vivosonic

Calibration System Manual

I Contents

2 Hardware Requirement:

Computer Interface

- (not included)
- IMPORTANT: The Vivosonic Calibration System software should only be used with a Windows 7 64-bit computer to guarantee optimal performance.
- Portable laptop with Vivosonic Calibration System software, version 3.1 and higher.

Calibration Interface

- Powered by a laptop computer via a USB to UART cable.

Acoustic Couplers

- (not included)
- Acoustic couplers are used to calibrate different transducers.
- Customized coupler RA026 (Equivalent to B&K DB2012) calibrates OAE Probe, built-in sound source as well as the Ear Simulator (IEC60711 coupler)
- Coupler for insert earphones – B&K DB0370
- 9mm ear tip for P40-GP and P81-GP OAE probes and R9M ear tip for P40-UG and P81-UG OAE probes

Microphone Preamplifier

- (not included)
- Requires 200V supply voltage and gain to the acoustic test microphones.
- Requires AC output through BNC connector.
- Larson Davis Model 2221 recommended.

Sound Calibrator

- (not included)
- Sound Calibrator (type 4231) used as the standard sound source to calibrate the acoustic measuring equipment.

Ear Simulator

- (not included)
- Ear Simulator and its accessories used to calibrate receivers.
- Recommend B&K type 4157 or GRAS RX00045, or similar defined in IEC60711.

Pressure-field Microphone

- (not included)
- Pressure-field microphone and pre-amplifier are used to calibrate built-in sound source.
- Recommend B&K type 4192, or similar.

3 Main Screen

The following is the Vivosonic Calibration Software main screen.

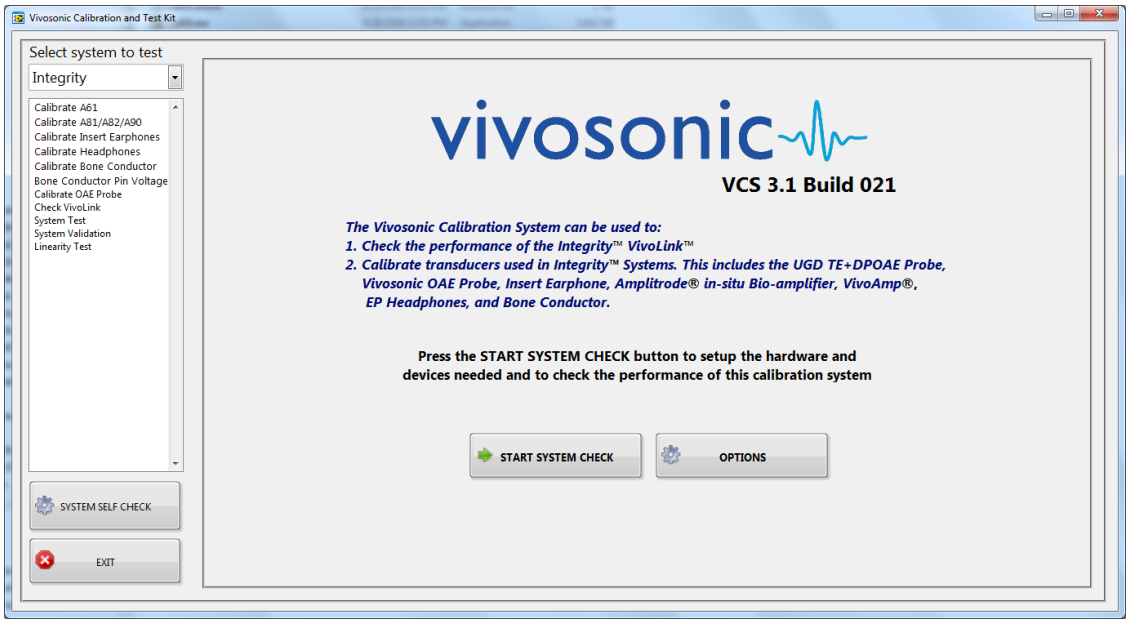


Figure 1

In the upper left corner of the software is a list of available calibration tests. This list will always be visible, but certain system elements must be calibrated before a test can be used.

In the lower left corner of the software is the “SYSTEM SELF CHECK” screen. This will open the main screen, from which you can visit the “Options” page or proceed to the system calibration screen by clicking “START SYSTEM CHECK”. (Figure 1)

Also in the lower left corner of the screen is the EXIT button. Use this to close the calibration software, rather than the “X” button in the upper right.

When you start, you must run a system check to calibrate the system electronically and acoustically.

4 System Calibration

The following are the various calibration choices. Depending on what you want to calibrate, you may choose the appropriate calibration. It is important to note that 'Calibrate Stimulating Channel 1' and 'Calibrate Stimulating Channel 2' are always required and must pass before any other tests can be performed. *(*Figure 2*)*

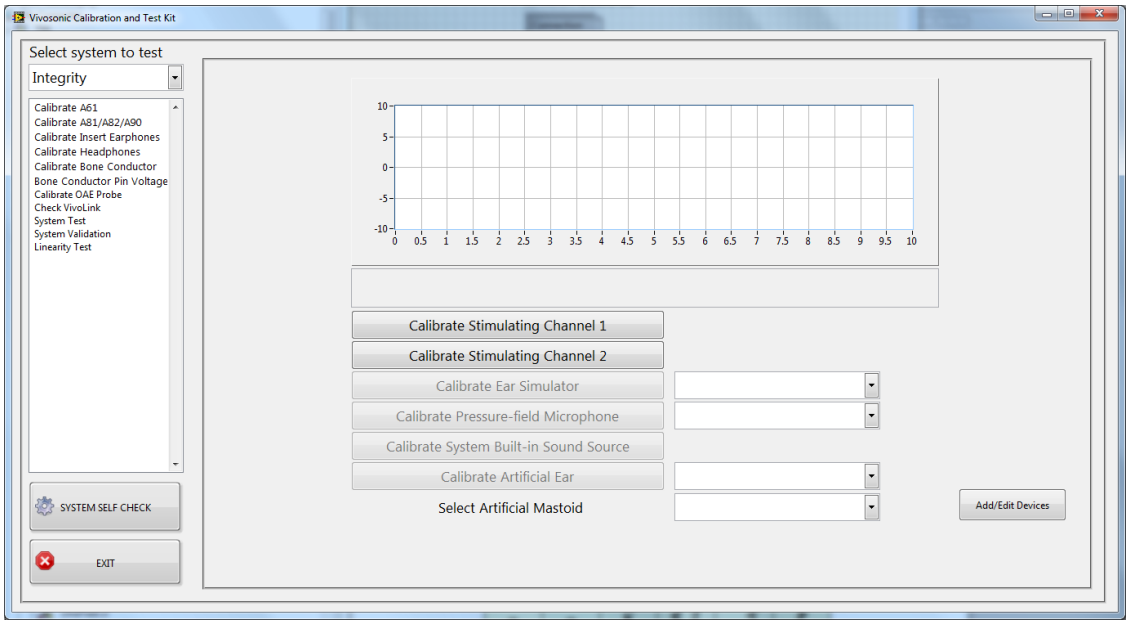


Figure 2

The following chart specifies which devices must be calibrated for each test type:

	Channel 1	Channel 2	Ear Simulator	Pressure Field Microphone	System Sound Source	Artificial Ear
Calibrate Insert Earphone	✓	✓	✓			
Calibrate Amplitrode®/VivoAmp™	✓	✓				
Calibrate Bone conductor	✓	✓				✓ *
B-71 Pin Voltages	✓	✓				
Calibrate OAE Probe	✓	✓	✓	✓	✓	
Calibrate Headphones	✓	✓				✓
Check VivoLink™	✓	✓				
System Check	✓	✓	✓			✓

Figure 3

* Not required if using a mechanical artificial mastoid

4.1 Channel one calibration

The following are the steps required to calibrate channel one on the calibration board.

1. Connect the adaptor board to the CaliBoard (CON1 through to CON2). VERIFY THAT THERE ARE NO TRANSDUCERS CONNECTED. (Figure 4)
2. Set S1 to CAL, S2 to SELF, S3 to DIFF, S4 to OFF, and S5 to P. *(*Figure 5*)*
3. Press the OK button to output a 1 kHz, 100 mV rms sinusoidal waveform from the stimulating channel 1 (SCH1) of the calibration system.
4. Measure the SCH1 output between test points DVR1 and AGND with a multimeter in AC mV mode.
5. Click the UP and DOWN arrows to adjust the multimeter reading to within 100 ± 0.25 mV. *(*Figure 6*)*
6. Press the "Calibrate Recording Channel 1" button to set the recording channel 1 (RCH1) calibration.

A PASS (check mark) or FAIL (X) will be displayed when finished.

