Calibration

The FP35 provides you with a means to calibrate the system, the probe and coupler microphones, and the insert earphone(s).

The system calibration of the FP35 should be done once a year, but the microphones should be calibrated only when necessary. Even if you have determined that the microphones are out of calibration, you should contact the factory or your sales representative before calibrating the microphones. The reason for taking this precaution is that the microphone calibration is stored in the microphone connector rather than in the instrument. Because of this setup, the microphones should not go out of calibration. If they do, it may indicate that something more is wrong, and simply calibrating the microphones might not correct the problem.

Note: For best accuracy, allow the FP35 to stabilize to room temperature before performing a system calibration. The FP35 will stabilize to room temperature if it is left on for 15 minutes. The current internal temperature is displayed in the Calibration Screen.

A. Calibrating the System

To calibrate the system:

1. Press [MENU] from the Opening Screen to enter the Default Settings Screen.
2. Press [NEXT] to go to the Advanced Default Settings Screen.
3. Use the arrow keys to set the USER LEVEL to ADVANCED.
4. Press [F3] to enter the Calibration Menu.
5. Use the [▲,▼] buttons to move the cursor next to “Calibrate System.”
6. Press [START/STOP]. The FP35 will confirm that you want to calibrate the system.
7. Press [START/STOP] to begin the calibration (or press any other key to cancel). The FP35 will ask you to wait while the system is calibrating. Once calibration is complete, the FP35 will return to the Calibration Menu.
8. Select “Store Calibration in EEROM” in the menu.
9. Press [START/STOP] twice. The system calibration is now complete and stored.

B. Checking the Microphone Calibration

Do the following procedure to determine if the coupler and probe microphones are out of calibration.

Calibration instructions are in Section C.

B.1 Coupler Microphone Check

For the coupler microphone, you will need a sound level calibrator such as the Quest QC-10.

1. Press [MENU] from the Opening Screen to enter the Default Settings Menu.
2. Press [NEXT].
3. Use the arrow keys to set the USER LEVEL to ADVANCED.
4. Press [EXIT] to return to the Opening Screen.
5. Press [F3] to enter the Coupler Multicurve Mode from the Opening Screen.
6. Use [F4] to choose NORM.
7. Press [MENU].
8. Set REF MIC to OFF, if necessary, using the arrow keys. (This menu item will not appear on all analyzers.)
9. Press [NEXT] to enter the Advanced Menu. Set STATIC TONE to SINGLE.
10. Press [EXIT] to return to the Coupler Multicurve Screen.
11. Press [▼] repeatedly until the single tone is turned off.
12. Use the microphone adapter supplied with the FP35 to fit the coupler microphone into the calibrator, and turn the calibrator on. See Figure C-1.
13. Observe the output under MIC SPL. If it matches the specified amplitude level of the calibrator within ±1 dB, the coupler microphone is within specifications and does not need to be calibrated. If the coupler microphone is out of calibration, follow the instructions found in Section C.1.
14. Press [EXIT] and follow steps 1-4 again to set the USER LEVEL back to EASY.

Note: if you are using a calibrator that uses a signal with a frequency not divisible by 100 Hz, you will need to check the calibration in the microphone calibration screen.

Figure C-1: Coupler microphone inserted into sound calibrator.

B.2 Reference Microphone Check

These instructions only need to be followed if you are using a new style integrated probe microphone set. If you are using an old style (legacy) probe microphone set, skip to the probe microphone calibration check instructions found in Section B.3.

1. Follow Steps 1-4 in Section B.1 above to set the USER LEVEL to ADVANCED.
2. Press [F3] to enter the Coupler Multicurve Mode from the Opening screen.

3. Press [MENU].
4. Press [NEXT] to enter the Advanced Menu, and use the arrow keys to set the STATIC TONE setting to SINGLE.
5. Press [NEXT] to enter the Custom Menu. Use the arrow keys to set the MIC PORT to EXTERNAL.
6. Press [EXIT] and [MENU] again to refresh the menu selections.
7. Use the arrow keys to set the REF MIC to OFF.
8. Press [EXIT] to return to the Coupler Multicurve Screen.
9. Use [F4] to set the source type to NORM.
10. Use the down arrow key repeatedly until the SOURCE is OFF.
11. Place the rectangular calibrator adapter into the calibrator as shown in Figure C-2. You can either hold the reference microphone to the calibrator manually or use a rubber band.

