



FAQ's for Microsemi Antifuse FPGA Programming

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Table of Contents

I. Programmer- Installation and Setup	5
I.1. General.....	5
1. What programmers can I use to program Microsemi® devices?.....	5
I.2. Activator.....	5
2. Is there a checklist to follow before programming with Activator?	5
3. How can I verify that the software driver for the Activator (2/2S) is configured properly?	5
4. How do I configure the Adaptec AVA-1505A SCSI Card for Windows 95/98?.....	5
5. How do I configure the Adaptec AVA-1505 SCSI Card for Windows NT 4.0?	5
6. Can I use an existing Adaptec SCSI Controller on a PC?	5
7. How can I determine what IRQ and I/O addresses are used by installed add-in cards?	6
8. The green power light is blinking after I turn on the power in Activator. What is the problem?....	6
9. What does the error message “SCSI Controller not found” (PC only) mean?	6
10. What does the error message “ <i>Firmware load failed. WARNING: Could Not Connect With Activator 2</i> ” mean?	7
11. What does the message “Error: Activator communication link down. Exiting ...” mean?.....	7
12. Is there any memory in the Microsemi Activator programmer?	7
I.3. Silicon Sculptor I and II.....	7
13. Where can I find a list of the supported devices for the Silicon Sculptor programmer?	7
14. Is there a checklist to follow before programming with Silicon Sculptor?	7
15. What is the Power-On Self-Test (POST) for Silicon Sculptor?	7
16. How many devices can I program successfully on a Silicon Sculptor adapter module?	7
17. Is there any memory in the Silicon Sculptor programmer?	7
II. Adapter Modules.....	8
II.1. Activator.....	8
18. Where can I find a list of adapter module part numbers for Activator?.....	8
II.2. Silicon Sculptor I and II.....	8
19. Where can I find a list of adapter module part numbers for Silicon Sculptor?	8
20. Can I use the same module for different devices? For example, if I have an SM84P-Microsemi-1 module, can I use this to program an A1020B PL84 or an A3265DX PL84 device?	8
21. Can I use Silicon Sculptor Adapter modules to program the Microsemi devices with the other BP programmers like BP1400, BP2100 etc?	8
III. Diagnostic/Self-Test	9
III.1. Activator.....	9
22. How do I run the Activator 2 test Procedure?	9
III.2. Silicon Sculptor I & II	9
23.How do I run a self-test in the DOS version of the Silicon Sculptor software?	9
24. How do I run a self-test in the Windows version of Silicon Sculptor?	9
25. The self-test failed for the BGA 329 Adapter module for Silicon Sculptor. Why?.....	10
26. How frequently should I run the self-test?.....	10
IV. Calibration.....	11
IV. Calibration.....	11
IV.1. Activator	11

27. How frequently do I need to calibrate Microsemi Activators?	11
28. How do I perform the calibration of Activator 2/2S?	11
IV.2. Silicon Sculptor I and II.....	11
29. How do I perform the calibration of Silicon Sculptor?	11
V. Concurrent Programming	12
V.1. Activator.....	12
30. What is the maximum number of Activator programmers that I can daisy chain together?.....	12
V.2. Silicon Sculptor I and II.....	12
31. How do I setup Silicon Sculptor for concurrent programming?	12
32. What is the max number of Silicon Sculptor programmers that I can daisy chain together?.....	12
VI. Programming Software	13
VI.1. General.....	13
33. What software packages should I use to program Microsemi devices?	13
VI.2. Activator.....	13
34. Where can I get the APSW software?.....	13
35. Does the programming software also work on HP/Solaris workstations?.....	13
36. How do I verify the functionality of a programmed device with the APSW debugger?	13
37. What is the .avi/.txt file? When and where is it generated?	13
38. After loading the .afm file successfully, why am I getting "Unable to open AFM BLANK file" when I click on Blankcheck in Activator?	13
39. If I program four devices in the four sockets of the activator, will I get four different .avi files for four parts?	13
VI.3. Sculptor	14
40. Where can I get the Silicon Sculptor software?	14
41. How can I measure the programming time in Silicon Sculptor DOS?.....	14
42. How can I measure the programming time in Silicon Sculptor Windows?.....	14
43. Is the .avi/.txt file supported in Silicon Sculptor?	14
44. Why am I getting a five digit checksum (example: CSUM=7EA7C) under "Data Pattern" when I load an .afm file in the Silicon Sculptor Windows software?	14
45. In the Sculptor software under Device>Option, you will see two other options "secure after programming" and "secure after verifying". What is the difference between these two options?14	14
46. What are the functions of the Blankcheck and Checksum commands in the software?	14
VII. Programming Files and Functions.....	15
VII.1. General.....	15
47. What files can I use to program a device?	15
48. Can I still program with .def and .fus files on Activator?	15
49. Can I generate the .afm files from .def and .fus files?.....	15
50. How are the programming files generated?	15
51. Are .afm files that are generated by different versions of Designer compatible?	15
52. How do I check which version of Designer was used to create my .afm file?.....	16
53. Can I use the same programming file with devices of different technologies?	16
54. Can I retarget to a compatible device with just an .afm file?	16
55. Can I use ACT 2 .afm files to program 1200XL devices?	16
56. Can I use 1020A files to program a 1020B device?	16