Figure 4

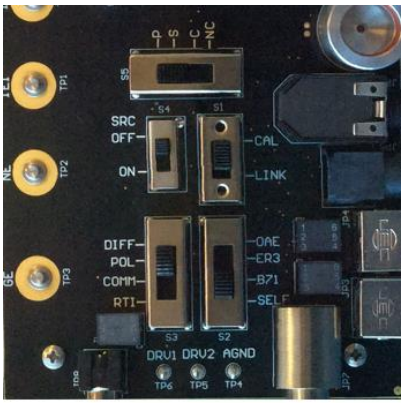


Figure 5

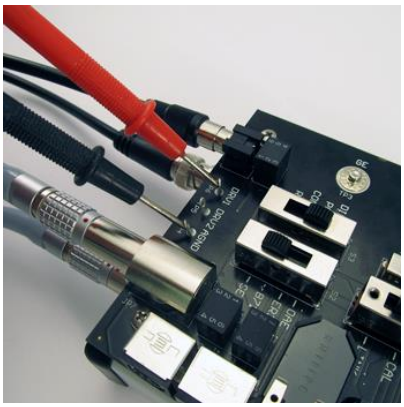


Figure 6

4.2 Channel two calibration

The following are the steps required to calibrate channel two on the calibration board.

1. Connect the adaptor board to the CaliBoard (through CON1 and CON2). VERIFY THAT THERE ARE NO TRANSDUCERS CONNECTED. *(*Figure 7*)*
2. Set S1 to CAL, S2 to SELF, S3 to DIFF, S4 to OFF, and S5 to P. *(*Figure 8*)*
3. Press the OK button to output a 1 kHz, 100 mV rms sinusoidal waveform from the stimulating channel 2 (SCH2) of the calibration system.
4. Measure the SCH2 output between test points DVR2 and AGND with a multimeter in AC mV mode.
5. Click the UP and DOWN arrows to adjust the multimeter reading to within 100 ± 0.25 mV. *(*Figure 9*)*
6. Press the "Calibrate Recording Channel 2" button to set the recording channel 2 (RCH2) calibration.

A PASS (check mark) or FAIL (X) will be displayed when finished.

Figure 7

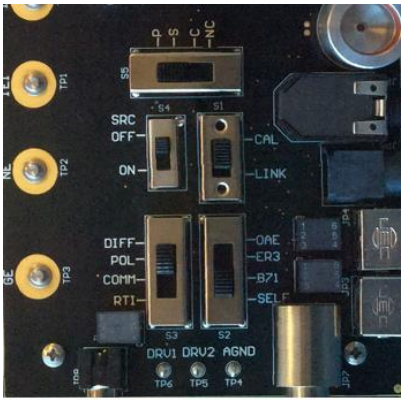


Figure 8

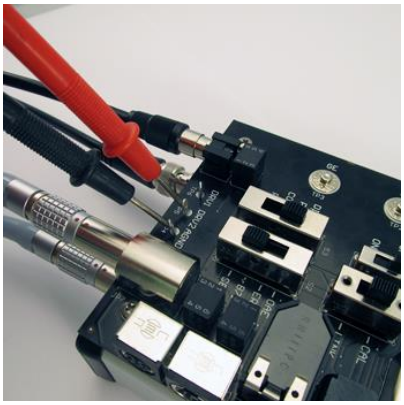


Figure 9

4.3 Ear simulator calibration

The following are the steps required to calibrate the ear simulator. The ear simulator will be used to test and calibrate the insert earphones and the OAE probes.

1. Choose the appropriate ear simulator using the drop-down menu or press “Add Device” to define a new one.
2. Attach the adapter to the Microphone Preamplifier.
3. Connect the Microphone Preamplifier to the CaliBoard (through CON1) and the Adaptor board to the Caliboard (through CON2). *(*Figure 10*)*
4. Connect the ear simulator with the appropriate coupler to the Microphone Preamplifier.
5. Set S1 to CAL, S2 to SELF, S3 to DIFF, S4 to OFF and S5 to P. *(*Figure 11*)*
6. Place the ear simulator in the Sound Calibrator. *(*Figure 12*)*
7. Turn the Sound Calibrator ON and press the OK button to continue.

The calibration system will measure a 1 kHz tone at 94.0 plus adapter value (dB SPL) ± 0.5 dB SPL and will update the sensitivity of the ear simulator. A PASS (check mark) or FAIL (X) will be displayed when finished.

Figure 10

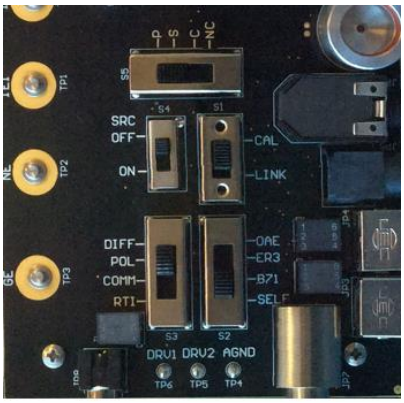


Figure 11

Figure 12

4.4 Pressure-field microphone calibration

The following are the steps required to calibrate the pressure-field microphone. The pressure-field microphone will be used to calibrate the internal sound source.

1. Choose the appropriate pressure-field microphone using the drop-down menu or press “Add Device” to define a new one.
2. Connect the Microphone Preamplifier to the CaliBoard (through CON1) and the Adaptor board to the CaliBoard (through CON2). *(*Figure 13*)*
3. Attach the Pressure-field Microphone to the Microphone Preamplifier.
4. Set S1 to CAL, S2 to SELF, S3 to DIFF, S4 to OFF and S5 to P. *(*Figure 14*)*
5. Place the Pressure-field microphone in the Sound Calibrator. *(*Figure 15*)*
6. Turn the Sound Calibrator ON and press the OK button to continue.

The calibration system will measure a 1 kHz tone at 94.0 ± 0.5 dB SPL and will update the sensitivity of the Pressure-field Microphone. A PASS (check mark) or FAIL (X) will be displayed when finished.

Figure 13

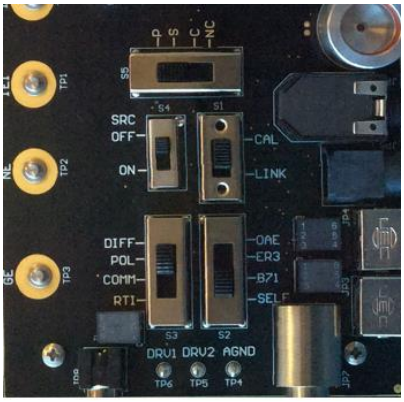


Figure 14

Figure 15

4.5 Sound source calibration

The following are the steps required to calibrate the internal sound source on the calibration board. This sound source will be used to test the OAE probes.

1. Connect the Microphone Preamplifier to the CaliBoard (through CON1) and Adaptor board to the Caliboard (through CON2). *(*Figure 16*)*
2. Connect pressure-field Microphone to the Microphone Preamplifier.
3. Set the S1 to CAL, S2 to OAE, S3 to DIFF, S4 to ON and S5 to P. *(*Figure 17*)*
4. Place the pressure-field Microphone in the Sound Source on the Adaptor Board. *(*Figure 18*)*
5. Press the OK button to start the calibration test.

The levels at the 80 frequency points from 100Hz to 8000Hz generated by the Sound Source will be measured with the calibrated pressure-field microphone and will be saved and used as the reference for calibrating the OAE probe microphone.

Levels from 100 Hz to 4000 Hz must be higher than 90 dB SPL and levels between 4100 Hz and 8000 Hz must be higher than 70 dB SPL. A PASS (check mark) or FAIL (X) will be displayed when finished.

Figure 16

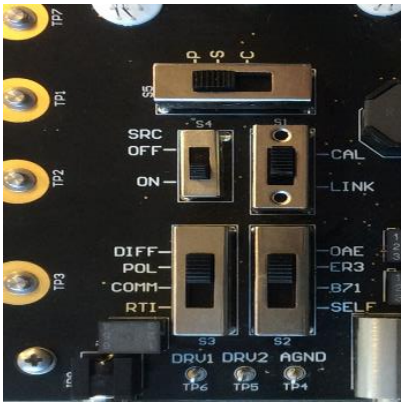


Figure 17

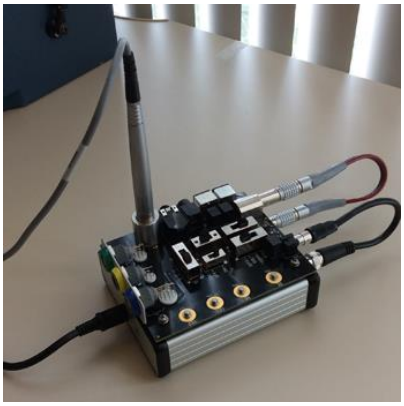


Figure 18

4.6 Artificial ear microphone calibration

The following are the steps required to calibrate the artificial ear microphone. This will be used to test and calibrate the bone-conductors and the EP headphones.