Figure C-2

12. Turn on the calibrator and observe the MIC SPL. If the reading matches the output specified on the calibrator by ±1 dB, the reference microphone is within specification and does not need to be calibrated. Otherwise, follow the instructions found in Section C.2 to calibrate the reference microphone.

B.3 Probe Microphone Check

1. Follow Steps 1-4 in Section B.1 above to set the USER LEVEL to ADVANCED.
2. Press [F3] to enter the Coupler Multicurve Mode from the Opening Screen.
3. Press [MENU].
4. Press [NEXT] twice to enter the Custom Menu. Use the arrow keys to set the MIC PORT to EXTERNAL. (This setting will not appear on all analyzers.)
5. Press [EXIT] and [MENU] again to refresh the menu selections.

6. Use the arrow keys to set DISPLAY to GAIN, NOISE RED (TONE) to 16X, and REF MIC to ON.
7. Press [EXIT] to return to the Coupler Multicurve Screen.

8a. If you are using an old style (legacy) probe microphone set, locate the calibration clip and fasten it to the edge of the reference microphone. Insert a fresh probe tube through the tube on the clip until the tip of the probe is at the center of the reference microphone grill as shown in Figure C-3A.

8b. If you are using a new style integrated probe microphone set, fasten the tip of a fresh probe tube to the reference microphone using a dab of putty, as shown in Figure C-3B.

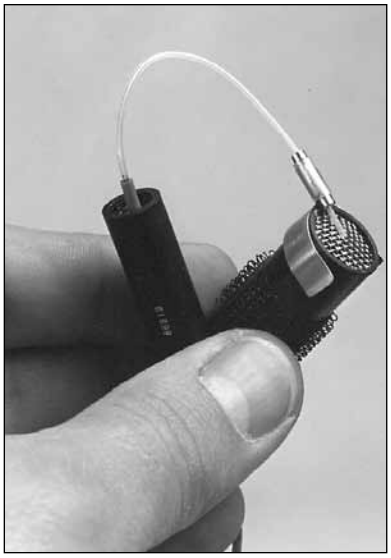

Figure C-3A—Attaching the probe to the reference microphone

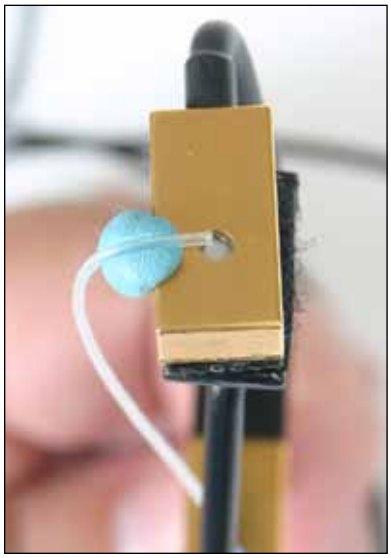

Figure C-3B—Attaching the integrated probe to the reference microphone

9. Put both microphones in the sound chamber and close the lid.
10. Set the source level to 90 dB SPL using the up arrow key.
11. Set the source type to COMP (if available) using [F4]. Otherwise, set the source type to NORM.
12. Press [START/STOP]. If you are using the COMP source type, press [START/STOP] again to stop the signal.
13. Look at the response. This curve represents the difference between the probe response and the reference response. The maximum deviation from the zero line should be 5 dB.
14. If you are not sure if the response is ± 5 dB from the zero line, press [MENU], use the arrow keys to set the DATA/GRAPH selection to DATA, and press [EXIT] to return to the Coupler Multicurve screen. This will give you the numerical data of the frequency response.
15. If the response is within 5 dB of the zero line, the probe microphone is within specifications. Otherwise, the probe microphone needs calibration. See Section C.3.

C. Calibrating the Microphones

The FP35 microphones should be calibrated **after** the system calibration described in Section A.

There are three possible microphones on the FP35 analyzer:

- Coupler microphone
- Probe microphone
- Reference microphone

There are several variations of these microphones that may be available, depending upon when the analyzer was manufactured and whether or not it includes the Real-ear Option.

FP35 analyzers that do not include the Real-ear Option will only have the coupler microphone. This procedure for calibrating this microphone is described in Section C.1.

FP35 analyzers with the Real-ear Option manufactured during or after November 2008 will have an integrated probe microphone set in addition to the coupler microphone. This consists of a probe microphone integrated into the earhook and a rectangular reference microphone that attaches to the top of the earhook. The procedure for calibrating the integrated probe microphone is described in Section C.3. The procedure for calibrating the rectangular reference microphone is described in Section C.2.

