Equipment Maintenance and Troubleshooting

Maximizing the life of your equipment

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e3 Diagnostics

Learner Objectives

- After this course, the participant will be able to:
  - Define a procedure for daily equipment check
  - Perform basic routine maintenance on common audiometric equipment
  - Perform basic troubleshooting for common audiometric equipment

Daily Equipment Checks

(Yes, daily …)

Daily Equipment Checks?? But why??

- This should be part of your daily routine
- Checking your equipment daily will
  - Help to insure your equipment is functioning properly and ready to test
  - Identify issues that may soon become problems
  - Minimize cancelled patients and lost revenue

Daily Equipment Checks - Audiometer

- Visually inspect
  - Look at cords on patient side
  - Check patient transducers and response button
  - Check condition of tester mic/monitor headset
- Obtain a quick audiogram on an assistant with known hearing levels
  - Each day, use same person with normal hearing, if possible
  - Check for unexpected changes

Daily Equipment Checks - Audiometer

- Turn on interrupt for channel 1 and rotate attenuator from 0 dB to 60 dB
  - Listen for any hum, hiss, or rushing sound
  - Note that slight audible noise may be present at 70 dB and above
- Cycle through the frequencies, listen to ensure that frequencies change appropriately
- Check speech by presenting at 40 dB. Intelligible speech should be heard

Daily Equipment Checks - Audiometer

- Check talk-forward
  - Speech should be audible and intelligible
  - While talking through mic/monitor headset, move cable to check for intermittent issues
- Bone oscillator check
  - Set frequency to 2000 Hz and level to 40 dB
  - Tone should be audible and clear

Daily Equipment Checks – Middle Ear Analyzer

- Carefully inspect cables, probe, tubing, and tip
  - Clean or replace tips and tubing as necessary
- Perform a 226 Hz tymp using the test cavity to verify proper volumes
  - Test with probe in the 0.5 cm^3, 2.0 cm^3, and 5.0 cm^3 cavities
- Also check 678 Hz and 1000 Hz probe tones, if applicable
- Perform biologic calibration check
  - Run tymp and ipsi/contra reflex on yourself or colleague
  - Check stimulus - listen for distortion or other issues

Daily Equipment Checks – Other Equipment

- OAE equipment
  - Visually inspect the equipment, cables, probes, and probe tips
  - Run test on yourself or colleague with known results
  - Check signal sound quality
  - Move cable during test to check for intermittent issues or cable problems
- ABR equipment
  - Visually inspect equipment – cables, transducers, patient cables, etc.
  - Present stimulus and check for signal quality
  - Periodically perform biologic check on person with known results

Troubleshooting

What to do if you identify a problem?

Troubleshooting

- The first goal of troubleshooting is to find the problem and, if possible, solve it.
- If you can't identify and/or solve the problem, at least attempt to rule out issues and narrow the scope of the problem.
  - The information should be obtained with the goal of providing information when calling for assistance.

Troubleshooting Issues - Audiometer

- Common Issues
  - Transducer not working (headphones, inserts, bone oscillator, etc.)
  - Response button not working
  - Patient reports distorted speech
  - Cannot hear patient or patient cannot hear you

Troubleshooting Common Issues

- Transducer troubleshooting
  - What is the problem?
    - Distortion, lack of signal, decreased output, etc.
  - Is the problem consistent or intermittent?
  - Is the issue on one or both sides (headphones and inserts)?
  - Does it happen across all transducers or just one?
  - Can you make it happen or can you make it better? If so, how?

Troubleshooting Common Issues – Transducers
(all but speakers)

- Check the cables between the transducer and the booth patch panel. Do they look OK?
- Move the cable where it connects to transducer and patch panel, unplug/replug the cables into the patch panel a few times – does the issue change?
- Check the cables running from the audiometer to the panel. Are they fully seated on both ends? (Unplug and replug a few times, any change?)

