

Hearing Loop Metal Loss & Background Noise Test Process

Determining metal loss and background noise is a critical and necessary step in designing a proper hearing loop system. This document will step you through the metal loss and background noise test process. Included along with this process is a metal loss test kit that includes most of the items needed to perform these tests. Please note the items below that you will need to supply. Please verify the test kit is complete before going to the job site.

Required Items (Included with the Metal Loss test kit):

- ILD122 Professional Loop Driver
- R1 Loopworks Measure Receiver
- Stereo Headphones
- 16 AWG Loop Cable w/ Quick Connectors
- 16 AWG Twisted Feeder Cable w/ Quick Connectors
- Multi-Meter
- Tools (Screwdriver & Tape Measure)
- 3.5 mm to Dual RCA Audio Cable w/ Mono 1/4" Adaptor
- Gaffers Tape
- USB Flash Drive (Contains Test Documents and Audio Files)
- Laminated figure 8 test loop diagram

Required items (not included):

- Audio Player (PC, DVD Player, MP3 Player)
 - Pre-install the 3 audio files located on the USB flash drive if this will not possible on-site. (Ref. section 4 in the Metal Loss Test below)
- iDevice (iPhone, iPad or iPod Touch) with Loopworks Measure application installed

Setup and Calibrate Loopworks Measure R1 Receiver

Plug in the Loopworks Measure R1 into your iDevice, open the Loopworks Measure App and follow the on screen instructions.

- If prompted to calibrate the receiver, select "Yes" to calibrate. If not prompted select "Settings" from the lower menu and then select "Calibration".
- When prompted, enter the receiver label. The receiver label is a 7 digit alphanumeric serial number on the side of the R1 device. Only enter the last 4 digits. Follow the remaining on screen prompts to calibrate. Upon successful calibration select "Ok", "Back" and "Done" to return to the meter screen to begin testing.
 - If the calibration fails, follow the on screen instructions.

Background Noise Test

1. Environmental Prep

- 1.1 Verify the loop driver is powered off.
- 1.2 Verify that the room lights are on and any other electrical equipment to be used in the room is also powered on. Some electrical devices, including lighting circuits, could produce a magnetic field that could interfere with the hearing loop system. It is important that these devices are active so noise measurements reflect noise levels during normal use of the room.

2. Measure Background Noise

- 2.1 From the Loopworks Measure app, with a calibrated R1 receiver connected, select the "Noise" tab at the top portion of the application window. Verify the Type option on the app is set to "Area Coverage" and the Signal option is set to "System Off".
- 2.2 Position the iDevice so that the R1 is vertical and 4' from the floor. Any more than a slight deviation from vertical will provide a false reading.
- 2.3 With the R1 positioned as described above, while monitoring the Live meter, walk around the area to be covered by the final loop. Be sure to cover the interior and edges of the area to be looped.
 - Log the average noise level of the entire space in the Hearing Loop Metal Loss and Noise Test form.
 - Log the highest noise level measured in the space.
 - If the highest reading is above -32dB, describe, on the Hearing Loop Metal Loss and Noise Test form, where in the room/area to be looped those readings occur.

- **NOTE:** If the highest noise level measured is greater than -32dB, performance of a hearing loop system may be compromised. Excessive electromagnetic noise in an environment will be picked up by hearing aid users and will mask or interfere with the audio from the hearing loop system and potentially make it unusable. This noise will need to be identified and corrected for a successful implementation
 - Systematically isolate the source of the noise by turning lights and other electrical equipment in the room off while monitoring the noise reading. Contact Listen for assistance.

Metal Loss Test

1. Determine Test Loop Location

The test loop should be placed within the intended area to be looped and positioned at the same height as the final loop will be installed. For example, if you intend to install the loop system directly on the floor, then layout the test loop directly on the floor. If the loop will be installed 6 inches above the ceiling then place the test loop 6 inches above the ceiling, etc.

If the area to be looped is very large, a large theater for example, repeat the test in multiple areas to account for variances in building structures throughout the space. Complete a separate metal loss test form for each and note the location of each test.

