Sonoscan Gen6 C-Mode Scanning Acoustic Microscope (SAM) Manual

The Gen6™ C-Mode Scanning Acoustic Microscope is the new generation in Acoustic Microscopy Imaging (AMI) innovation. While taking the best from the Gen5™ (e.g.: its cutting-edge technology, advanced features, aesthetics, and ergonomics), the Gen6 improves upon the rest and takes acoustic imaging to the next level. The Gen6 delivers the broadest range of capabilities available. Whether your needs are for nondestructive failure analysis, process development, R&D, High-Rel qualification for a military application, or low/medium volume screening, the Gen6 is the one C-SAM system that can meet all of your demands. Gen6 is perfect for a variety of applications, such as; Microelectronics, MEMS, SSL LEDs, Power Modules, Solar, HighTech materials, etc. Advanced Sonoscan® capabilities such as PolyGate™, SonoSimulator™, Virtual Rescanning Mode (VRM)™, and optional Frequency Domain Imaging (FDI)™ add value and confidence. With its large, easyaccess, illuminated scanning area, the Gen6 has the capability to efficiently scan everything from a single part to a 300mm wafer, with its tower referenced scan and fixtures.

Location: ERF 3024, packaging bay

Training: 3 sessions (2 trainings and a checkout session)

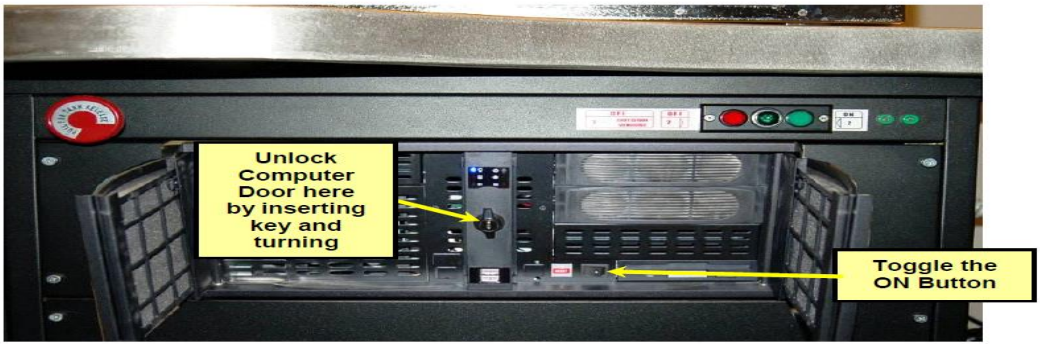
System specifications:

- PolyGate™ technology with Multi-Gate™ and Probing-Gate™ functions capable of single and multi-focus imaging.
- Up to 100 gates per channel with 2 Gsps sampling rate.
- Windows® 7 Ultimate for multi-language and 64-bit capabilities.

- Inertially Balanced Linear Motor Scanner minimizes vibrations and ensures optimal scanning results.
- Tower-mounted scan reference platform and sample fixture.
- Open-access scanning area makes loading and unloading easy and is capable of scanning JEDEC trays or a 300mm wafer.
- Water recirculation and optional inline temperature control.
- SonoSimulator for simplified analysis of stacked die parts.
- Digital Image Analysis (DIA)™ uses advanced algorithms to quantify the acoustic data and allows you to set accurate, automatic, accept/reject criteria.
- Virtual Rescanning Mode (VRM)™ stores comprehensive data and enables you to perform a complete analysis of a sample, even when it is no longer available.

