrys. If it is outside this spec the loop has failed and must be replaced.

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