1. Choose the appropriate artificial ear using the drop-down menu or press “Add Device” to define a new one.
2. Connect the Microphone Preamplifier to the CaliBoard (through CON1) and the Adaptor board to the CaliBoard (through CON2). *(*Figure 19*)*
3. Remove all adapters from the Microphone Preamplifier.
4. Connect the artificial ear to the Microphone Preamplifier. Note: if using a Larson Davis AEC201-A artificial ear with a type 377A13 microphone, ensure that the polarisation voltage is set to 0 V).
5. Set S1 to CAL, S2 to SELF, S3 to DIFF, S4 to OFF and S5 to P. *(*Figure 20*)*
6. Remove the top part of the artificial ear.
7. Remove the circular adapter of the Sound Calibrator and place it upside down on the one-inch microphone. *(*Figure 21*)*
8. Turn the Sound Calibrator ON and press the OK button to continue.

The calibration system will measure a 1 kHz tone at 94.0 ± 0.5 dB SPL and will update the sensitivity of the one-inch microphone. A PASS (check mark) or FAIL (X) will be displayed when finished.

Figure 19

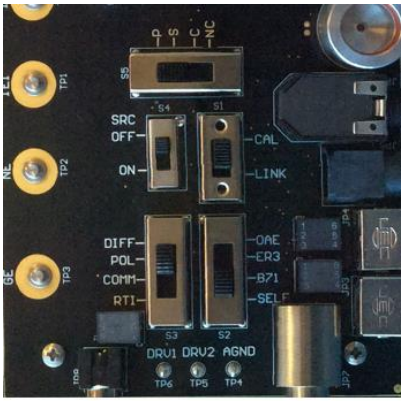


Figure 20

Figure 21

4.7 Artificial Mastoid Calibration Data Entry

The data entry for the Artificial Mastoid requires all values from the calibration sheet to be entered into the table. If the user fails to enter values for all the frequencies the default value is 0. This will cause the calibration to fail or be invalid.

5 Calibration tests

On the left-hand side, you will have a list of available calibration tests. By choosing one, you will open a new screen which is specifically-designed for that calibration test.

5.1 A61 Amplitrode® Calibration

The following are the steps required to calibrate an Amplitrode®.

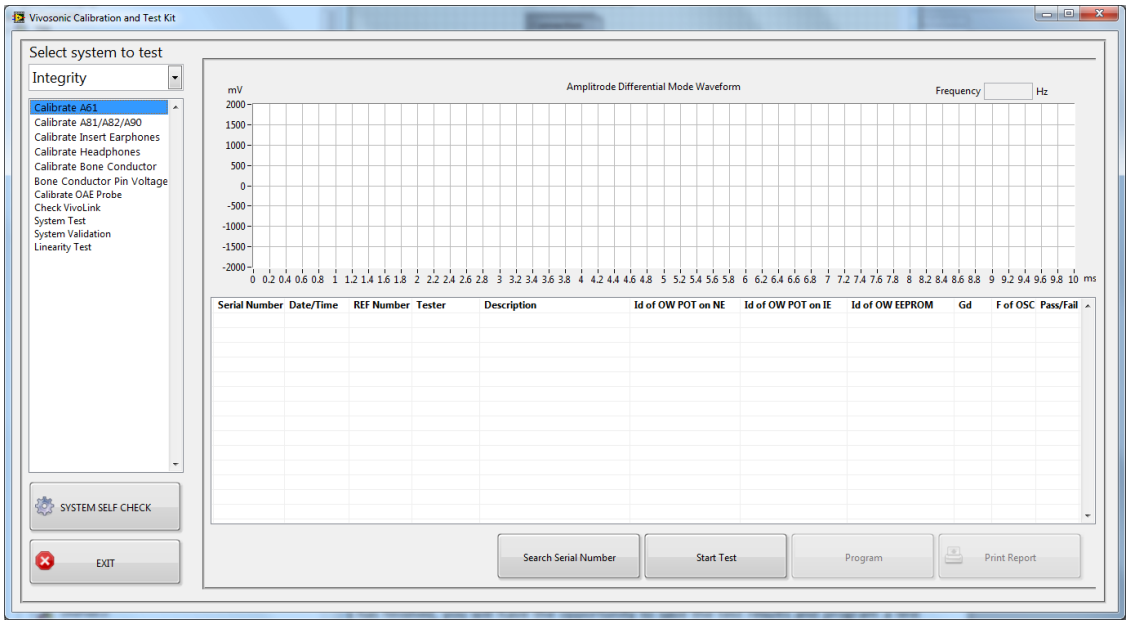


Figure 22

1. Plug the Amplitrode® to the appropriate connector on the Adaptor Board. *(*Figure 23*)*
2. Connect the Amplitrode® ground electrode clip to the GE electrode snap. *(*Figure 24*)*
3. Connect the Amplitrode® non-inverting (+) electrode clip to the NE electrode snap. *(*Figure 24*)*
4. Connect the Amplitrode® inverting electrode clip to the IE electrode snap. *(*Figure 24*)*
5. Set S1 to CAL, S2 to SELF, S3 to DIFF, S4 to OFF and S5 to P. *(*Figure 25*)*
6. Press the OK button to begin the Amplitrode® calibration test and follow the steps.

When the calibration has finished, you will have the opportunity to save the test results and program a test record's calibration information onto the Amplitrode® E^2PROM.

Figure 23

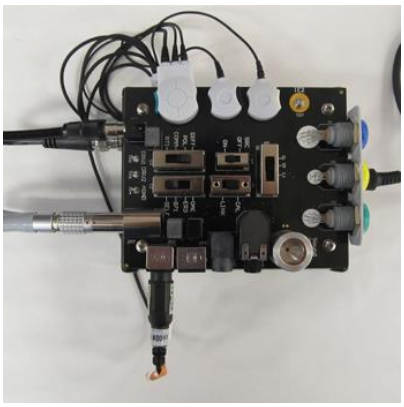


Figure 24

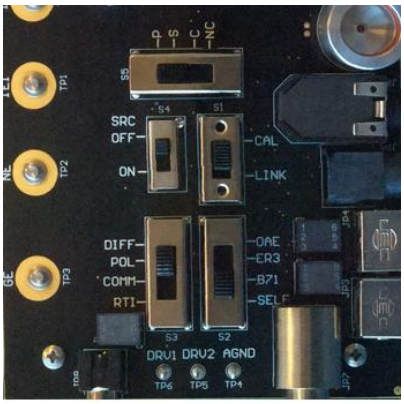
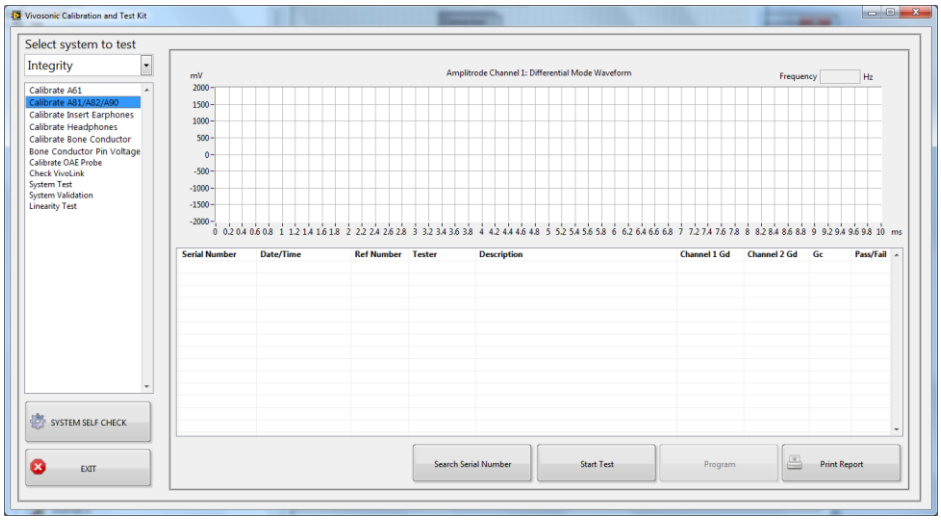


Figure 25

5.2 A81/A82/A90 Amplitrode®/VivoAmp™ calibration

The following are the steps required to calibrate an Amplitrode®/VivoAmp™.



5.2.1 A81 Amplitrode®

1. Plug the Amplitrode® to the appropriate connector on the Adaptor Board. *(*Figure 26*)*
2. Connect the Amplitrode® ground electrode clip to the GE electrode snap. *(*Figure 24*)*
3. Connect the Amplitrode® non-inverting (+) electrode clip to the NE electrode snap. *(*Figure 24*)*
4. Connect the Amplitrode® inverting electrode clip to the IE electrode snap. *(*Figure 24*)*
5. Set S1 to CAL, S2 to SELF, S3 to COMM, S4 to OFF and S5 to C. *(*Figure 27*)*
6. Press the OK button to begin the Amplitrode® calibration Common Mode Gain test
7. After the test is finished, Set S1 to CAL, S2 to SELF, S3 to DIFF, S4 to OFF and S5 to P. *(*Figure 28*)*
8. The Channel 1 gain test begins after you click on OK.