57. How do I make a device or package change?	17
58. What is the silicon signature?	17
59. What is PINCHECKSUM in the .afm file?	17
60. How do I verify that a device has been programmed?	17
61. How do I determine the status of the Microsemi security fuse?	17
62. What is the fuse checksum?	17
63. What causes the FUSCHECKSUM to change?	18
64. What is the difference between Array, Security, Probe, and Program fuse types?	18
65. Will parts programmed with the Silicon Sculptor have the same Checksum as devices programmed on the Activator?	19
66. What is the probability of getting a correct checksum but an incorrect program fuse?	19
67. How can antifuse resistance be determined? Is it possible that fuse resistance could be great enough to cause a delay greater than the worst case simulated delay?	19
68. Concerning the programming file .afm, is there a way of incrementing the silicon signature without re-doing the place-and-route?	19
69. Can I modify the header line from "VAR SIG xxxx" to "VAR SIG yyyy" in the .afm file to change the silicon signature?	19
70. Why does the size of the .adb file change during programming?	20
71. What is the Microsemi recommended RT/RH programming flow?	20
72. Can I use a .dio file to program with Silicon Sculptor?	20
73. Are all the antifuses checked by Activator?	20
VIII. Device	21
VIII.1. RH/ RT/ Military Devices	21
74. Is there a need for dynamic or static burn-in after programming?	21
75. Can 172 CQFP sockets withstand military temperatures (-55°C to +125°C)?	21
76. Are there statistics for parts failing after burn-in?	21
77. What is Expected Programming Failure for RH/RP/RT devices?	21
78. Does Microsemi recommend programming a commercial part before programming an RH/RT part?	21
VIII.2. Commercial/Industrial	22
79. What is the expected programming failure rate for Industrial/Commercial devices?	22
80. What is the expected Failure rate for -F devices?	22
VIII.3. General	22
81. Where can I find the lot number and date code on Microsemi FPGAs?	22
82. Are electrical characteristics of the device guaranteed after programming? Is it necessary to perform functional tests on the programmed units?	22
83. Can I program the antifuse devices on board?	22

I. Programmer- Installation and Setup

I.1. General

1. What programmers can I use to program Microsemi® devices?

Ans. Microsemi only tests the programming of Microsemi devices on the FlashPro, Silicon Sculptor, and BP Microsystems programmers. Each release of the Silicon Sculptor and FlashPro software goes through a rigorous testing procedure to ensure the best programming yield possible. This test procedure includes programming devices and functionally testing these devices. The Activator programmer has been discontinued, and we no longer provide software updates.

Microsemi does not test programming solutions from any other vendors and cannot guarantee programming yield. Microsemi accepts Programming Failure RMAs up to the allowed fallout, but reserves the right to reject any RMA requests if the fallout is excessive. Microsemi does not perform Failure Analysis on devices programmed by hardware from other vendors.

I.2. Activator

2. Is there a checklist to follow before programming with Activator?

Ans. If you are using Microsemi Activator 2 or Activator 2S programmers to program a Microsemi FPGA, verify the following before executing any commands from the Windows programming software:

- Activator 2 or (Activator 2S) is powered on and the green LED is on.
- The appropriate adapter module(s) is plugged into the socket(s) on Activator.
- A device is inserted in the adapter module, with pin 1 oriented as indicated in the diagram printed on the adapter module.

Note: Insert a device into the adapter module socket AFTER the module is plugged in and the Activator is powered up.

3. How can I verify that the software driver for the Activator (2/2S) is configured properly?

Ans. Double-click the devices icon located in the Control Panel program group. Look for the "Aspi32" driver. Its status should be **Started** and **Automatic**.

4. How do I configure the Adaptec AVA-1505A SCSI Card for Windows 95/98?

Ans. To configure the Adaptec AVA-1505 SCSI controller card for Windows 95, refer to the [Activator User's Guide](#). Once opened, refer to "Installing the 1505A Card" under Windows 95/98, located in Chapter 2.

5. How do I configure the Adaptec AVA-1505 SCSI Card for Windows NT 4.0?

Ans. To configure the Adaptec AVA-1505 SCSI controller card for Windows NT 4.0, refer to the [Activator User's Guide](#).

6. Can I use an existing Adaptec SCSI Controller on a PC?

Ans. You can only use an Adaptec SCSI controller card with Activator 2 or 2S. You cannot use any other manufacturer's SCSI card. You need to find an appropriate SCSI cable to match your board's external SCSI connector to the Activator 2 or 2S connector (female DB50 for Activator 2, DB25 for Activator 2S).

IMPORTANT: Activator 2 or 2S must be the last device in the SCSI chain, as Activator 2 and 2S contain termination resistors. If SCSI ID number 5 is not available on your SCSI bus, set the rotary switch on the back of your Activator 2 or 2S to an available SCSI ID and invoke the APSW programming software with an additional parameter, as described below. These examples assume that your Microsemi software is installed in the "c:\actel" directory, and that you want to use SCSI ID number 4. The following procedure is for Windows NT 4.0 or Windows 95.

1. From the main window, highlight the **Start** button with the right mouse button.
 2. Select **Open All Users** (Open for Windows 95) > **Programs** > **Designer Series** 3.1 click Windows Programming.
 3. From the **File** menu, select **Properties** > **Shortcut** tab.
 4. Append "devactivator2: <SCSI ID>" to the command line, as shown below:
C:\actel\bin\apsw.exe devactivator2:4
- 7. How can I determine what IRQ and I/O addresses are used by installed add-in cards?**

Ans. Follow the instructions below:

1. Double-click the **Computer** icon. The **Computer Properties** window is displayed.
2. Click **Interrupt Request (IRQ)** to view the IRQ already in use.
3. Click **Input/output (I/O)** to view the I/O addresses already in use.