Startup Procedure

1. Obtain the key for the SAM, unlock the PC doors and turn on the PC connected to the acoustic microscope.



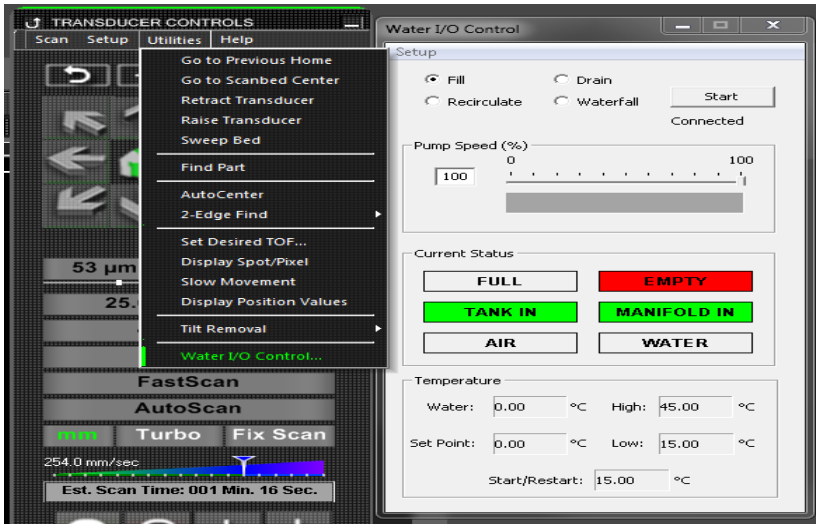
2. Press the green button to turn on the acoustic microscope.

3. Login to the PC using the password “sonoscan” for the Admin profile.

4. Close the hood and open “Sonolytics” software.

5. Login to the “Sonolytics” software.

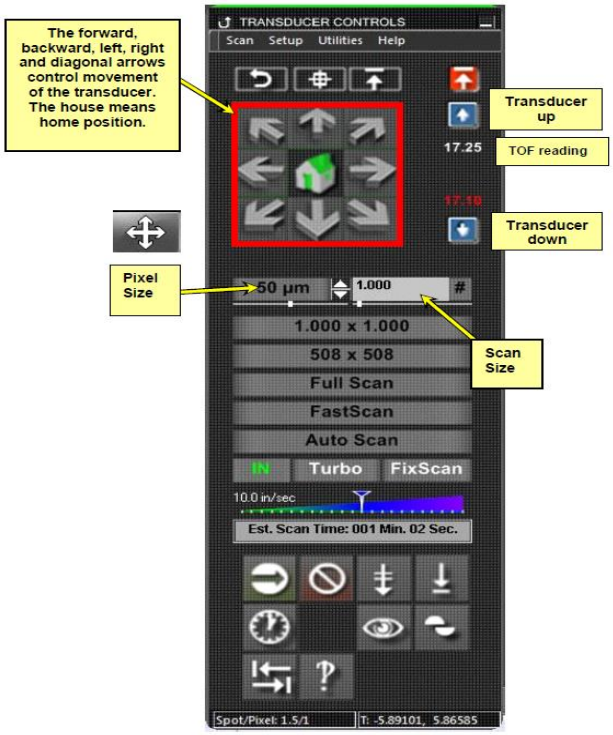
6. Wait for the instrument to go through its startup procedure.



7. To fill the tank with DI water, in the "Transducer Control" window, click "Water I/O controls. A window will pop up. Make sure fill is selected and press start. Observe the water level from the window in the front of the tank. Fill enough water to dip your sample. **DO NOT OVERFILL THE TANK.** Once satisfied with level of water, press stop.

Operating Procedure

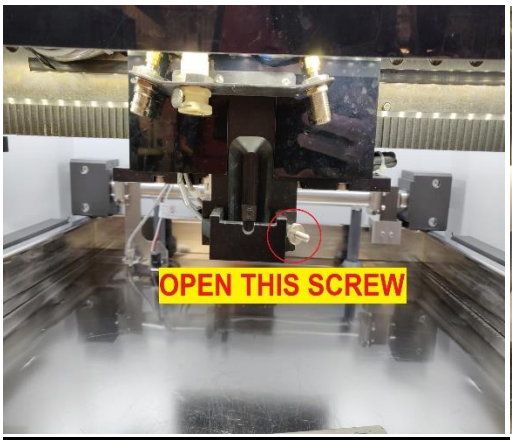
8. Raise the transducer fixture by left clicking the up-arrow button in the Transducer Controls window.