When the calibration has finished, you will have the opportunity to save the test results and program a test record's calibration information onto the Amplitrode® E^2PROM.

Figure 26

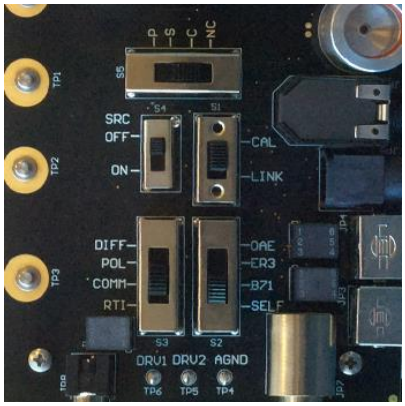


Figure 27

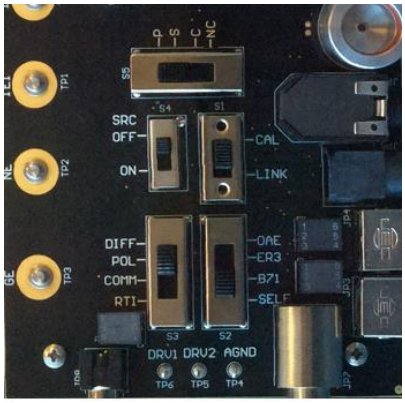


Figure 28

5.2.2 A82 Amplitrode® and A90 VivoAmp™

1. Plug the Amplitrode®/VivoAmp™ to the appropriate connector on the Adaptor Board.
2. Connect the Amplitrode®/VivoAmp™ ground electrode clip to the GE electrode snap. (Figure 30*)*
3. Connect the Amplitrode®/VivoAmp™ non-inverting (+) electrode clip to the NE electrode snap. (Figure 30*)*
4. Connect the Amplitrode®/VivoAmp™ inverting electrode clip to the IE1 electrode snap. (Figure 30*)*
5. Connect the Amplitrode®/VivoAmp™ inverting electrode clip to the IE2 electrode snap. (Figure 30*)*
6. Set S1 to CAL, S2 to SELF, S3 to COMM, S4 to OFF and S5 to C. *(*Figure 31*)*
7. Press the OK button to begin the Amplitrode® calibration Common Mode Gain test
8. After the test is finished, Set S1 to CAL, S2 to SELF, S3 to DIFF, S4 to OFF and S5 to P. *(*Figure 32*)*
9. Click on the OK button to being the Channel 1 gain test
10. After the test is finished, Set S1 to CAL, S2 to SELF, S3 to DIFF, S4 to OFF and S5 to S. *(*Figure 33*)*
11. Click on the OK button to being the Channel 2 gain test

When the calibration has finished, you will have the opportunity to save the test results and program a test record's calibration information on the Amplitrode®/VivoAmp™ E^2PROM

Figure 29

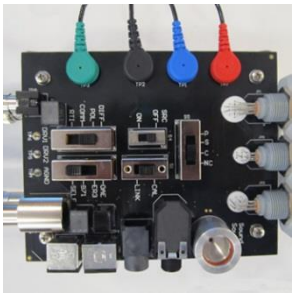


Figure 30

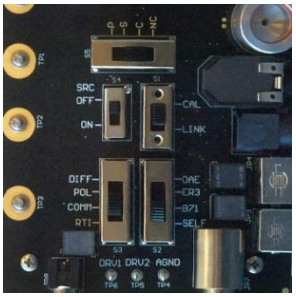


Figure 31

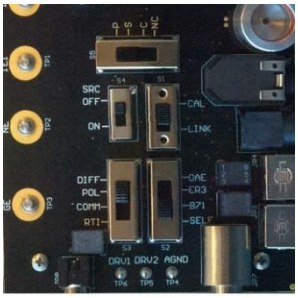


Figure 32

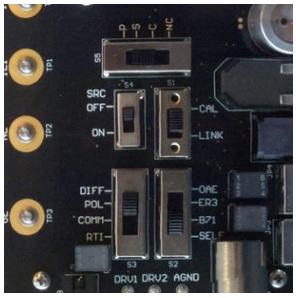


Figure 33

5.3 Insert earphone calibration

The following are the steps required to calibrate a pair of insert earphones.

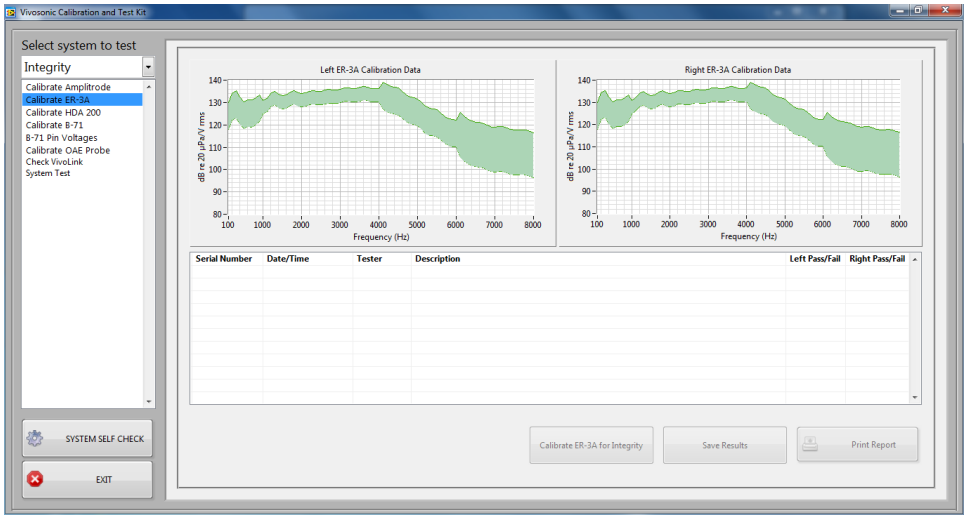


Figure 34

1. Connect the ear simulator with the appropriate coupler to the Microphone Preamplifier.
2. Plug the insert earphone into the appropriate G1 or G2 receptacle.
3. Set S1 to CAL, S2 to ER3A, S3 to DIFF, S4 to OFF and S5 to P for an ER-3A-ABR insert earphone *(*Figure 35*).* For all other insert earphones set S2 to OAE (Figure 36)
4. Connect the LEFT insert earphone to the ear simulator coupler. *(*Figure 37*)*
5. Press the OK button to begin the calibration test.
6. Test will pause when left ear calibration has completed.
7. Remove the LEFT insert earphone from the ear simulator coupler.
8. Connect the RIGHT insert earphone to the ear simulator coupler. *(*Figure 38*)*
9. Press the OK button to continue the calibration test.

Once the calibration has finished, you will have the opportunity to save the test results and generate a text file that can be used on the Integrity™ system. If using a G2 insert earphone, the calibration data can be programmed directly onto the transducer by clicking on the “Program” button after saving.

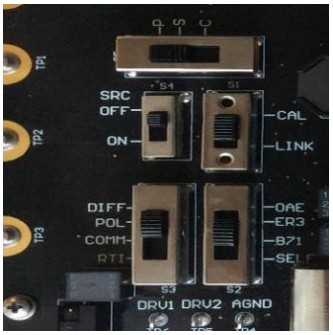


Figure 35

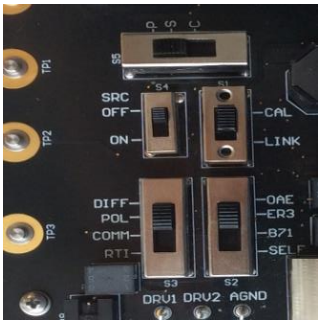


Figure 36

Figure 37

Figure 38

5.4 EP Headphone Calibration

The following are the steps required to verify a pair of EP circumaural headphones.

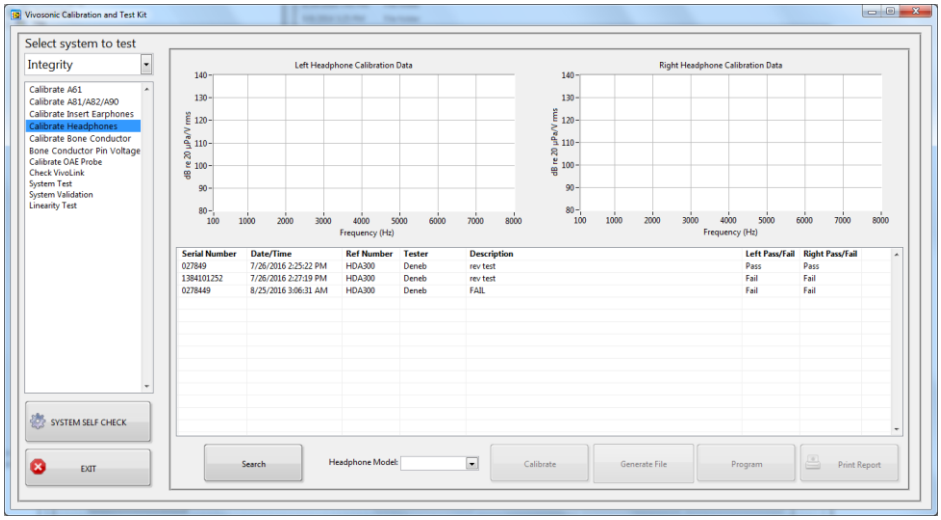


Figure 39

1. Connect the artificial ear with the appropriate coupler to the Microphone Preamplifier. Note: if using an artificial ear with a Larson Davis 377A13 microphone, ensure the preamplifier is set to 0 V polarization (in contrast to all other tests in this manual).
2. Plug the EP headphone into the appropriate G1 or G2 receptacle (**Error! Reference source not found.**).

