



Forth Language / FCode Driver Programming Class

To equip qualified engineers to work with Open Firmware (as defined by *IEEE Standard 1275-1994*) and to write Open Firmware device drivers, FirmWorks conducts a four and 1/2 day class which provides the knowledge necessary to write Open Firmware-compliant FCode Drivers.

No prior knowledge of the Forth language or Open Firmware is assumed. However, participants should have the following:

- Some experience with programming in a high level language.
- Some knowledge of the hardware organization of a general purpose computer.
- Some knowledge of what a device driver is and what it does.

The course consists of lecture and in-class programming exercises for which each student is provided his/her own computer. By the end of the week, participants will have a basic understanding of Forth, Open Firmware and FCode, and will have written their first FCode device driver.

Course Description

Pre-Work — approximately 20 hours

Materials:

Starting Forth
Class workbook

Description:

Upon completion of registration, each student is provided with a class workbook, a copy of *Starting Forth, Second Edition* by Leo Brodie and, if necessary, a 32-bit, ANS Forth interpreter suitable for use on an IBM-PC compatible computer. The class workbook contains clarifications of the material in *Starting Forth*, additional information related to Open Firmware's Forth environment, and exercises to help the student master Forth in preparation for the classroom environment.

Although some class time will be spent reviewing the Forth language, it is important that the student have scheduled time available prior to the class for completing the pre-work assignment.

Forth Language, Debugging Tools and Forth Laboratory — 1.5 days

Materials:

Starting Forth
Class workbook

Description:

At the start of the class, students will be given a short questionnaire with which they can self-evaluate their Forth skills. Based upon the questionnaire results and student feedback, the instructor will review the topics with which the students need help, and will review all of the language constructs that the students should need over the course of the class.

At the end of this review, the students will be given a programming exercise with which to refine their Forth skills. Experience has shown that refining Forth language skills in this laboratory helps prepare students for the FCode driver laboratory later in the week.

Open Firmware Design — 1.5 days

Materials:

Open Firmware Command Reference
Writing FCode Programs for PCI
Open Firmware presentation handouts

Topics:

Open Firmware Overview
Device Tree
 Device Names
 Interconnection
 Node names
 Device paths
 Ambiguous device paths
 Aliases
Properties
 Names
 Encoding
 Creation
 Browsing
 Example definitions
Methods
 Static
 Instance-specific
 Instance chains
 Instance records
 Instance chain creation
 Method execution
Data
 Static
 Instance-specific
Wildcard Nodes
FCode Overview
Standard Device Types
 Standard method sets
 block
 byte
 network

- serial
- memory
- mmu
- Support Packages
 - disk-label
 - obp-tftp
 - debloker
- Software Nodes
- Method execution
 - \$call-method
 - \$call-parent
 - execute-device-method
- Memory types
- User Interface Tools
 - "Magic" keyboard chords
 - Command line editor
 - Hardware debugging
 - FCode debugging
- Device Interface and FCode
 - Source
 - Binary
 - Tokenizing
 - Downloading and debugging
 - Code walkthrough of a serial device driver

FCode Driver Laboratory — 1 day

Description:

Each student will write a simple FCode driver for their classroom computer's serial port. Adjacent computers will have their serial ports connected, and the students will test their drivers by "chatting" through their drivers across the serial ports.

Open Firmware Conclusion — 0.5 day

Description:

- Standard Device Types
 - display
- Support Packages
 - fb1
 - fb8
 - terminal emulator
- Code walkthrough of a display device driver
- Console selection issues
 - Fallback devices
- Configuration Variables
- Start-up sequence
 - nvrnrc
 - Expansion bus probing
- Booting
- Interrupts
- Client Program Interface
 - Initial program state
 - Calling conventions
 - Services
 - Callbacks
 - Debugging

The training is conducted in English. Course materials are provided.

Class Schedules

Classes are scheduled each month at our Mountain View, CA site and are subject to cancellation if a minimum class size of 4 is not achieved. Please call for information on the next available class in Mountain View.