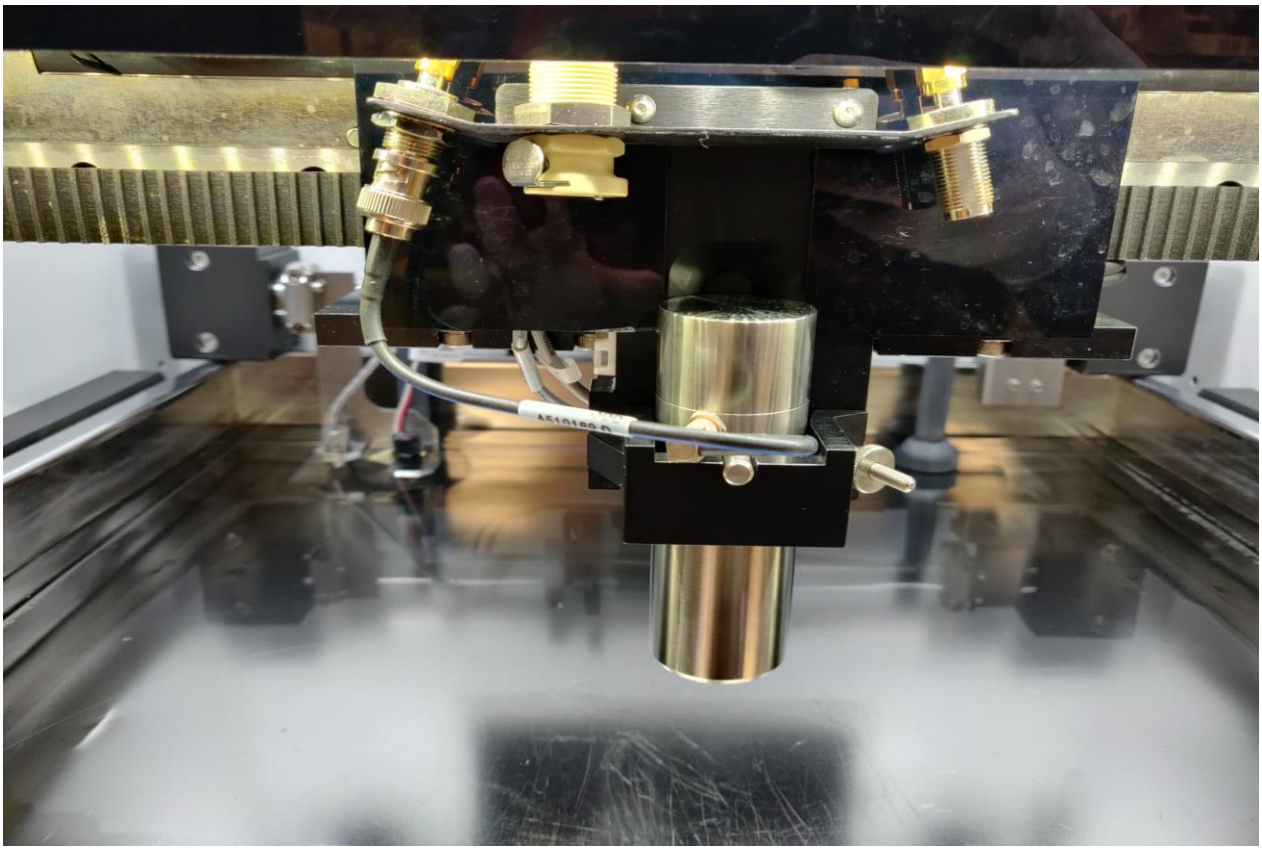


9. Add the sample platform placed on top of machine (if necessary for your sample).

10. Open the hood and load your sample by adhering it to one of the stainless-steel fixture plates or placing it directly into the tank.

11. Insert an appropriate transducer for your sample by placing it into the fixture and attaching the BNC cable to the socket on the left while avoiding dipping the cable in the water. To attach the 10, 15, or 25 MHz transducers, they must first be screwed into the adapter. The 230 MHz transducer requires a BNC and TNC connection. Thru-scanning with transducers requires attaching the transducer to the thru-scan mount and attaching the BNC and TNC connections. The 230 MHz transducer cannot be used for thru scanning.