Set S1 to CAL, S2 to ER3A, S3 to DIFF, S4 to OFF and S5 to P for HDA200 and HDA300 *(*

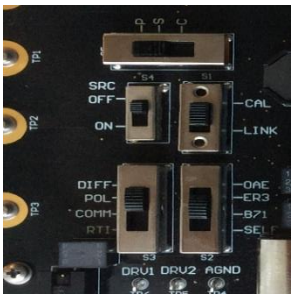


Figure 41

3. *).* For all other EP Headphones set S2 to OAE. *(*Figure 42*)*
4. Carefully place the left headphone onto the artificial ear with the appropriate adapter plate and weight on top. *(*Figure 43*)*
5. Press the OK button to begin the calibration test.
6. Test will pause when the left headphone has completed.
7. Replace the left headphone with the right headphone on the adapter plate. Place the weight on top of the right headphone.
8. Press the OK button to continue the calibration test.

Once the calibration has finished, you will have the opportunity to save the test results and if using an H-800 EP headphone, program the calibration data directly to the transducer after saving the results.

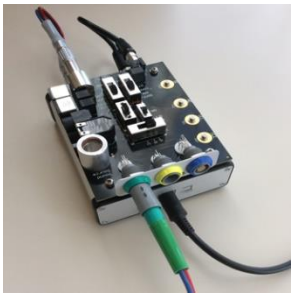


Figure 40

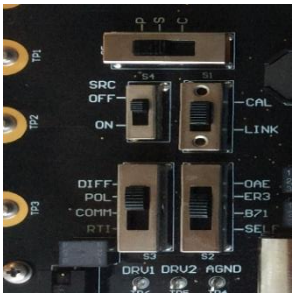


Figure 41

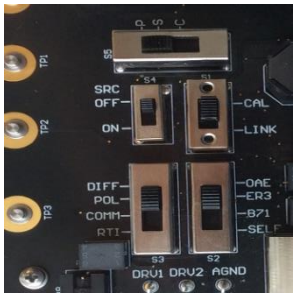


Figure 42

Figure 43

5.5 Bone Conductor calibration

5.5.1 Pin voltage method

Use this method if the pin voltage information (to produce a standard target force level) has been provided with the bone conductor transducer.

In the bone-conductor screen, input the pin voltage data (in mV) into the appropriate column. Press enter when the last value has been entered. If the data is valid, you can save this information as a test record, and you will have the opportunity to generate a text file that can be used on the Integrity™ system.

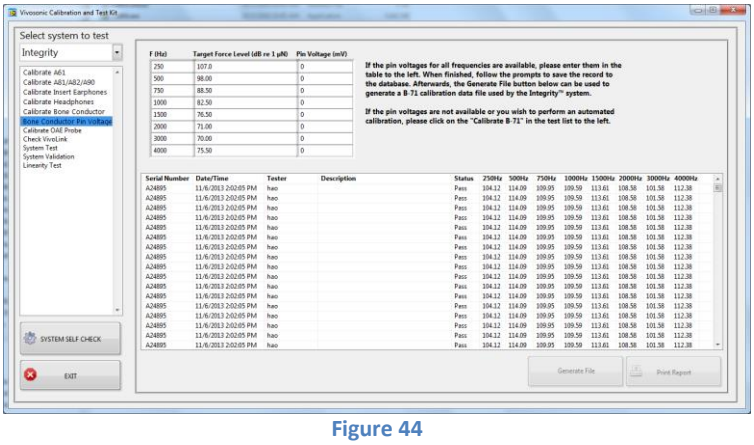


Figure 44

5.5.2 Automatic method

Prior to calibrating a bone conductor, in the “SYSTEM SELF CHECK” screen you must first select the artificial mastoid being used for this test. Click “Add/Edit Devices” in this screen to enter the artificial mastoid calibration information if this has not already been done.

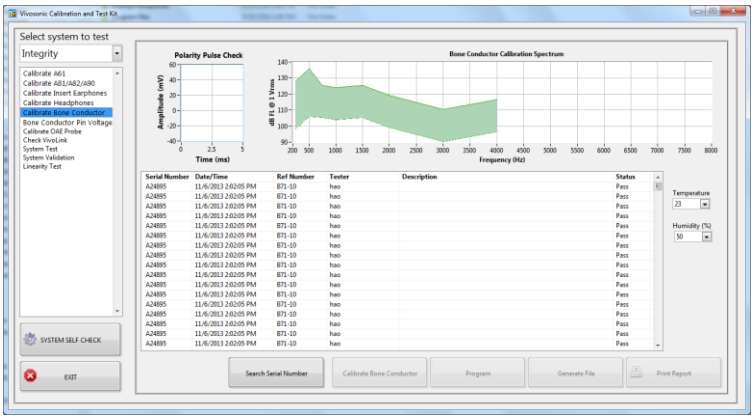


Figure 45

If using an acoustic artificial mastoid, such as a Larson Davis type AMC493B:

1. Enter the temperature and humidity settings. This is very important since the acoustic artificial mastoid is very sensitive to the environmental settings.
2. Connect the artificial ear to the Microphone Preamplifier.
3. Set S1 to CAL, S2 to B71, S3 to DIFF, S4 to OFF and S5 to P. *(*Figure 46*)*
4. Install the 6cc coupler to the artificial ear.
5. Place the artificial mastoid on the 6cc coupler.
6. Place the bone conductor face down on the centre of the mastoid. *(*Figure 47*)*
7. Place the black retaining ring on the coupler with the bone conductor wire coming out through the opening in the cover.
8. Gently lower the weight assembly into the interior of the retaining ring until the foam vibration isolation is resting on top of the bone-conductor. *(*Figure 48*)*
9. Press the OK button to begin the calibration test.

If using mechanical artificial mastoid, such as a Brüel & Kjær type 4930:

1. Follow the device manufacturer’s instructions to set the static force (typically 5.4 N).
2. Connect the artificial mastoid output to the Microphone Preamplifier.
3. Set S1 to CAL, S2 to B71, S3 to DIFF, S4 to OFF and S5 to P. *(*Figure 46*)*
4. Install the bone conductor (face downward) in the artificial mastoid in the center location, with the static load applied evenly (Figure 49)
5. Press the OK button to begin the calibration test.

Once the calibration has finished you will have the opportunity to save the test results, and generate a calibration text file that can be used on the Integrity™ system. If using a G2 bone conductor, you can program the calibration data directly into the transducer after saving the results.

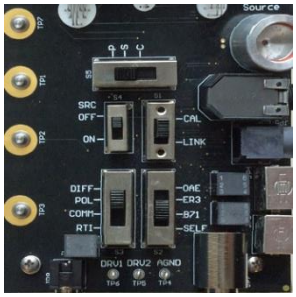


Figure 46


Figure 47


Figure 48


Figure 49

5.6 OAE Probe calibration

The following are the steps required to calibrate an OAE probe.