The default interrupt number is IRQ11, but can be set from IRQ9 to IRQ12. The default I/O address is 340h-35Fh but can be set to 140h-15Fh.

For information about changing the I/O address on the 1505A card, refer to the "Jumper Block Settings" section in the Adaptec AVA-1505A AT-to-SCSI Host Adapter Installation Guide. If all the interrupts between IRQ9 and IRQ12 are being used, you must change the IRQ settings on another card to free one of these interrupts for the 1505A card.

- 8. The green power light is blinking after I turn on the power in Activator. What is the problem?**

Ans. A self-test has failed. Contact Microsemi Technical Support at 1-800-262-1060 or soc_tech@microsemi.com for assistance.

- 9. What does the error message "SCSI Controller not found" (PC only) mean?**

Ans. The SCSI controller board has not been installed in the PC or there is an SCSI I/O address conflict. Also, verify that the device driver(s) were installed correctly. For more information, refer to the following knowledge based articles located at:

www.microsemi.com/soc/kb/article.aspx?id=SL1184

10. What does the error message “*Firmware load failed. WARNING: Could Not Connect With Activator 2*” mean?

Ans. This message is displayed by Microsemi Windows Programming software when no contact with the programmer can be found. If this occurs, check that you have turned on the Activator 2/2S programmer and that the SCSI cable is correctly installed. Be especially sure that the SCSI cable connection is secure. The locking arms on the SCSI board can easily be misaligned. Also, verify that the device driver(s) were installed correctly.

For more information, see the [Activator User's Guide](#).

11. What does the message “*Error: Activator communication link down. Exiting ...*” mean?

Ans. There is a problem with the connection between the Activator and the PC or the Activator has lost power. Check the connections (the Activator power light should be illuminated), and try re-invoking APSW. For more information, refer to the [Activator User's Guide](#).

12. Is there any memory in the Microsemi Activator programmer?

Ans. No. The programming information is downloaded to the programmer during the programming of a device.

I.3. Silicon Sculptor I and II

13. Where can I find a list of the supported devices for the Silicon Sculptor programmer?

Ans. To check devices currently supported by Silicon Sculptor, visit:
www.microsemi.com/soc/custsup/updates/silisculpt/device_list.html

14. Is there a checklist to follow before programming with Silicon Sculptor?

Ans. You need to check several things to start programming with Silicon Sculptor. You can find the checklist in the knowledge based document located at:
www.microsemi.com/soc/documents/SiliSculptQuickRef.pdf

15. What is the Power-On Self-Test (POST) for Silicon Sculptor?

Ans. When power is applied to the Silicon Sculptor programmer, it performs a power-on self-test (POST). This test checks RAM, ROM, CPU, analog circuits, and basic system integrity.

Note: Do not attempt any programming operations until the POST is complete. If the POST fails, the red ERROR LED turns on.

Failure codes are:

- Three short flashes: cannot self-calibrate
- Two short flashes: ROM checksum error
- One short, one long flash: RAM error

If you encounter any of these errors, contact Microsemi Technical Support at 1-800-262-1060 or soc_tech.support@microsemi.com. Do not attempt to program any device if self-test fails.

16. How many devices can I program successfully on a Silicon Sculptor adapter module?

Ans. The modules are rated for up to 10,000 insertions. The frequency of running the self-test is dependent upon usage.

17. Is there any memory in the Silicon Sculptor programmer?

Ans. Yes. The memory is used to broadcast the programming information in concurrent mode.

II. Adapter Modules

II.1. Activator

18. Where can I find a list of adapter module part numbers for Activator?

Ans. The adapter modules are device, package, and programmer specific. The list of modules for Activator is available at:
www.microsemi.com/soc/products/hardware/program_debug/activator/modules.aspx

II.2. Silicon Sculptor I and II

19. Where can I find a list of adapter module part numbers for Silicon Sculptor?

Ans. The adapter modules are device, package, and programmer specific. The list of modules for Silicon Sculptor is available at:
www.microsemi.com/soc/products/hardware/program_debug/ss/modules.aspx

20. Can I use the same module for different devices? For example, if I have an SM84P-Microsemi-1 module, can I use this to program an A1020B PL84 or an A3265DX PL84 device?

Ans. You can program the majority of Microsemi antifuse devices using the same package module on the Silicon Sculptor. However, some devices require a new revision or a different module for programming. For the appropriate module needed to program each Microsemi device, refer to the module list at:
www.microsemi.com/soc/products/hardware/program_debug/ss/modules.aspx

21. Can I use Silicon Sculptor Adapter modules to program the Microsemi devices with the other BP programmers like BP1400, BP2100 etc?

Ans. Yes, Microsemi recommends using Silicon Sculptor adapter modules to program Microsemi devices with other BP programmers. However, you cannot use other BP Adapter modules to program Microsemi devices with Silicon Sculptor.

III. Diagnostic/Self-Test

III.1. Activator

22. How do I run the Activator 2 test Procedure?

Ans. You can run the diagnostic test for the Activator 2 and 2S. The procedure is described in the knowledge based article located at:

www.microsemi.com/soc/kb/article.aspx?id=SL1233

If you use the programmer occasionally, run the self-test before each programming. If you use the unit daily, test it once a week.