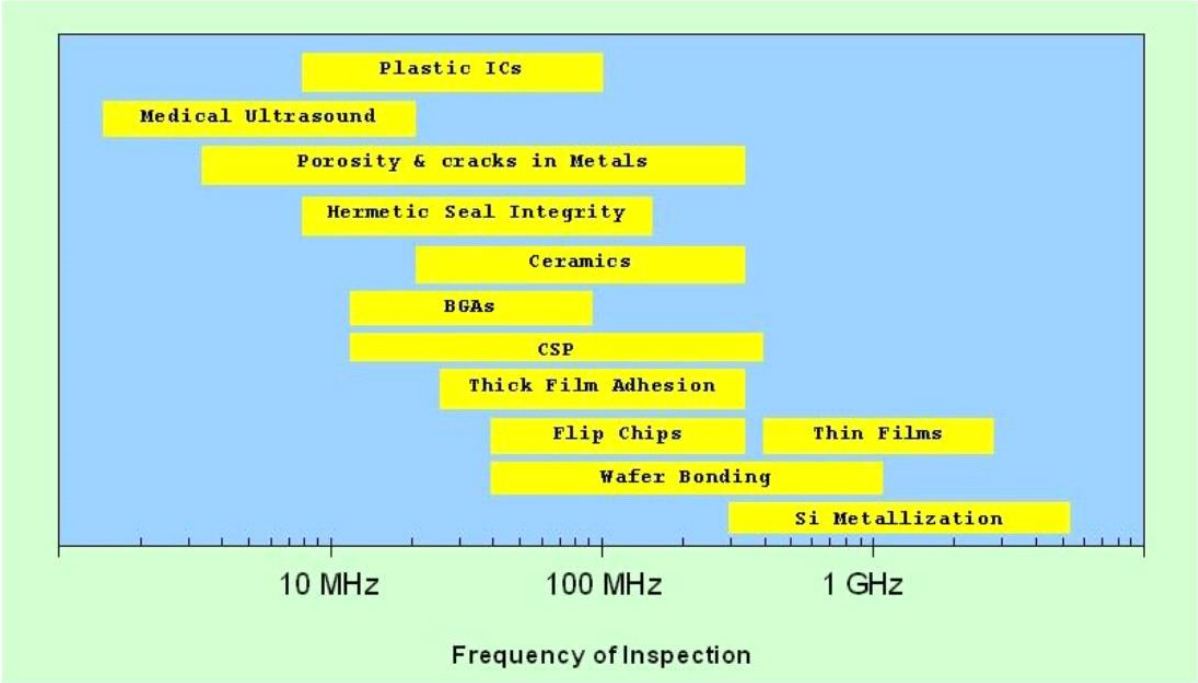




Transducer Selection

When selecting a transducer, consider the features and flaws you wish to detect in your sample. A higher frequency transducer results in less sound penetration, but produces higher resolution images. Whereas a lower frequency transducer results in more sound penetration, but produces a lower resolution. Thus, you want to select the highest frequency that still enables you to view the desired interface.

Appropriate Frequencies for Different Materials



12. After inserting a transducer, close the hood.

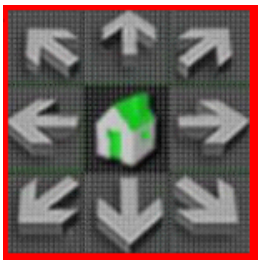
13. Set the transducer in the software to the one that was inserted.

14. Lower the transducer by right clicking on transducer control window until the bottom edge of transducer is submerged in water.

15. Remove any air bubbles from the end of the transducer by wiping your fingers across the end of the transducer or spraying them with DI water.

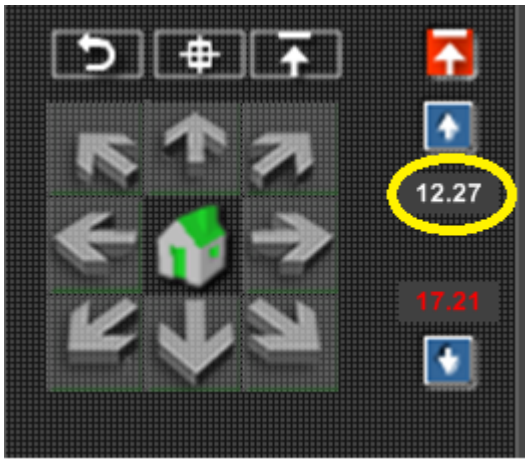
16. Ensure that the transducer is at an appropriate height (about 0.5 inch) such that it won't touch your sample. For this, observe the distance in the water from the front window.