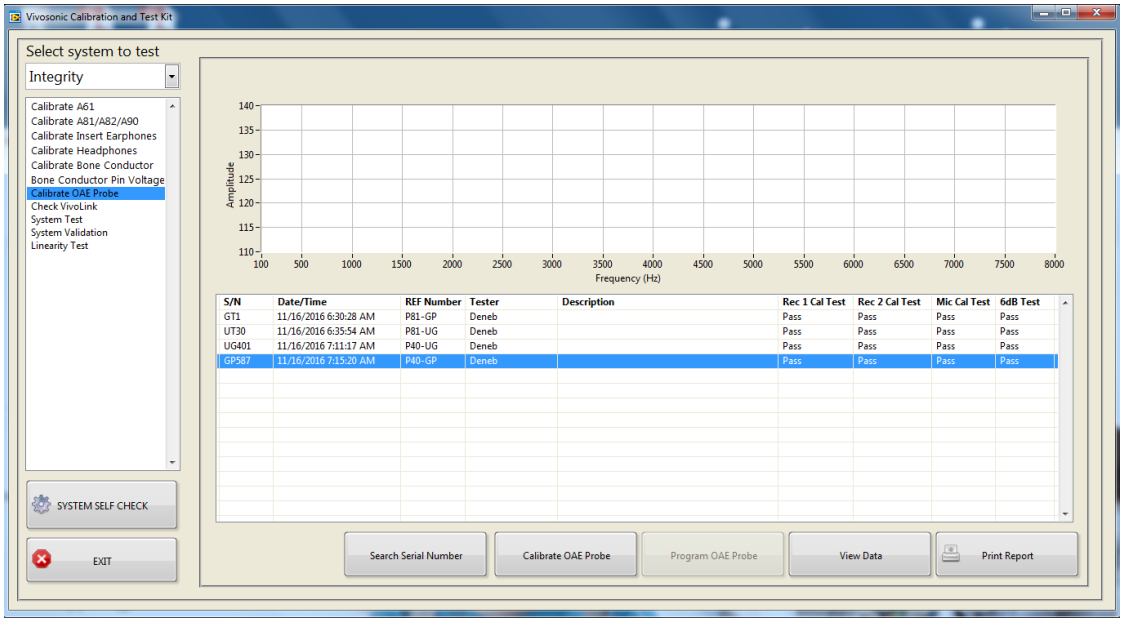


Figure 50

1. Connect the ear simulator with the appropriate coupler to the Microphone Preamplifier.
2. Connect the OAE probe connector to the adaptor board. *(*Figure 51 or ***Error! Reference source not found.****)*
3. Set S1 to CAL, S2 to OAE, S3 to DIFF, S4 to OFF and S5 to P. *(*Figure 53*)*
4. Place the OAE probe with the ear-tip (9mm) installed into the ear simulator coupler. *(*Figure 54 or **Error! Reference source not found.***)***
5. Press the OK button to begin the calibration test.
6. The calibration test will pause when the ear simulator test has finished.
7. Place an OAE coupler into the Sound Source.
8. Set S1 to CAL, S2 to OAE, S3 to DIFF, S4 to ON and S5 to P.
9. Place the OAE probe with the ear-tip (9mm) installed into the coupler attached to the Sound Source. *(*Figure 56***Error! Reference source not found.*** or Figure 57)
10. Press the OK button to begin the calibration test.

When the calibration has finished, you will have the opportunity to save the test results, and program a test record’s calibration information onto the OAE's EEPROM.

Figure 51

Figure 52

Figure 53

Figure 54

Figure 55

Figure 56

Figure 57

VivoLink™ Test

The Check VivoLink™ test is a collection of electronic tests performed on the various VivoLink™ channels. You may choose to perform any combination of tests or perform all tests in sequence. The first step is to pair via Bluetooth® to the VivoLink™ and search the VivoLink™ to download a specific command sequence that will be used for testing.

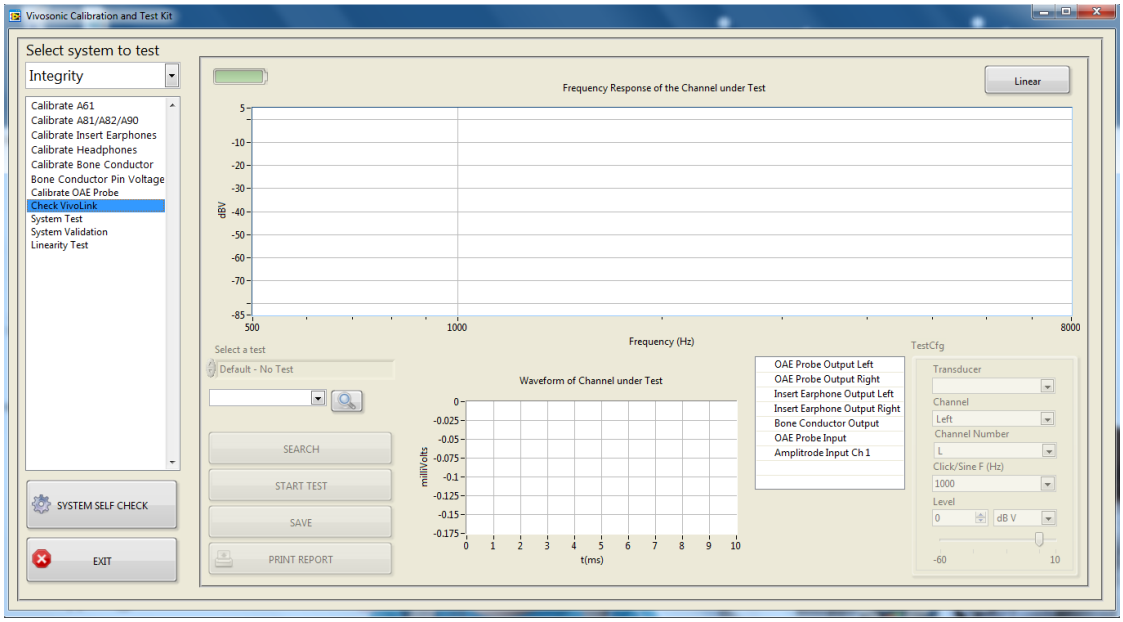


Figure 58

5.6.1 Insert earphone channel VivoLink™ test

The calibration system will test both insert earphones channels or you can test them individually.

1. Connect the VivoLink™ to the Adaptor Board using the appropriate connectors. *(*Figure 59 or Figure 60*)*
   2. Set S1 to LINK, S2 to ER3A, S3 to DIFF, S4 to OFF and S5 to P ***(Error! Reference source not found.)*** for a 1 VivoLink™. Set S2 to OAE for a G2 VivoLink™. ***(Error! Reference source not found.)***
3. Press the OK button to begin the VivoLink™ calibration test.

DO NOT TURN OFF THE VIVOLINK™ DURING THE TEST.

Figure 59

Figure 60

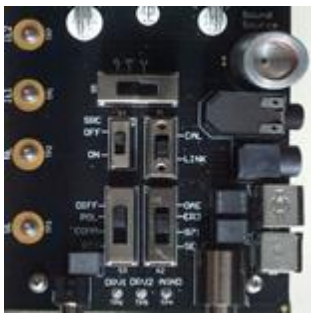


Figure 61

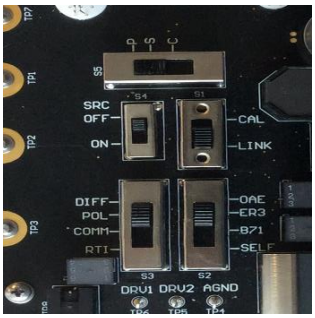


Figure 62

5.6.2 OAE VivoLink™ channel test

The calibration system will test both OAE receivers and the microphone or you can test them individually.

1. Connect the VivoLink™ to the Adaptor Board using the appropriate connectors. *(*Figure 63 or Figure 64*)*
2. Set S1 to LINK, S2 to OAE, S3 to DIFF S4 to OFF and S5 to P. *(*Figure 65*)*
3. Press the OK button to begin the VivoLink™ calibration test.

DO NOT TURN OFF THE VIVOLINK™ DURING THE TEST.

Figure 63

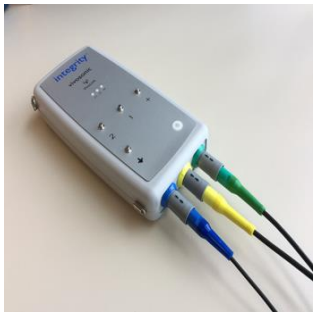


Figure 64

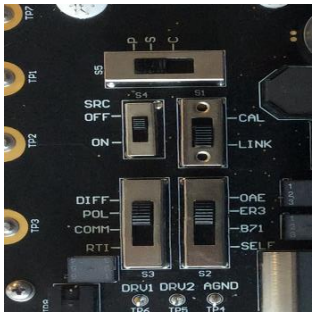


Figure 65

5.6.3 Bone conductor channel VivoLink™ test

The calibration system will test the bone conductor channel.

1. Connect the VivoLink™ to the Adaptor Board using the appropriate connectors. *(*Figure 66 or Figure 67*)*
2. Set S1 to LINK, S2 to B71, S3 to DIFF, S4 to OFF and S5 to P.
3. Press the OK button to begin the VivoLink™ calibration test.

DO NOT TURN OFF THE VIVOLINK™ DURING THE TEST.

Figure 66

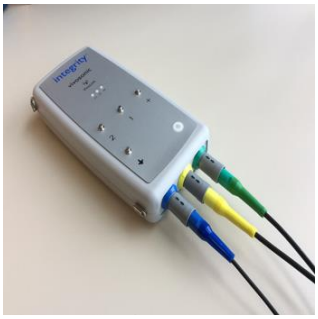


Figure 67

5.6.4 Amplitrode® channel VivoLink™ test

The calibration system will test the Amplitrode® channel.

1. Connect the VivoLink™ to the Adaptor Board using the appropriate connectors.
   2. Set S1 to LINK, S2 to SELF, S3 to DIFF, S4 to OFF and S5 to P for a G1 VivoLink™. Set S5 to S when testing Amplitrode® Channel 2 according to onscreen instructions for a G2 VivoLink™
3. Press the OK button to begin the VivoLink™ calibration test.

DO NOT TURN OFF THE VIVOLINK™ DURING THE TEST.