III.2. Silicon Sculptor I & II

23. How do I run a self-test in the DOS version of the Silicon Sculptor software?

Ans. The Silicon Sculptor programmer can test its own hardware quite extensively. You are strongly advised to run a full system self-test on the programmer before performing any other operation. The self-test routine can detect problems in the pin drivers, power supply, microprocessor, data cable, printer port, and several other circuits.

To execute the test:

1. Remove any chips from the programmer sites. Any device left in a programmer site may be damaged during testing.
2. Press **Alt-D**.
3. Choose to test a single unit or all units.
4. Watch the screen for any error messages.

If you receive an error during the test, contact Microsemi Technical Support at 1-800-262-1060 or soc_tech@microsemi.com for assistance.

24. How do I run a self-test in the Windows version of Silicon Sculptor?

Ans. To run the self-test on your device programmer, click **Device**, and select **Actel Diagnostics** from the list of available devices (type “diagnostics”). Once selected, the main window displays the **Actel Diagnostics** label in the **Device** field and a **Test File** tab appears.

To test the programmer, click **Test**. The **Test** dialog box verifies how many units you wish to test. Once you click **OK** to begin the test, a window is displayed to prompt you to verify that there is no chip in the socket. The test starts and runs until it is completed or until you click **Stop**. If you decide to cancel the self-test, click **Stop** at any time during the procedure. A window is displayed acknowledging that the operation was aborted. To re-execute the test, simply click **Test** again. Your programmer should pass the test.

Verify by checking the green PASS LED on the chassis of the programmer. If your programmer does not pass the test, the red FAIL LED is activated and the following error message is displayed on-screen:

- Error 47: Self-test failed. This unit may need service. Please call technical support.

If this happens, double-check the fidelity of the cable connections and try again. Make a note of the exact error message and contact Microsemi Technical Support at 1-800-262-1060 or soc_tech@microsemi.com for assistance if you are still having trouble.

25. The self-test failed for the BGA 329 Adapter module for Silicon Sculptor. Why?

Ans. The lid of the BGA 329 adapter module is made of metal. So when you run the self-test by keeping the lid closed, it may come in contact with the base of the socket, which is also made of metal. It gives you the "self test failed" result for this particular adapter module. It is recommended to run the self-test by keeping the lid open for this particular adapter module. If it still fails the self-test, contact Microsemi technical support for the replacement. You can run self-test for all other modules by closing the lids.

26. How frequently should I run the self-test?

Ans. You must ensure that all programming hardware is in good, working condition. This requires regular execution of the hardware self-diagnostic test and maintaining valid calibration of the programming hardware. Perform the self-diagnostic test before every programming session. At a minimum, execute the test every week.

IV. Calibration

IV.1. Activator

27. How frequently do I need to calibrate Microsemi Activators?

Ans. Microsemi Activators are calibrated before leaving the factory and should not require any further calibration during their lifetime. Microsemi provides a diagnostic utility (Activator Diagnostic Test) that you can run to guarantee that Activator is operating within the calibration specifications. Microsemi recommends that you run this diagnostic test on a schedule that coincides with your normal hardware calibration routine (typically once every six months). If you find their Activator “out of specification” after running the diagnostic tool, the unit must be calibrated.

28. How do I perform the calibration of Activator 2/2S?

Ans. Eagle is responsible for performing the calibration of Activator 2/2S. Please contact Eagle if you would like your Activator 2/2S calibrated. Their telephone number is 408-748-1545.

IV.2. Silicon Sculptor I and II

29. How do I perform the calibration of Silicon Sculptor?

Ans. Calibration customers should contact BP Microsystems (1-800-225-2102 or tech@bpmicro.com) to perform the calibration of Silicon Sculptor. BP charges \$75.00 and provides an approximate one week turnaround time. Alternatively, a calibration (# 48D) socket can be purchased from BP Microsystems for \$250, which includes instructions on how to check the calibration. During operation, each pin driver is continuously monitored and calibrated by a special supervisory circuit. The self-diagnostic test verifies correct operation of the pin drivers, power supply, CPU memory, and communications. It is necessary to verify the accuracy of the self-test to ensure that it provides accurate results. The programmer uses an internal Digital Volt Meter (DVM) to measure the voltage and/or current of 13 internal nodes and 48 analog pin drivers, allowing verification. Its accuracy may be verified with a bench DVM.

An option in the self-diagnostic test may be executed to allow testing of the accuracy of the internal DVM and time base using a bench DVM and oscilloscope or period counter. Microsemi recommends that the following procedure be performed every 12 months. The procedure may be performed in the field or at the factory for a charge. If the unit fails the accuracy or self-test, return it to the factory for repair and failure analysis.

Procedures for verifying accuracy of internal DVM

1. Secure the SM48D in place on the programmer (48 pin DIP socket module: this adapter module can only be bought from BP MICROSYSTEM 1-800-225-2102).
2. Press **ALT-D**.
3. Press the **T** key when prompted.
4. Connect the black lead of the DVM to Pin 3 of the DIP Socket.
5. Measure the voltage at pins 1 and 2 of DIP socket and check that they fall within the minimum and maximum levels displayed on the screen.
6. Press any key to continue.

Procedures for verifying AC calibration

1. Use an oscilloscope or period counter to verify that the positive pulse on pin one is between 890 us and 910 us.
2. The programmer produces a 900 us pulse width on Pin 1 of the DIP socket. This completes the traceability test. The programmer continues with a self-test, and it must pass this test. Perform a self-test on each programming socket module that you use.