Classes may also be scheduled on request in Mountain View or at your site subject to a guaranteed minimum class size of 4. Please call to make arrangements for a class scheduled for your needs.

Mountain View Class Schedule

Class Dates	Registration Closes	
	U.S. Registrants	All Other Registrants
1998		
January 12 - 16	December 22, 1997	December 22, 1997
	Note early registration close due to holidays	
February 9 - 13	January 28	January 21
March 9 - 13	February 25	February 18
April 13 - 17	April 1	March 25
May 11 - 15	April 29	April 22
June 8 - 12	May 27	May 20
July 13 - 17	July 1	June 24
August 10 - 14	July 29	July 22
September 14 - 18	September 2	August 26
October 12 - 16	September 30	September 23
November 9 - 13	October 29	October 22
December 14 - 18	December 2	November 25

Fees

Our standard single student rate for a class at our Mountain View, California site is \$2155. Alternatively, multiple enrollments from a single company for a single class may be purchased for \$7500 plus \$1085 per student.

Discounts are available from both these rates for holders of FirmWorks system ROM source or manufacturing kit licenses. Please contact FirmWorks for details.

Our fees do not include meals, hotels or transportation.

We will also run single company classes on our site or yours given a minimum class size of 4 for \$7500 plus

\$1085 per student. In addition, travel time and expenses are charged for off-site classes.

We accept Mastercard, Visa, Diners Club, Carte Blanche, JCB, check, money order or company purchase order (subject to credit approval). (Sorry. We do not accept American Express.)

Deposit on Forth Interpreter

FirmWorks will loan a copy of a proprietary 32-bit, ANS Forth interpreter to any student needing one to complete their pre-work assignment. This interpreter is suitable for use on an IBM-compatible PC running MS-DOS®.

The student must accept the terms of FirmWorks's license agreement, must agree to return the software at the completion of the class, and must provide a \$500 refundable deposit. If the software is not returned by one week after the class's completion, the deposit will be forfeited.

Registration

Registration for a given class session closes approximately two and 1/2 weeks prior to the start of that session for United States registrants and three and 1/2 weeks prior to the start of that session for all other registrants (as shown above). Payment must be received by the close of registration to allow sufficient time for shipment of pre-work materials and completion of pre-work by students.

Cancellation Policy

Regularly Scheduled Classes at FirmWorks's Site

If, after registering for the class, a student's registration is rescheduled or canceled, one of the following fees will apply for each student whose registration is modified.

- Reschedules more than 2 weeks before class start: \$50.
- Cancellations more than 2 weeks before class and before shipment of class pre-work materials: \$50.
- Reschedules within 2 weeks before class start or "act of God" no-shows who reschedule: \$400 each time you reschedule.
- Cancellations after shipment of pre-work materials: \$400.
- No-shows (including "act of God" no-shows that do not reschedule): 100%.

Classes Scheduled on Request

If, after a class has been scheduled per your request, the class is rescheduled or canceled, one of the following fees will apply.

- If a class as a whole is canceled or rescheduled more than 2 weeks before class and before shipment of class pre-work materials: \$200.
- If a class as a whole is rescheduled after shipment of class pre-work materials: \$400 for every set of prework materials shipped each time the class is rescheduled.
- If a class as a whole is canceled after shipment of class pre-work materials: \$400 for every set of prework materials shipped.
- If a class is held as scheduled, but the number of students in attendance is less than the number of students registered (as measured by the number of sets of prework materials shipped): \$400 for every student who was registered and did not attend the class.

In addition to the above, you will be required to reimburse FirmWorks for any non-refundable travel expenses that were incurred by FirmWorks as a result of the cancellation or rescheduling of any class not scheduled to be held at FirmWorks's site.

To Register

FirmWorks
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Terms:

1. All prices are exclusive of sales, use and other applicable taxes, which must be paid by customer.
 2. Prices, offerings and terms subject to change without notice.
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