FP35 analyzers with the Real-ear Option manufactured before November 2008 will have a two microphone set consisting of a larger 14 mm coupler microphone and a probe microphone. (The coupler microphone is used as a reference microphone during real-ear measurements.) The procedure for calibrating the coupler microphone is described in Section C.1. The procedure for calibrating the probe microphone is described in Section C.3.

To perform the microphone calibrations, you will need the following equipment, depending on what type of microphones you are calibrating. The adapters come standard with the analyzer. You can purchase additional adapters and a sound calibrator from the factory. (Sound calibrators are special orders and may not be immediately available for purchase.)

- Sound calibrator such as a QC-10 (all calibrations)
- 14 mm-to-1 inch microphone adapter (coupler microphone calibration)
- Rectangular reference microphone adapter (rectangular reference microphone on integrated probe microphone).
- Calibration clip (legacy probe microphone)

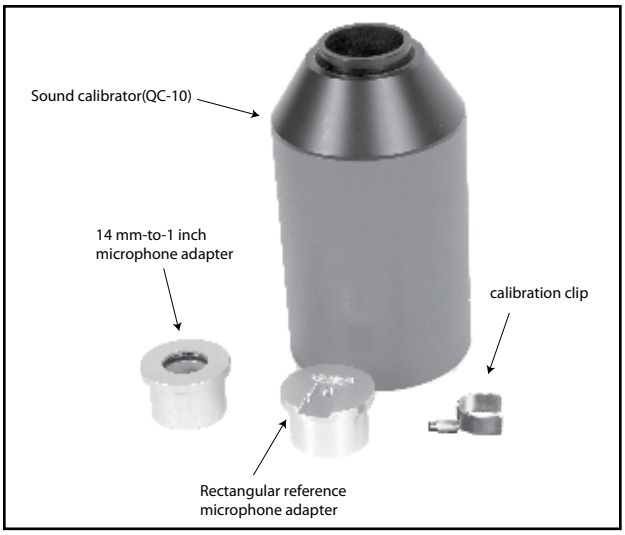

Figure C-4: Microphone calibration equipment

C.1 Calibrating the Coupler Microphone

This procedure describes how to calibrate the coupler microphone. (On FP35 analyzers manufactured before November 2008, the coupler microphone was also used as a reference microphone during real-ear measurements.)

1. Press [MENU] from the Opening Screen to enter the Default Settings Screen.
2. Press [NEXT] to go to the Advanced Default Settings Screen.
3. Use the arrow keys to set the USER LEVEL to ADVANCED.
4. Press [F3] to enter the Calibration Menu.
5. Press [F3] to enter the Microphone Calibration Screen.
6. If you have an FP35 analyzer manufactured after November 2008, select the port the microphone is plugged into. The “internal mic” is the connector located inside the internal sound chamber. The “external mic” is the connector located on the front of the analyzer. This functionality is not available if the external microphone port is not on the analyzer. Normally the coupler microphone is plugged into the internal port.
7. Use the arrow keys to select “Custom Coupler Mic Cal.” This may be the only selection available.
8. Attach the 14 mm-to-1 inch microphone adaptor into the sound calibrator.
9. Insert the coupler microphone into the adapter. See Figure C-1. Turn on the sound calibrator.
10. Press [START/STOP] to start the calibration.
11. Use the up/down arrow keys to adjust the “MEASURED dBSPL” until it matches the output of the calibrator. Pressing the keys briefly will result in 0.1 dB changes. Holding the buttons down will result in 1 dB changes.
12. Once the “MEASURED dBSPL” matches the calibrator, press [EXIT] to return to the Microphone Calibration Screen.
13. Press [F5] to store the calibration.

C.2 Calibrating the Rectangular Reference Microphone

This procedure describes how to calibrate the rectangular reference microphone that is part of the new-style integrated probe microphone set. This microphone is not normally available on FP35 analyzers manufactured before November 2008.