2. Install the Test Loop (refer to Figure 1.)

The test loop must be laid out in a figure 8 pattern consisting of two segments of 7 ft. wide x 20 ft. long with a 1.5 ft. gap between segments, as shown in Figure 1 (Note: If, due to physical constraints of the space, the test loop cannot be installed to the specified dimensions, please contact Listen to discuss alternatives before proceeding. Changes to the specified test loop dimensions, if not properly compensated for, will result in inaccurate metal loss measurements.)

2.1 Starting at one of the quick connectors on the supplied loop cable, lay out the cable following the specified figure 8 pattern, using the supplied tape to secure the cable. Connect the two ends of the loop cable together with the quick connectors to complete the loop as shown in Figure 1.

- There may be a few inches of excess loop cable. If so, lay it flat (not coiled) outside of the test loop.

2.2 Connect the 3rd quick connector on the loop cable to the quick connector on the twisted feeder cable. With the loop driver powered off, connect the other end of the feeder cable to the loop driver as shown in Figure 1.

3. Validate the Test Loop

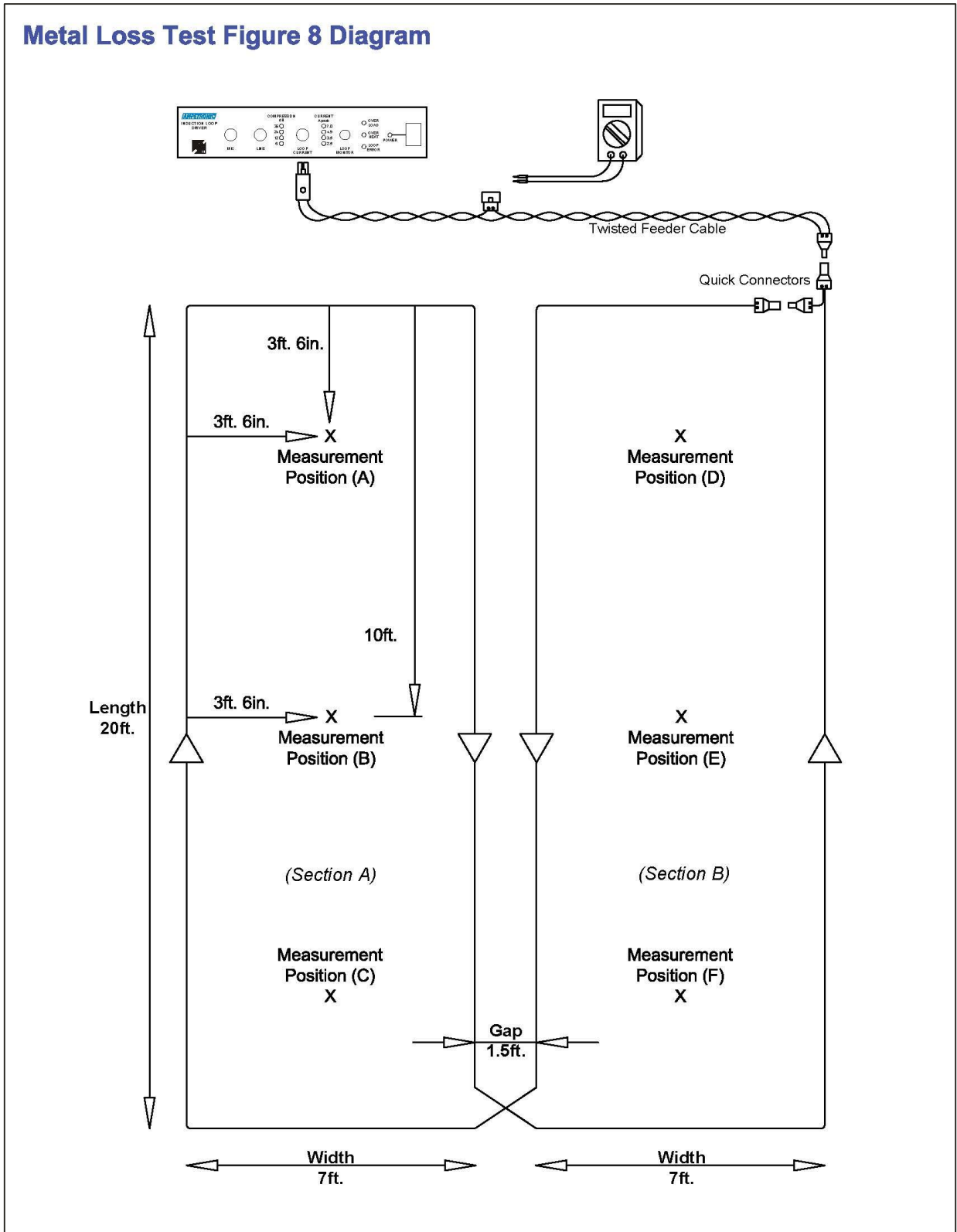
3.1 Turn the Loop Current and Line input level controls / pots on the front panel of the loop driver all the way down. (Fully counterclockwise).