V. Concurrent Programming

V.1. Activator

30. **What is the maximum number of Activator programmers that I can daisy chain together?**

Ans. Activator programmers cannot be daisy-chained together.

V.2. Silicon Sculptor I and II

31. **How do I setup Silicon Sculptor for concurrent programming?**

Ans. Silicon Sculptor is a concurrent programmer, meaning that multiple sites can simultaneously program the same design. Your PC is used to hold the data that is programmed into the devices. Specific programming algorithms and instructions are stored on the PC and downloaded to the programmer when you select a chip and load the buffer. Thus, the algorithm is actually executed by each programmer's internal microprocessor. This guarantees accurate waveforms and precisely controlled critical time delays independent of the PC's performance. The speed of your PC only affects the rate at which the programming algorithm and data is downloaded to the programmer, not the programming yield. For more information on how to setup multiple Sculptors to facilitate concurrent programming, refer to the [*Silicon Sculptor Verification of Calibration Work Instruction User's Guide*](#).

32. **What is the max number of Silicon Sculptor programmers that I can daisy chain together?**

Ans. The maximum number of 6X programmers that can be daisy-chained together is two for 12 programming sites. Microsemi does not support more than four single site programmers connected together.

VI. Programming Software

VI.1. General

33. What software packages should I use to program Microsemi devices?

Ans. For Activator: APSW version R1-2000 or newer contains all the latest available programming algorithm updates. For Silicon Sculptor: Sculptor for DOS and SculptW for Windows. Check the Microsemi website for the latest version:
www.microsemi.com/soc/custsup/updates/index.html

VI.2. Activator

34. Where can I get the APSW software?

Ans. APSW comes with the Microsemi Designer or Libero® System-on-Chip (SoC) software package. Contact your local sales representative to get the latest version of the software.

35. Does the programming software also work on HP/Solaris workstations?

Ans. APSW is available for HP and Solaris workstations, but the Silicon Sculptor software is only available for DOS or Windows.

36. How do I verify the functionality of a programmed device with the APSW debugger?

Ans. The Activator 2/2S can be used to verify functionality of a Microsemi FPGA (not available for SX and newer devices) by using special debugger software to stimulate inputs and to observe outputs and internal nodes. For complete information on how to invoke the debugger software and write verification commands, refer to the *Activator User's Guide*.

37. What is the .avi/.txt file? When and where is it generated?

Ans. The .avi/.txt file is a generated log file when a Microsemi FPGA is programmed. The file contains information about the number of VPP voltage pulses applied to each fuse to program the fuse and the programming current sensed through each fuse. If a programming failure occurs, the .avi/.txt file contains information about programming failure mode. A new .avi/.txt file is generated each time the programming sequence begins. If you want to save an .avi/.txt file, you must rename it before restarting the programming sequence. For an example and explanation of an .avi file, refer to the *Activator User's Guide*.

The .avi file is generated by the Activator and the .txt file is generated by the Sculptor. Silicon Sculptor generates the .txt file for RT and RH devices only. However, due to some limitations, it does not generate a .txt file for RTSX/RTSX-S devices.

38. After loading the .afm file successfully, why am I getting "Unable to open AFM BLANK file" when I click on Blankcheck in Activator?

Ans. Check if the file <family>.afm exists in the \$ALSDIR/data/a<family>/<family>/<family>.afm directory. If the file does not exist, APSW gives this message. Please uninstall and reinstall the software to resolve this problem.

39. If I program four devices in the four sockets of the activator, will I get four different .avi files for four parts?

Ans. No. Actually you will get only one .avi file, but it will contain all the information pertaining to the four sockets.

VI.3. Sculptor

40. Where can I get the Silicon Sculptor software?

Ans. Silicon Sculptor for DOS and for Windows is available for download at:
www.microsemi.com/soc/custsup/updates/silisculpt

41. How can I measure the programming time in Silicon Sculptor DOS?

Ans. While programming a device in Silicon Sculptor you can measure the elapsed time. To do this, select **ALT + F10** and select **ON** in the **Elapsed Time** window prior to starting programming.

42. How can I measure the programming time in Silicon Sculptor Windows?

Ans. To measure the elapsed time during a function in Silicon Sculptor Windows, go to the **Tools** menu, choose **Options**, and select **ON** in the **Elapsed Time** window.

43. Is the .avi/.txt file supported in Silicon Sculptor?

Ans. The .txt file is supported in Silicon Sculptor only for RT and RH devices. No .txt file is supported for RTSX/RTSX-S devices.

44. Why am I getting a five digit checksum (example: CSUM=7EA7C) under "Data Pattern" when I load an .afm file in the Silicon Sculptor Windows software?

Ans. This checksum is not related to a Microsemi device or an Microsemi .afm file. The BP software performs some internal calculations, which gives the five digit checksum. There is no need to worry about this; it is not related to Microsemi.

45. In the Sculptor software under Device > Option, you will see two other options "secure after programming" and "secure after verifying". What is the difference between these two options?

Ans. Secure After Programming is the option we use for Microsemi devices. Secure After Verifying is something that is used for EPROM devices. BP uses the same interface for the Microsemi software and their own software. Selecting Secure After Verifying does not do anything to Microsemi devices. If you want automatic secure, use the **Secure After Programming** option.