1. Press [MENU] from the Opening Screen to enter the Default Settings Screen.
2. Press [NEXT] to go to the Advanced Default Settings Screen.
3. Use the arrow keys to set the USER LEVEL to ADVANCED.
4. Press [F3] to enter the Calibration Menu.
5. Press [F3] to enter the Microphone Calibration Screen.
6. Select the port the microphone is plugged into. The "internal mic" is the connector located inside the internal sound chamber. The "external mic" is the connector located on the front of the analyzer. Normally, the integrated probe microphone is plugged into the external mic port.
7. Attach the rectangular reference microphone adaptor into the sound calibrator.
8. Remove the reference microphone from the integrated ear hook and insert it into the calibration adapter with the opening of the reference microphone pointing into the calibrator. See Figure C-5A. You can use a rubber band to hold the microphone onto the calibrator, if necessary. See Figure C-5B. Turn on the sound calibrator.

Figure C-5A: Rectangular reference microphone inserted into sound calibrator

Figure C-5B: Using a rubber band to hold the microphone in place on the calibrator

9. Use the arrow keys to select "Custom Reference Mic Cal."
10. Press [START/STOP] to start the calibration.
11. Use the up/down arrow keys to adjust the "MEASURED dBSPL" until it matches the output of the calibrator. Pressing the keys briefly will result in 0.1 dB changes. Holding the buttons down will result in 1 dB changes.
12. Once the "MEASURED dBSPL" matches the calibrator, press [EXIT] to return to the Microphone Calibration Screen.
13. Press [F5] to store the calibration.

C.3 Calibrating the Probe Microphone

These instructions describe how to calibrate the probe microphone. There are two models of probe microphone on the FP35 analyzer: the old style 1 cm diameter microphone and the new style integrated microphone. The calibration procedure is the same.

1. Press [MENU] from the Opening Screen to enter the Default Settings Screen.
2. Press [NEXT] to go to the Advanced Default Settings Screen.
3. Use the arrow keys to set the USER LEVEL to ADVANCED.
4. Press [F3] to enter the Calibration Menu.
5. Press [F3] to enter the Microphone Calibration Screen.
6. If you have an FP35 analyzer manufactured after November 2008, select the port the microphone is plugged into. The “internal mic” is the connector located inside the internal sound chamber. The “external mic” is the connector located on the front of the analyzer. This functionality is not available if the external microphone port is not on the analyzer. Normally the probe microphone is plugged into the external port when it’s available.
7. Use the arrow keys to select “Custom Probe Mic Cal.”
8. Attach a new probe tube to the probe microphone.
9. If you have the old style microphone, attach the calibration clip to the reference microphone and thread the probe tube through it so that the end of the probe tip is centered on the grill of the reference microphone. See Figure C-6A.

   If you have the integrated microphone, place the end of the probe tip over the reference microphone and secure with Fun Tak. See Figure C-6B.
10. Place the probe and reference microphones together at the reference point in the sound chamber.

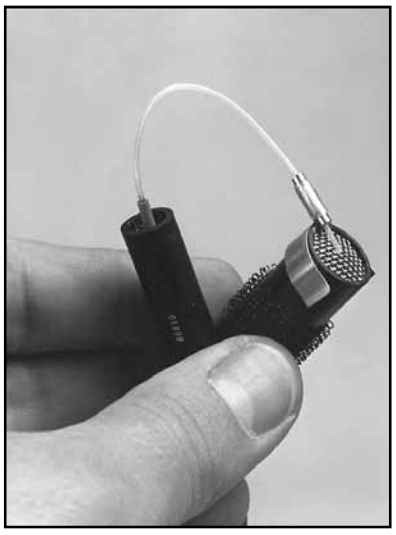

Figure C-6A: Attach probe to the reference microphone using the legacy (old style) probe microphone set.

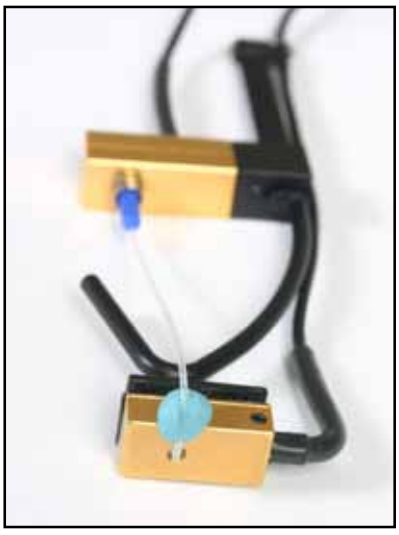

Figure C-6B: Attach probe to the reference microphone using the integrated probe microphone.