3.2 Validate that the Metal Loss Correction rotary switch on the back panel is set to 0. (Fully counterclockwise)

3.3 Turn the hearing loop driver on. The driver will automatically run a loop validation test.

- The power indicator LED on the front of the driver will light solid green if all tests pass.
- If there is an issue, the Loop Error LED will light and the power LED will flash. This would indicate an open or short in the loop or feeder cable. If this occurs, power off the driver and double check that the loop is wired properly. Verify the jumper / shorting plug on the phoenix connector is in place. Also inspect the wire for breaks and verify that a wire has not come loose from one or more connectors.
- Contact Listen for additional assistance.

Figure 1.



4. Audio Files and Player Connection

The supplied USB flash drive contains three audio files that will be required for the metal loss test setup and testing:

- 1 - 1kHz Sine.mp3 – Used for short durations during setup.
- 2 – Combination.mp3 (Pink Noise w/ One second 1 kHz Bursts) – Used during Field Strength testing.
- 3 – Pink_Noise (Bandlimited).mp3 – Used during Frequency Response testing.

4.1 Copy these files to an audio player (PC, MP3 player, etc). (Preferably one with a 3.5mm output)

4.2 Verify that the audio player's EQ is off or set to flat.

4.3 Using the supplied 3.5mm to RCA (with ¼ in. adapter), connect the audio player (3.5 mm) to loop driver's ¼ in Line Input.

5. Audio Input Level Setup

5.1 On the audio player select and play the 1 kHz Sine.mp3 file. The file is 1 min. long. Put on repeat if needed.

- Set the volume of the audio player to max volume.

5.2 While monitoring the compression LEDs on front of the loop driver, adjust the Line input level control clockwise until the 12dB compression LED is lit solid.

5.3 Pause or stop the 1 kHz Sine.mp3

5.4 Power off the loop driver.

6. Loop Current level Setup

6.1 Verify the supplied multi-meter is configured for AC current measurement.

- Connect the red lead to the 10A connector on the meter and the black lead to the COM connector. Set the rotary dial on the meter to the amp "A" setting and using the function button set the unit to "AC" as indicated on the lower left of the meter's display.

6.2 Remove the jumper / shorting plug from the phoenix connector on the feeder cable as shown in Figure 2.

6.3 Play the 1 kHz Sine.mp3 file. (Verify the audio player volume is still at max)

6.4 Place and hold the meter leads on the phoenix connector screw heads as shown in Figure 2. This completes the loop circuit through the multi-meter. (Polarity of the leads does not matter)

6.5 Power on the loop driver while continuing to hold the meter leads on the phoenix connector.

6.6 Adjust the Loop Current level on the front of the loop driver clockwise until the level on the multi-meter (not the loop driver) reads 2.5 Amps. Once set, do not adjust loop current on the driver until all tests are complete.

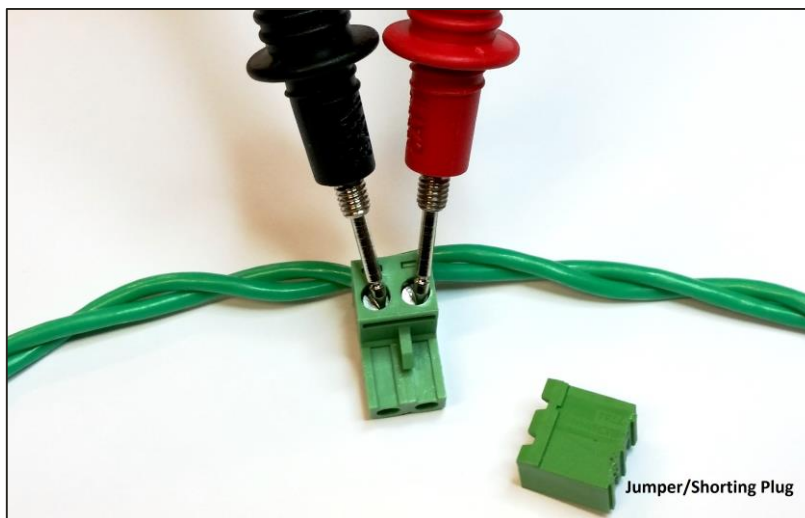
- **NOTE:** A loop error may be indicated if you accidentally remove the multi-meter leads during this process. If this occurs replace the multi-meter leads on the phoenix connector and power cycle the loop driver to clear the error and continue.