17. Right click the x/y arrow keys to move the transducer over your sample.



18. Check to see if you are seeing a signal. For this, on the sonolytics window, the lower graph is the refracted waves. Adjust the green slider to see if you have a signal.

19. Adjust the time of flight (TOF) shown in microseconds as white text the upper right of the user interface (Yellow circle) to maximize the signal amplitude by raising or lowering the transducer using the up and down arrow keys. If the amplitude is too large to be seen, lower the gain using the purple slider.

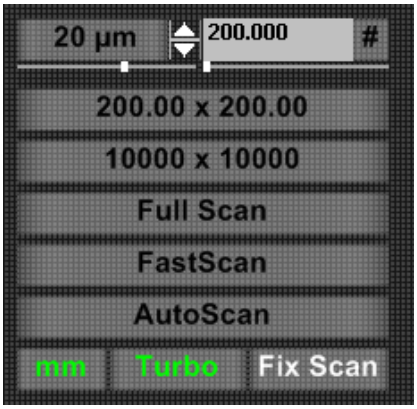


If the TOF doesn't change when raising or lowering the transducer, check to make sure you are above your sample, there are no air bubbles beneath the transducer, the transducer is ~0.5" from your sample, and that the transducer is above a smooth area.

This approximate values for the TOF are 17 µsec for the 25, 50 and 100 MHz transducers, 25.5 µsec for the 10 and 15 MHz transducers, and 8.5 µsec for the 230 MHz transducer.

20. Adjust the pixel size and scan size to the desired values. The pixel size is shown in micrometers and the scan size is shown in millimeters. When changing the pixel size, the spot/pixel value changes. The optimum spot/pixel value is 1.4/1 for all transducers.

21. Set the scan type. AcuScan is the slowest scanning type but provides the highest resolution. FastScan is an intermediate scanning speed and provides lower resolution.



22. Ensure that the measurement mode is set to “Amplitude”.

23. Set the scan speed by adjusting the slider. The estimated scan time automatically adjusts.

24. Adjust the gate to remove noise, by adjusting the green bars.

25. Scan your sample by pressing the button. Stop the scan at any time using the button.

26. The image from your scan will show up in on the right monitor.

27. Save your scan. The scan can be saved as a picture, a report which includes all the scan details, or as a “Sonolytics” file, which can be opened by the software and manipulated.

Profilometry

28. Set measurement mode to “Profile”.

29. Adjust the gate to remove half of the bottom portion of the signal.

30. Scan your sample.

31. Once done, adjust the colorbar by clicking on it beside your scan image.

32. Click on the 3D button.

33. Save your image.

Cross-sections (Q-Bam)

34. Set the measurement mode to Amplitude.

35. Perform a scan of the top surface of the sample.

36. Use the move-to-location button to select the point where to take a cross-section.

37. Press the Start Q-Bam button

Thru-Scan (Not included in the Training)

38. Raise and retract the transducer mount.

39. Switch the receiver to the correct frequency setting.

40. Insert the thru-scan receiver (this may require removing the transducer).

41. Attach the cables for the receiver.

42. Check the box for thru scan under Options

43. Scan the sample.

Shutdown Procedure

44. Remove the transducer, dry it off using paper towels and place it on the holding rack.

45. Raise the transducer mount to its maximum height by pressing the button.

46. Retract the transducer mount by pressing the button.

47. Remove your sample.

48. Unless someone else is using the SAM after you, drain the water from the system by clicking on “Utilities” in the Transducer Controls window and clicking on water I/O control and drain. While draining the water, ensure that the hose remains in the bucket and that the bucket does not overflow.

49. Log out of the “Sonolytics” software by going to “File”, “Logout”.

50. Shutdown the computer.

51. Turn off the SAM by pressing the red button and return the key to the office.