46. What are the functions of the Blankcheck and Checksum commands in the software?

Ans. The **Blankcheck** command executes a test to determine if a device has already been programmed. Blankcheck displays a report for each socket that has an adapter module plugged into it. Blankcheck is performed automatically before the chip is programmed whenever the command is used. The result of executing Blankcheck is either "blank" or "not blank" followed by the silicon signature, checksum, and security fuse status read from the device. Only blank devices of the correct type (according to the design parameters) result in a blank status.

The **Checksum** command verifies that the current programming file is the same that you used to program the device. The Checksum command compares the checksum number, computed from the programming file, to the checksum number programmed into the chip. If the two numbers are the same, the program displays "PASSED." If the two numbers are not the same, the program displays "FAILED," with additional comments to briefly explain why it failed.

VII. Programming Files and Functions

VII.1. General

47. What files can I use to program a device?

Ans. See [Table 1](#):

Table 1: Files for Programming

Activator	Silicon Sculptor
.adb or .afm file	.afm file

48. Can I still program with .def and .fus files on Activator?

Ans. Yes. You can still program Microsemi FPGAs with the .def and .fus files by using the appropriate method from the Knowledge base article located at: www.microsemi.com/soc/documents/ProgFiles_AFU_AN.pdf

Microsemi supports the .afm format.

49. Can I generate the .afm files from .def and .fus files?

Ans. Yes. It is possible to generate .afm files from .def and .fus files, but the procedure to do so depends on your version of the Microsemi software. Choose the procedure that corresponds to the software version you are running from the Knowledge base article located at: www.microsemi.com/soc/documents/ProgFiles_AFU_AN.pdf

50. How are the programming files generated?

Ans. The Designer software is used to generate the programming file. The **Fuse** button in the Designer software generates the .afm file. You can also generate the .afm file using the following path: **File > Export > Fuse Files**.

51. Are .afm files that are generated by different versions of Designer compatible?

Ans. All the .afm files generated from Designer v3.0 and later are forward compatible. For example, an .afm file generated from Designer v3.0 can be used to program a part using Designer v3.1.1.

- For SX family devices: If the .afm file was generated using R1'99 Update One or earlier, you must regenerate a new .afm file with R1 '99 Update Two or newer. For A54SX72A devices, the .afm file should be generated using Designer R1-2001 SP4 or newer.
- For A42MX24 and A42MX36 devices: If the .afm file was generated using R1'99 Update One or earlier, you must regenerate the .afm file using R1'99 Update Two or newer.
- For ACT1 and 40MX family devices: Microsemi has experienced some issues with the .afm files generated using R1'99 Release and R1'99 Update One. To solve these issues, you must use R1'99 Update Two or newer.

Designs that are generated from Designer versions prior to v3.0 (that is, before the .afm file was introduced) are programmed using the .def and .fus files.

52. How do I check which version of Designer was used to create my .afm file?

Ans. Open the .afm file in a text editor. The header states the Designer release number that was used. The following example is an excerpt from an .afm file:

```
| PROGRAM Designer Series (tm) Development System  
| VERSION R2-2001 Post-Prod 4.3.4.7
```

53. Can I use the same programming file with devices of different technologies?

Ans. If you generate a programming file with one technology, (for example, a1020A), but actually program a different technology of the same device (for example, an RH1020), there are risks that this operation will not be successful. Because of the differences in separate revisions of devices, there are variations in programming. They include the programming voltage level and length of time allowed before the device "times out," that might result in a programming failure.

In addition, there are AC timing differences from one technology to the next. If proper simulation is not performed, the new device technology may not exhibit the same AC characteristics as the original. To avoid these issues, Microsemi recommends using the .afm files generated specifically for the device you want to program. See the **User Action** section below for more information.

User Action

- **Required:** Whenever you change to a new device, you must update the design files to the targeted device type prior to programming the new device. This ensures that device receives the proper programming steps and settings.
- **Recommended:** Microsemi recommends that you re-simulate your designs for the new device type to ensure that all timing requirements are met.
- **Warranty:** Microsemi does not provide any warranty for devices that are programmed with an incorrect device type file. Programming failures resulting from the device being programmed with the incorrect file types will not be accepted for replacement unless approved by Microsemi Technical Support.

54. Can I retarget to a compatible device with just an .afm file?

Ans. No. The .afm file for one technology cannot be used to program a device of another technology—even if the parts are compatible. In general, there is no way to regenerate any design database information from just the .afm file.

55. Can I use ACT 2 .afm files to program 1200XL devices?

Ans. While it is true that ACT 2 and 1200XL devices are pin-to-pin compatible, their .afm files are not the same. The primary difference between ACT 2 devices and 1200XL devices is the length of the register used for programming; 1200XL devices have a much longer register chain. To program a 1200XL device, you must regenerate the .afm file. Microsemi also recommends that you rerun timing and simulation since the 1200XL devices are faster.

Note: You may use ACT 2 .afm files to program “A” rev ACT 2 devices (1280 .afm file can program 1280A device) since the register chains are of the same length.

56. Can I use 1020A files to program a 1020B device?

Ans. Yes, the 1020B is compatible to the 1020A, but the timing will be different because the 1020B device technology is faster. Microsemi strongly recommends that you rerun all timing analyses after making the compatible die change.

57. How do I make a device or package change?

Ans. Whenever you make a device or package change to an existing device, other components of the design database need to be regenerated. Exactly what needs to be regenerated depends on what type of change you make.