Figure 68

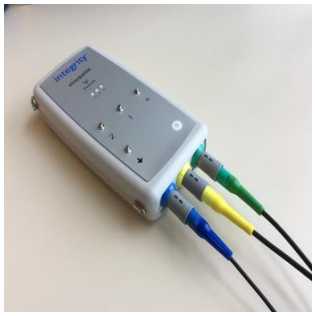


Figure 69

6 System test validation

The System Test Validation is a collection of system level tests performed with the Integrity™ software on the various Vivosonic transducers. The three transducers available for testing are the G1 and G2 Left and Right insert earphones and the G1 and G2 bone conductor. A signal created by the transducer through the Integrity™ software is looped back through the Amplitrode®.

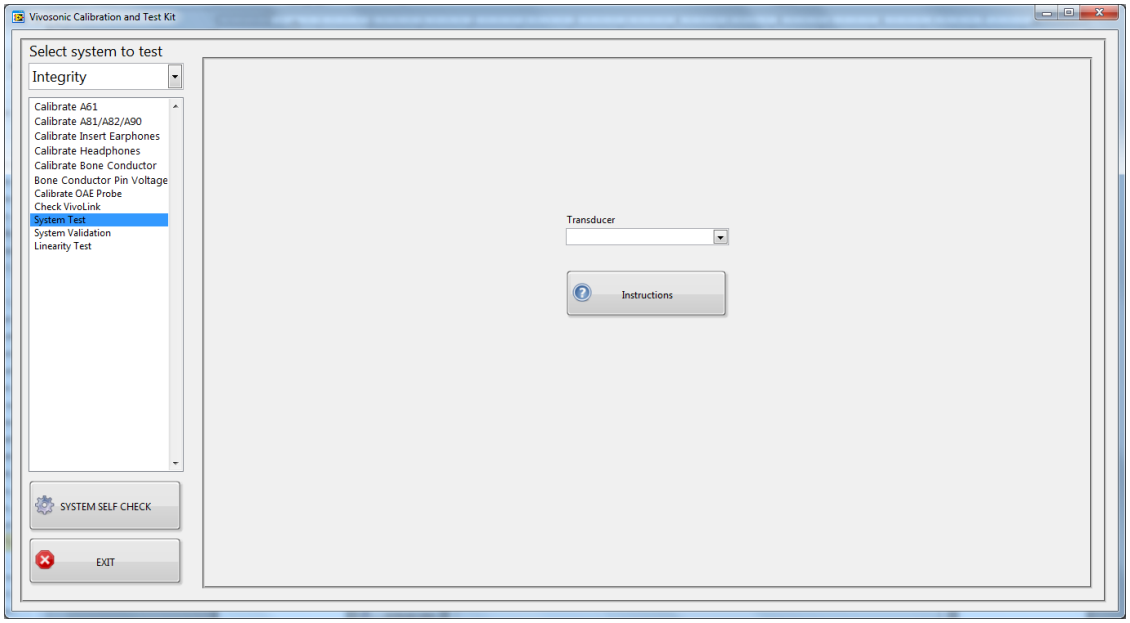


Figure 70

6.1 Left Insert Earphone loopback test

During this test the calibration system will loopback the signal when a stimulus is detected through the microphone.

1. Click on System Test in the test list.
2. Select Insert earphone Left
3. Connect the insert earphone and the Amplitrode® to the VivoLink™.
4. Connect the Amplitrode® electrode clips to the snaps on the calibration system.
5. Set S1 to CAL, S2 to SELF, S3 to DIFF, S4 to OFF and S5 to P.
6. Connect the ear simulator with the appropriate coupler to the Microphone Preamplifier.
7. Connect the insert earphone connector to the corresponding G1 or G2 port.
8. Connect the LEFT insert earphone to the ear simulator coupler.

Figure 71

Figure 72

Figure 73

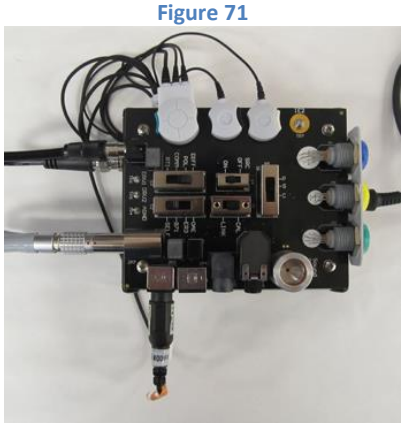


Figure 74

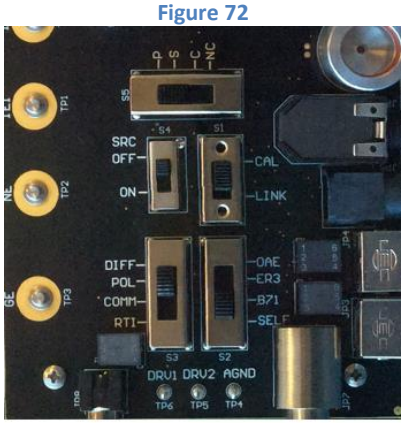


Figure 75

9. Start the Integrity™ software and go to the "System" screen.
10. Choose "dB pe SPL" for the air-conducted units drop down menu.
11. Select the ABR test modality.
12. Select the "ABR air-conducted 1000 Hz tone-burst 27.5" protocol, change the "Algorithm" to "Averaging" and the "Polarity" to "Condensation".
13. Select "Left Ear" and set the level to 96 dB SPL.
14. Press the "Start" button to begin an ABR test.

15. When you see the trace, scale the y-axis so the entire wave is visible and zoom in between 0 and 10 ms.
16. Place a V and V' on the maximum and minimum points on the curve respectively.
17. Looking at the V-V' field on the bottom in the Test Conditions table, verify that this field is 84 ± 35 µV.
18. You can click on the "OK" button to close this window and click the "Instructions" button to reopen it later.

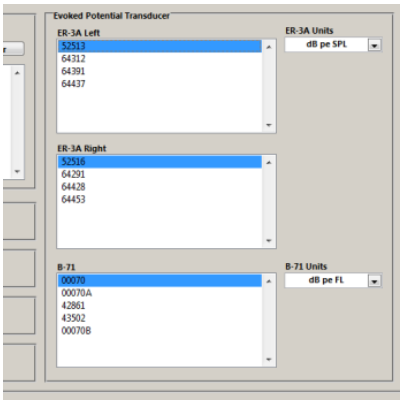


Figure 76

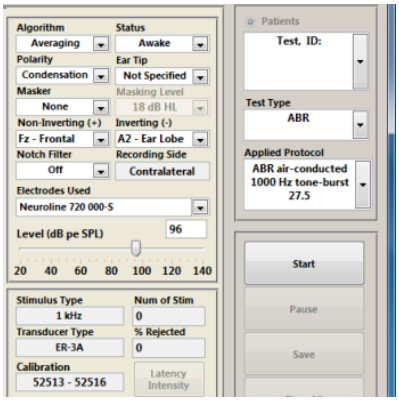


Figure 77

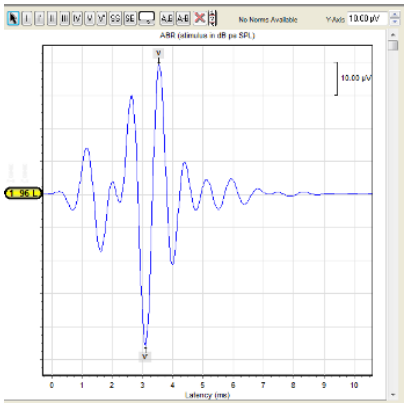


Figure 78

6.2 Right Insert Earphone loopback test

During this test the calibration system will loopback the signal when a stimulus is detected through the microphone.

1. Click on System Test in the test list.
2. Select Insert earphone Right
3. Connect a G1/G2 Insert Earphone and Amplitrode®/VivoAmp™ to a VivoLink™.
4. Connect the Amplitrode®/VivoAmp™ electrode clips snaps on the calibration system.
5. Set S1 to CAL, S2 to SELF, S3 to DIFF, S4 to OFF, and S5 to P.
6. Connect the ear simulator with the appropriate coupler to the Microphone Preamplifier.
7. Connect the RIGHT insert earphone to the ear simulator coupler.

Figure 79

Figure 80

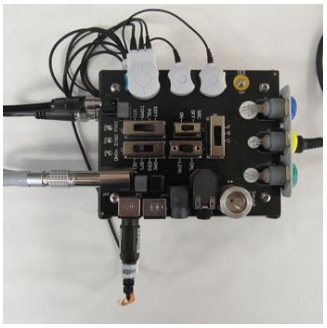


Figure 81

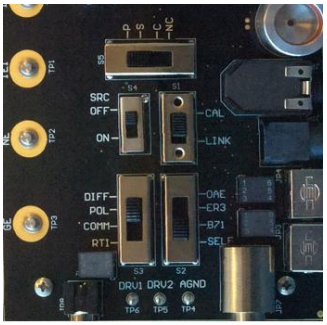


Figure 82

8. Start the Integrity™ software and go to the "System" screen.
9. Choose "dB pe SPL" from the air conducted units drop down menu.
10. Select the ABR test modality.
11. Select the "ABR air-conducted 1000 Hz tone-burst 27.5" protocol, change the "Algorithm" to "Averaging" and the "Polarity" to "Condensation".
12. Select "Right Ear" and set the level to 96 dB SPL.
13. Press the "Start" button to begin an ABR test.
14. When you see the trace, change the y-axis scale so the entire waveform is visible and zoom in between 0 and 10 ms.
15. Place a V and V' on the maximum and minimum points on the curve respectively.
16. Looking at the V-V' field in the Test Conditions table, verify that this field is 84 ± 35 µV.
17. You can click the "OK" button to close this window and click the "Instructions" button to reopen it later.