6.7 Power off the loop driver.

6.8 Turn off the 1 kHz Sine audio file

6.9 Remove the meter leads and replace the jumper / shorting plug on the phoenix connector.

Figure 2.



7. Field Strength Testing

Field strength will be measured at six positions (A-F) as specified in Figure 1. Note the top to bottom and left to right coordinates of each test point as shown on Figure 1. Measurement height or distance should be 4' up or down from the plane of the loop. For example, if the test loop is on the floor then test at a height of 4' above the floor. If the test loop is on a 9' ceiling then test 4' below the ceiling / 5' feet above the floor. Etc.

- NOTE: Please consult with Listen and note on the Metal Loss test results if measurements cannot be taken at the specified coordinates.

7.1 Power on the loop driver.

7.2 With the audio player still connected to the loop driver's Line input, select and play the Combination.mp3 audio file.

- Put the audio player on repeat so the combination file will continue to play for the duration of the test.
- Verify the audio player is still set to max volume.

7.3 Select the "Field" tab on the Loopworks Measure application

- Set the Type option on the app to "Area Coverage" and set the Signal option to "Combi".

7.4 Position the iDevice so the Loopworks R1 is set to the location of the first test point at the specified height.

- Remember to keep the R1 positioned vertical for accurate readings.

NOTE: The combination audio file used for this portion of the test consists of a repeating 4 seconds of noise followed by 1 second of tone. This is used to prevent damage to the loop driver which can occur when a single tone is played for extended periods. This is reflected in the meter reading with a jump or peak in level every 4 seconds. It is the peak level that needs to be captured.

7.5 To capture the peak reading at each test point use the "Hold" meter function. Before taking a reading press "Reset" next to the Hold meter and record the highest peak value over several seconds. Remember to keep the iDevice and R1 perfectly vertical and at the specified coordinates during this time.

- NOTE: Disregard the Pass / Fail status on the application.

7.6 Repeat for each test point.

7.7 Log results for each test point on the Hearing Loop Metal Loss and Noise Test form.

8. Frequency Response Testing

Frequency response testing is performed at the same six test locations / coordinates (A-F) as specified and performed in the above Field Strength tests.

8.1 With the audio player still connected to the loop driver's Line input, select and play the Pink_Noise (Bandlimited).mp3 audio file.

- Put the audio player on repeat so the pink_noise file will continue to play for the duration of the test.
- Verify the audio player is still set to max volume

8.2 Select the "Freq" tab on the Loopworks Measure application. The meter on "Freq" tab is a real time spectrum analyzer enabling measurement of level at specific frequencies.

- Set the Type option on the app to "Area Coverage" and set the Signal option to "Pink".

8.3 Position the iDevice so the Loopworks R1 is set to the location of the first test point at the specified height.

- Remember to keep the R1 positioned vertical for accurate readings.

8.4 Measure the dB level at 100Hz and 5kHz for each test point.

- NOTE: Disregard the Pass / Fail status on the application for this test.

8.5 Record results on the Hearing Loop Metal Loss and Noise Test form.

9. Wrap Up

9.1 Power off loop driver, disconnect and neatly coil audio and Loop wires.

9.2 Repeat metal loss portion of test as needed. NOTE: Metal structures can vary throughout a large space. For large spaces repeat the metal loss test in multiple areas to account for these variances in the hearing loop system design. For example, the main floor vs the balcony in a theater.

- Consult with Listen if needed.

9.3 Send test results to your Listen Sales Representative or sales@listentech.com