58. What is the silicon signature?

Ans. A silicon signature is a 1-5 digit hexadecimal number that can optionally be programmed into a Microsemi device. You can assign the digital signature during the Fuse Generation function in Designer. This feature is provided so you can program an individual identification code into your devices. After programming, the silicon signature can be read from the device by executing Blankcheck within the Window's programming software or by executing **Device > Actel_Checksum** in the SCULPT software.

59. What is PINCHECKSUM in the .afm file?

Ans. The PINCHECKSUM variable in the .afm file is the package-pin checksum. This checksum always has two values, as shown in the following line:

```
; VAR PINCHECKSUM 5e7dbf37_c9cf9fee
```

The first value (5e7dbf37) represents the package type used (for example, 84PLCC vs. 84CQFP). The second value refers to the mapping between design I/Os and their pin assignments.

60. How do I verify that a device has been programmed?

Ans. You can verify that a Microsemi FPGA has been programmed by placing it in any supported programmer and running a blank check/Actel checksum.

61. How do I determine the status of the Microsemi security fuse?

Ans. How you verify the status of the security fuses in a Microsemi device depends on the type of programmer you have.

62. What is the fuse checksum?

Ans. The fuse checksum is a four digit hexadecimal number programmed into all Microsemi devices at the end of the programming sequence. This information can be used to match a programmed device to its programming (.afm) file. The fuse checksum is calculated from the fuses in the .afm file and stored in the device. This number is unique for each fuse map. This number can also change when the target die is changed, even if no change is made to the layout of the device. The checksum is the last information programmed to the device, which is the best way to ensure that all the information has been programmed successfully.

63. What causes the FUSCHECKSUM to change?

Ans. To uniquely identify a given design, Microsemi created a FUSCHECKSUM in the .afm file. Any design modification that causes a change in the fuse map (that is, the list of fuses to be programmed) will cause a related change in the FUSCHECKSUM. However, there are situations when the FUSCHECKSUM changes, even though no modifications were made to the design (see Situation One and Two below). These changes apply to all devices.

Situation One

There were detailed router changes between the R2-1998 and R1-1999 versions of Microsemi Designer software, which could result in different FUSCHECKSUMs from the same, unchanged .adb file. In this case, it is important to remember that the timing is the same since only the software version changed and not the design's placement and routing.

Situation Two

Between R1-1999 and R2-1999, the entire unused freeway tie-offs were interchanged between VCC and GND. As a result, there are guaranteed differences in the FUSCHECKSUMs for .afm files that are based on the same .adb file, but generated by the two different software versions. In this case, it is important to remember that the timing is the same since only the software version changed and not the design's placement and routing.

Note: FUSCHECKSUM will be same for conversions between R2-1998 and R3-1998 and for conversions between R2-1999 and R1-2000.

64. What is the difference between Array, Security, Probe, and Program fuse types?

Ans. When you program a Microsemi FPGA with either the APSW software and an Activator or SCULPT software and a Silicon Sculptor, you have the option to select the fuse type. Depending on the device family you are using, you will be given the options as shown below:

Table 2: Fuse Types

Fuse types for all Microsemi antifuse devices except ACT 1 and 40MX	Fuse types for ACT 1 and 40MX devices
Array Security	Array Probe Program

The differences between these fuse types are as follows:

- **Array Fuse:** Used to implement your design on the FPGA
- **Security Fuse:** Used to disable Action Probe, Silicon Explorer, and ALS Debugger capabilities
- **Probe Fuse:** Used to disable Action Probe, Silicon Explorer, and ALS Debugger capabilities (ACT 1 and 40MX only)
- **Program Fuse:** Used to prevent additional data from being programmed into the device (ACT 1 and 40MX only)
- For more information, refer to the [Activator User's Guide](#).

65. Will parts programmed with the Silicon Sculptor have the same Checksum as devices programmed on the Activator?

Ans. Yes.

66. What is the probability of getting a correct checksum but an incorrect program fuse?

Ans. Each fuse is individually verified during programming and additional programming verification tests are performed before the checksum is programmed, as described above. Programming occurs in this order to ensure that the array fuses are programmed correctly. All units that pass programming are guaranteed to function properly.

67. How can antifuse resistance be determined? Is it possible that fuse resistance could be great enough to cause a delay greater than the worst case simulated delay?

Ans. Antifuse resistance cannot be directly determined on a programmed unit. However, worst-case timing is guaranteed for programmed parts. During programming, the current sensed through each fuse is recorded in the .avi/.txt file each time you program a RH/RT device (prior to RTSX-S).

68. Concerning the programming file .afm, is there a way of incrementing the silicon signature without re-doing the place-and-route?

Ans. There is no way of incrementing the silicon signature without regenerating the .afm file. However, it is not necessary to run place-and-route repeatedly.

69. Can I modify the header line from "VAR SIG xxxx" to "VAR SIG yyyy" in the .afm file to change the silicon signature?

- Is the file going to be corrupted?
- Is the checksum going to change?
- Are there any other side effects?

Ans. The entry in the .afm "VAR SIG xxxx" is simply a comment in the file. Modifying this entry does not affect what gets programmed into the FPGA. The programmer uses this value to compare what is programmed in the part. Changing this value will result in an error when reading the silicon signature back since the programmer is comparing the value in the "VAR SIG xxxx" and what is programmed in the part, which is not altered when you modify "VAR SIG xxxx". To change the silicon signature, you need to change the silicon signature fuses that get programmed in the .afm. The only way to do this, with the .afm, is to regenerate it from Designer. In any case, you will need a separate .afm for each unique silicon signature.