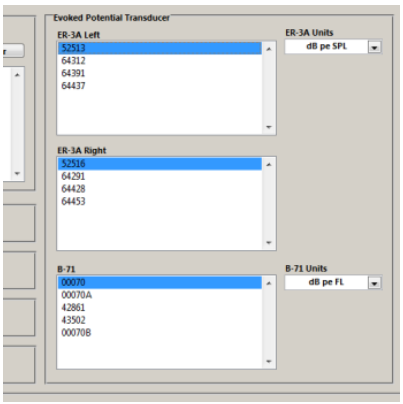


Figure 83

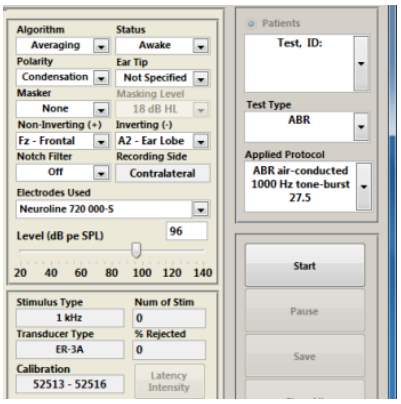


Figure 84

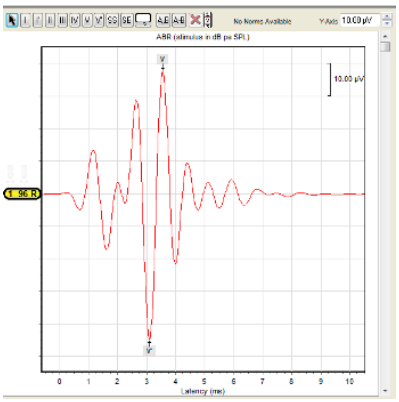


Figure 85

6.3 B-71 and B71W Bone conductor loopback test

During this test the calibration system will loopback the signal when a stimulus is detected through the microphone.

1. Select “System Test” from the test list on the left.
2. Choose bone conductor.
3. Connect the bone conductor and the Amplitrode®/VivoAmp™ to a VivoLink™.
4. Connect the Amplitrode®/VivoAmp™ electrode clips snaps on the calibration system.
5. Set S1 to CAL, S2 to SELF, S3 to DIFF, S4 to OFF, and S5 to P.
6. Connect the Artificial Mastoid to the pre-amplifier and the AC output of the pre-amplifier to the BNC connector of the Calibration system.
7. Connect the bone conductor to the Artificial Mastoid.

Figure 86

Figure 87

Figure 88

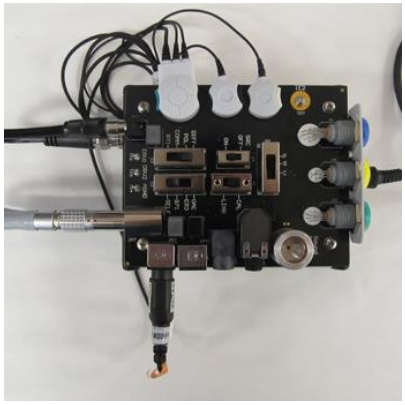


Figure 89

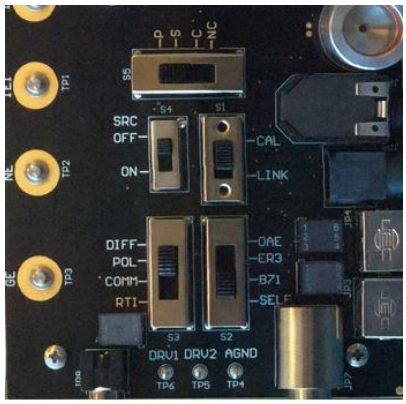


Figure 90

8. Start the Integrity™ software and go to the "System" screen.
9. Select ABR test modality.
10. Select the "ABR bone-conducted 1000 Hz tone-burst 37.7" protocol, change the "Algorithm" to "Averaging" and the "Polarity" to "Condensation".
11. Set the Level to 114 dB FL.
12. Press the "Start" button to begin an ABR test.

13. When you see the trace, change the y-axis scale so that the entire waveform is visible and zoom in between 0 and 15 ms.
14. Place a V and V' on the maximum and minimum points on the curve respectively.
15. Looking at the V-V' field in the Test Conditions table, verify that this field is 195 ± 80 µV.
16. You can click the "OK" button to close this window and click the "Instructions" button to reopen it later.

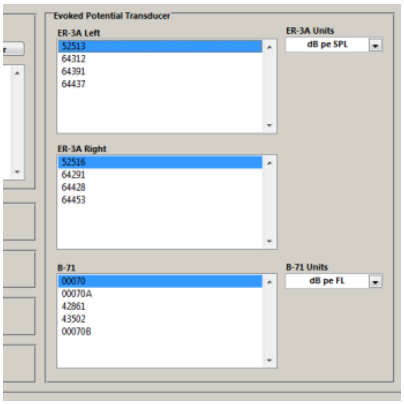


Figure 91

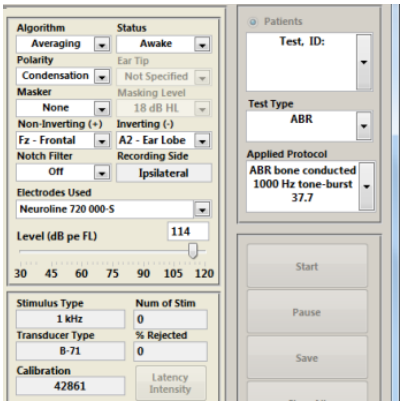


Figure 92

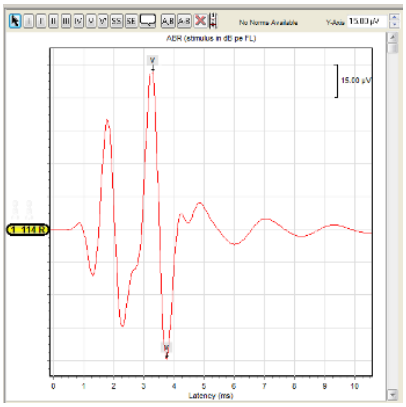


Figure 93

7 Troubleshooting

This section covers problems, possible causes and possible solutions.

ATTENTION

Do not attempt to repair any component of the system as this may cause it to function improperly. Please call Vivosonic Customer Support for all repairs.

WARNING

Only Vivosonic Integrity V500 transducers should be plugged into the Calibration System.

Problem Observed	Possible Causes	Possible Solutions
"Lost Connection" dialog appears	• The USB cable is not connected to the laptop • The UART cable is not connected to the calibration hardware • Computer settings are trying to conserve power • Too much power is being drawn	• Ensure that the USB cable is securely connected to the laptop • Ensure that the UART cable is securely connected to the calibration jig • Go to the Start menu and then Device Manager 1. Expand the "Universal Serial Bus controllers" option 2. Right click on all of the options that appear with "hub" in the name and click Properties 3. Select the Power Management tab 4. The box beside "Allow the computer to turn off this device to save power" should be unchecked • Unplug the UART cable from the calibration hardware and then plug it back in. You should hear a clicking noise 1. Click on another test module that is listed on the left hand side. You should hear a clicking noise again. 2. Return to the testing module for the transducer you're calibrating. You should hear a clicking noise again. 3. Restart the calibration test
Calibration equipment is failing the System Self Check	• Calibration equipment data is incorrect	• Confirm that the calibration sensitivity levels and data entered in the Add/Edit section are correct • Confirm that the calibration equipment is set up correctly and the switches are configured properly

Transducers are failing calibration	• Channel 1 and Channel 2 are not calibrated correctly • Calibration equipment data is incorrect	• Confirm that Channel 1 and Channel 2 are calibrated to be 100 ± 0.25 mV • Confirm that the calibration sensitivity levels and data entered in the Add/Edit section are correct • Confirm that the calibration equipment is set up correctly and the switches are configured properly

8 Disposal of electronic equipment (WEEE)

This equipment shall not be disposed of as unsorted municipal waste and shall be collected as electrical and electronic equipment, as applicable, separately as specified by local laws and regulations of your region, such as European Community directive 2002/96/EC on Waste Electrical and Electronic Equipment (WEEE).