Troubleshooting Common Issues – Transducers

- Plug the transducer directly into the back of the audiometer to rule out issues with the patch cables and jack panel
- For phones and inserts, if only one side is not working, swap the right and left plugs. Does the problem stay with the same transducer?
  - If yes, the issue is likely the cable to the transducer or, less likely, the transducer
  - If no, the problem is likely in the patch panel, patch cable to the audiometer, or a problem in the audiometer itself

Troubleshooting Common Issues – Transducers

- For insert phones, in addition to steps already mentioned, check tubing and tips for cracks or other damage.
  - If tubing issues are identified, replace. Do not alter length of tubing.
  - Always keep an extra set of tips on hand.
- Occasional questions arise about inconsistent results with insert phones. Insertion depth and foam tip selection are critical to insert phone consistency and accuracy.

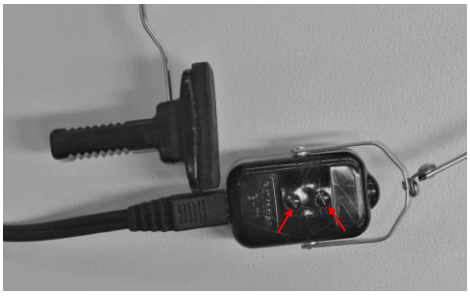
Troubleshooting Common Issues - Transducers

- You determine the problem to be the transducer cable …
  - Check cable connection at transducer
  - For headphones, tighten screws at phone
  - Replace the cable (recalibration is not necessary)




Troubleshooting Common Issues - Transducers

- Distortion with bone conduction can be caused by loose screws on the oscillator. Tighten if needed.



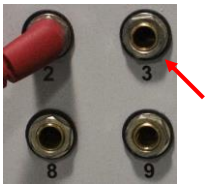
Don't Swap Transducers

Transducers are calibrated to a specific audiometer. If transducers are replaced, the audiometer must be recalibrated.

Cords and headbands can be replaced without need for calibration

Troubleshooting Common Issues – Patch Panel

- You determine the issue is related to one of the jacks in the panel
  - Try tightening the nut holding jack in place
  - Clean the contacts
    - Use contact cleaner
    - Wipe plug. If you use rubbing alcohol, wipe dry.
    - Unplug and replug the cable numerous times
  - Use a different jack (must also move corresponding cable on other side.)



A note about bone conduction …

- Calls reporting bone conduction being out of calibration are relatively common.
  - The first question to be asked is if this happens on every patient or just some. If calibration is off, it will be off for every patient.
- According to Robert Margolis, BC variability is audiology's "dirty little secret." (https://www.audiologyonline.com/articles/vanishing-air-bone-gap-audiology-901)
- Also see *That doesn't make sense! –The practical realities of bone conduction audiometry* by Sherman Lord, Au.D. in course materials

Troubleshooting Common Issues – Other Audiometer Issues

- Response button
  - Use many of the same techniques as with a transducer issue
  - Buttons are typically not repairable but new one can be ordered
- Sound field speakers
  - Speaker cables run through panel
  - Verify speakers are properly plugged in at audiometer
  - Check connections at speaker – usually at the bottom of the speaker
  - Some audiometers use external amplifiers – is this on and connected?

Troubleshooting Common Issues – Other Audiometer Issues

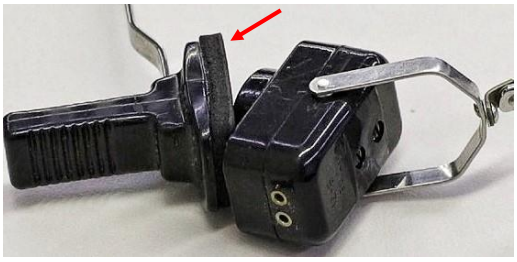
- Cannot hear the patient
  - Turn on/up monitor – can you hear tones as they are presented? Yes, check the talk-back mic connection to the audiometer. (Like speakers, connects directly to audiometer and not plugged into jack panel.
  - If you cannot hear the patient AND cannot hear tones via the monitor, the issue is likely related to the mic/monitor headset.
    - Verify it is plugged in properly
    - Has the monitor volume been turned down?
    - Replace mic/monitor headset if needed

Troubleshooting Common Issues – Other Audiometer Issues

- Patient reports that your voice is distorted
  - Most common issue is VU meter adjusted too high
  - Can also be related to a defective mic/monitor headset or microphone
- Patient's voice is distorted
  - Most common issue is talk-back volume set too loud
  - If tones are distorted when listening to the monitor, may be defective mic/monitor headset