70. Why does the size of the .adb file change during programming?

Ans. To program a Microsemi device using Microsemi Windows programming software (from Designer v3.0 or later), you can use either the .adb or the .afm file. The file that is actually used during programming is the .afm file, which you can create manually by clicking **Fuse** in the Designer flow chart. However, if you skip this step, you can open the .adb file directly and the programming software internally creates the .afm file and add it to the .adb database file. This means that the first time you use this database to program a device; the .adb file size and timestamp change. If you reuse the same database for subsequent programming, the .adb file does not change size.

Keep in mind that when you program with the .adb file, the auto-generated .afm file is NOT exported to your project directory as a separate file. The only way to export the .afm file (which you need to do if you are programming with Silicon Sculptor) is to click **Fuse** in the Designer flow chart.

71. What is the Microsemi recommended RT/RH programming flow?

Ans. The Microsemi recommended programming flow for a RT/RH device is as follows:

1. Test the Activator/Silicon Sculptor.
2. Program a commercially equivalent part.
3. Program an RT/RH device.
4. Save the .avi/.txt files (where required).

72. Can I use a .dio file to program with Silicon Sculptor?

Ans. Yes. You can use a Data I/O (.dio) file format to program some Microsemi devices with Silicon Sculptor. To do so, simply load the .dio file using the **Load > Buffer** command and program as usual. Microsemi recommends you use the .afm file format to program the devices, since Microsemi does not have control over the Data I/O programming algorithm and does not test it.

73. Are all the antifuses checked by Activator?

Ans. Every fuse being programmed is checked during the programming sequence. Programming pulses are applied across each fuse individually until current is sensed through the fuse. Once current is sensed, additional "soak" pulses are applied to ensure the fuse is programmed. After soak pulses are applied, the programming voltage is lowered and the current is sensed through the fuse again. This verifies that the sensed current is through the programmed fuse and not caused by leakage in the device (check six test).

Each fuse is checked individually as the array is programmed. After all array fuses are programmed, a series of additional "net shorts" tests are performed to verify that no additional fuses have been programmed. Checksum fuses are programmed after the net shorts tests are performed.

VIII. Device

VIII.1. RH/ RT/ Military Devices

74. Is there a need for dynamic or static burn-in after programming?

Ans. There is no need for additional burn-in after the units have been programmed. Static and dynamic burn-in are included in the manufacturing flow for all RH/RT devices.

75. Can 172 CQFP sockets withstand military temperatures (-55°C to +125°C)?

Ans. The 172-CQFP socket used by Microsemi for military temperature testing is a custom socket made by Yamaichi (part number IC51-196-1952). The socket operates in the military temperature range (-55°C to +125°C).

76. Are there statistics for parts failing after burn-in?

Ans. Since units are tested at the fabs, Microsemi does not have detailed information on units that fail electrical tests after burn-in. However, we do receive the test summaries and travelers, so we know the number of failures is very small (the test flow includes PDA calculations that must be met in order for the lot to ship). As for test failure modes after burn-in, that data belongs to the fabs.

77. What is Expected Programming Failure for RH/RP/RT devices?

Ans. Refer to [Table 3](#):

Table 3: Maximum Allowed Programming Failures for RH/RP/RT devices

Sample Size	Max Number of Failures
10	3
20	4
50	6
100	10

Note: Programming yield should normally be over 95%. These sample sizes allow a larger percentage due to statistical fluctuations attributable to the small quantities. If you begin to see high programming failures, stop programming and contact your local Microsemi representative or the Technical Support hotline at 1-800-262-1060.

78. Does Microsemi recommend programming a commercial part before programming an RH/RT part?

Ans. Before programming a RadHard or RadTolerant device, Microsemi recommends that you program a commercially equivalent device to ensure the proper setup of the hardware and software. After you have successfully programmed a commercial device, you can program your RadHard or RadTolerant device.

VIII.2. Commercial/Industrial

79. What is the expected programming failure rate for Industrial/Commercial devices?

Ans. Refer to programming failure allowance tables in
www.microsemi.com/soc/documents/FA_Policies_Guidelines_5-06-00002.pdf

80. What is the expected failure rate for -F devices?

Ans. Refer to programming failure allowance tables in
www.microsemi.com/soc/documents/FA_Policies_Guidelines_5-06-00002.pdf

VIII.3. General

81. Where can I find the lot number and date code on Microsemi FPGAs?

Ans. To trace a device's lot history from qualification test records, Microsemi must have the lot number of the device under investigation. The lot number allows Microsemi to identify the silicon ingot and wafer from which the device was fabricated. For most Microsemi FPGAs, the lot number is printed on the bottom of the package and the date code is on the top, although there are exceptions. In either case, the lot number is easy to identify given the following example:

Lot Number: 2ACT312381

Date Code: 9919

The date code indicates that the device is fabricated in the 19th week of 1999, and the wafer is from lot number 2ACT312381

82. Are electrical characteristics of the device guaranteed after programming? Is it necessary to perform functional tests on the programmed units?

Ans. The electrical characteristics outlined in the Microsemi device datasheet are guaranteed for all devices that pass programming. Additionally, correct functional behavior is guaranteed for all devices that pass programming.

83. Can I program the antifuse devices on board?

Ans. No. Microsemi does not recommend this and does not support it.



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