12. Press [START/STOP] to start the calibration.
13. Press [F5] to store the calibration.

D. Insert Earphone Calibration

Before you can perform RECD or audiometric measurements, it is necessary to calibrate the insert earphone(s) that you will be using. The calibration for the insert earphones is based on the ANSI S3.6-1996 specifications. There is no need to specifically calibrate individual HL levels because the following calibration procedure provides a sufficiently stable reference.

D.1 RECD coupler setup

1. Insert the insert earphone into the "earphone" jack on the back of your analyzer.
2. Plug the other end of the insert earphone into the tubing of the ear level adapter attached to an HA-2 coupler. See Figure C-7.
3. Insert coupler microphone into the HA-2 coupler. See Figure C-8.
4. From the Opening Screen, press [MENU] to enter Default Settings Menu.
5. Press [F3] to enter the Calibration Screen.
6. Press [F4] to enter the Earphone Calibration Screen.

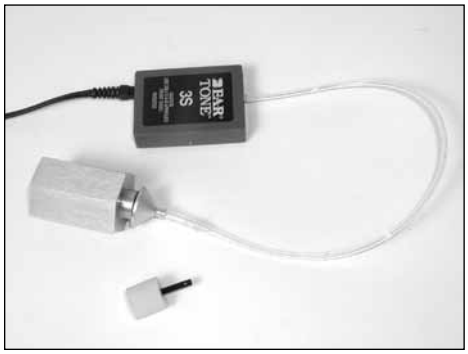

Figure C-7—Insert earphone connected to ear level adapter and HA-2 coupler

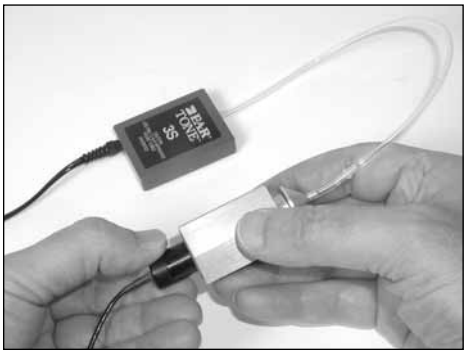

Figure C-8—Coupler microphone inserted into HA-2 coupler

D.2 RECD coupler measurement

1. Set up your insert earphone for calibration as described above.
2. If you have the external integrate probe microphone plugged into the front of the analyzer, unplug it. (This does not apply to the older style probe microphone set that plugs inside the internal sound chamber.)
3. Select "Cal Left (Single) Ins. Earphone (RECD)" with [▲,▼].
4. Press [START/STOP] twice to perform the calibration.
5. If you are using only one insert earphone for the RECD measurements, skip to step 8. If you are using two insert earphones (one per ear), proceed to the next step.
6. Set up the right insert earphone as described above.
7. Use [▼] to select "Cal Right Ins. Earphone (RECD)."
8. Press [START/STOP] twice to perform the measurement.

9. Press [F5] to save the insert earphone calibration.
10. Press [EXIT] to exit Earphone Calibration Screen.

D.3 Audiometer calibration setup

1. Attach the earphone calibration adapter to the HA-2 coupler
2. Insert the insert earphone into the "earphone" jack on the back of your analyzer.
3. Plug the other end of the insert earphone into the earphone calibration adapter. See Figure C-9.
4. Insert coupler microphone into the HA-2 coupler. See Figure C-10.
5. From the Opening Screen, press [MENU] to enter Default Settings Menu.
6. Press [F3] to enter the Calibration Screen.
7. Press [F4] to enter the Earphone Calibration Screen.

Figure C-9—Insert earphone connected to earphone calibration adapter and coupler

Figure C-10—Coupler microphone inserted into HA-2 coupler

D.4 Calibrating the audiometer

1. Set up the left insert earphone for calibration as described above.
2. Select "Cal Left (Single) Ins. Earphone" using [▲] if necessary.
3. Press [START/STOP] twice to perform the calibration.
4. If you're only using one earphone, skip to step 8. Otherwise, proceed.
5. Set up the right insert earphone for calibration as described above.
6. Use [▼] to select "Cal Right Ins. Earphone."
7. Press [START/STOP] twice to perform the calibration.
8. Press [F5] to save the insert earphone calibration.
9. Press [EXIT] to exit Earphone Calibration Screen.

D.5 Erasing the insert earphone calibration

If you want to set the calibration to be electrically flat to allow you to use the "earphone" jack for other devices, perform the following operation.

1. Press [F1] to erase the calibration.
2. Press [F5] to save this change.