Troubleshooting Common Issues – Other Audiometer Issues

- Headbands should be replaced if they have lost appropriate tension
- Foam pad on bone headband can be replaced without replacing whole headband

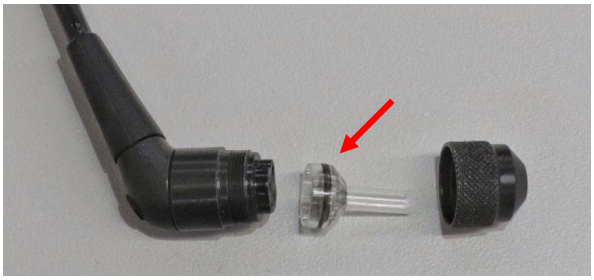


Troubleshooting Common Issues – Other Audiometer Issues

- Cushions should clean and not cracked.
- Cushions can be easily replaced as needed by simply pulling off and attaching a new one.

Troubleshooting Common Issues – Middle Ear Analyzers

- If a problem is found, first thing is <u>always</u> to clean or replace the probe tip
  - Some systems have a gasket for the probe tip. Be sure this is in place.



Troubleshooting Common Issues – Middle Ear Analyzers

- If leaks are occurring
  - Run in test cavity to see if pressure can be maintained in the cavity.
  - Check all exposed tubing for cracks or any damage. Replace if necessary.
  - Replace probe tip and gasket if it hasn't already been done.
- Problems with contra phone may be due to a bad cable (common) or a bad transducer (less common.)
  - Troubleshoot like an audiometer (e.g. check connections, cables, etc.)

Troubleshooting Common Issues – OAE

- If a problem is found, clean or replace the probe tip
  - Some systems have a gasket for the probe tip. Be sure this is in place.
  - Do not attempt to clean inside the probe itself
  - Follow manufacturer instructions



Troubleshooting Common Issues – OAE

- Check probe cable connection at unit
  - Is it seated properly?
  - Is it clean?
  - Are there any bent pins in the connection?


Troubleshooting Common Issues - Printers

- Tymp and OAE equipment commonly use thermal printers
  - Thermal printers work by heating the paper with a stylus
  - Thermal paper only works when inserted properly
  - If the printer is not printing, remove paper and replace with opposite side facing up

Troubleshooting

- If necessary, call for service.
- Talking to a service technician may provide a few additional troubleshooting steps.
- Explain what was done and what you think the issue is (or at least what you know it isn't.)

Routine Equipment Maintenance and Care

- Cleaning your equipment
- Cord management – don't wrap cords tightly

Correct – cord wrapped loosely

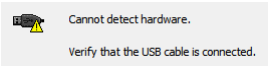
Incorrect – avoid wrapping tightly

Error Messages and Log Files

- As equipment has improved, so has the ability to obtain information about issues that have been experienced.
  - If an error message appears, write down the message (or, better yet, snap a picture.) This information is quite helpful when providing service.
  - Much of the modern equipment has the ability to store a logfile of equipment function.
    - Your service technician may either get these logs or ask you to do to so.
    - These logs can often be very long. Noting the date/time of the problem can be helpful.

Troubleshooting PC-Connected Devices

- Most equipment sold today can either share information with a PC or is PC-controlled.
- Troubleshooting connectivity and transfer issues should begin with icons and messages within the software.




- Check the user manual for specific troubleshooting guidance.

Troubleshooting PC-Connected Devices

- If equipment is not connected, check the connection
  - USB or other cable
  - Bluetooth
- Note that most USB-connected equipment only works with USB 2.0 ports, not USB 3.0
  - 3.0 is often labeled as SS or colored blue

Troubleshooting PC-Connected Devices

- USB-connected equipment should be connected directly to the PC, if possible.
  - If a USB hub is used, be sure that it is a powered hub (plugs into power outlet.)
  - Be careful of USB extension cables
- Using an extension cable or non-powered hub may initially work but spontaneously stop working.

Troubleshooting PC-Connected Devices

- If a quick check doesn't reveal the solution, fall back on the age-old solution …

Turn everything off and back on again.

Questions?