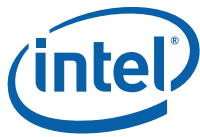


Intel[®] Flash Recovery Utility (FRU)

Reference Manual

September 2006



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Revision History

Date	Revision	Description
September 2006	-001	Launch Release.



1.0 Introduction

An input/output (I/O) processor (IOP) requires code to function. Out of reset, the processor executes the code that is located at the beginning of a Flash device on the peripheral bus. I/O processor evaluation platform boards ship with RedBoot* loading into the Flash device, but during normal development, the code in the Flash device needs to be reprogrammed.

There are multiple ways to update the code in the Flash device:

- When the Flash device is a socketed Flash, it can be physically removed and can be programmed in a Flash programmer.
- The Flash device can be reprogrammed with a JTAG device that supports the particular evaluation platform board and is capable of Flash programming.
- The Intel® Flash Recovery Utility (FRU) which is a free software that runs on a DOS bootable floppy disk.

In the first two cases, hardware and software must be purchased. The third option can program the Flash device through the PCI bus of a host computer.

Since a desktop computer is normally available in computer program development, no new hardware is required. The host computer must have an available PCI slot for the evaluation platform board to plug into, and it must be compatible with a DOS bootable floppy disk. In this case, the expense of the first two programming methods is avoided.

1.1 URLs Related to FRU

- Latest version of this manual, FRU 6.07:
<http://developer.intel.com/design/iio/docs/274060.htm>
- Zipped file to create a FRU boot disk (FRUCMD_0607.zip):
http://downloadfinder.intel.com/scripts-df-external/Detail_Desc.aspx?agr=N&DwnldID=5800&ProductID=973?????
- Previous version of this manual, FRU 6.0:
<http://www.intel.com/design/iio/devtools/iq80310/273551.htm>
- Previous version of the software, revision FRU 6.0:
http://downloadfinder.intel.com/scripts-df-external/Detail_Desc.aspx?agr=N&DwnldID=5800&ProductID=973
- FRU 6.07 supports several I/O processors. The documentation for each processor can be found on the Intel® I/O Processor web page:
<http://developer.intel.com/design/iio/>



2.0 System Requirements

2.1 Platforms and Operating Systems

The FRU requires an Intel Pentium®-based host platform, with an available PCI-X or PCI Express bus. The FRU uses the primary PCI bus to program the Flash, utilizing the Flash memory interface in the Intel® I/O processor. The FRU runs on Microsoft* DOS* or ROM-DOS and runs from a bootable floppy disk.

To build the boot disk, DOS, Windows 95*, or Windows 98* is required. The FRU is a DOS-based program, so do not use Windows NT*, Windows 2000*, or later versions of Windows to build the boot disk. The FRU works with FAT16 and FAT32 (File Allocation Table) file systems, but it does not work with NTFS (NT File System).

When a FRU boot disk is successfully built with DOS, Windows 95, or Windows 98, the FRU disk works with a Windows NT or Windows 2000 host, since the operating system is on the floppy disk. However, the Flash image file has to be on the floppy disk in this case, because the FRU program is not able to read the file system on the host hard drive.

2.2 Supported Input/Output Processors

The FRU 6.07 supports the following Intel® I/O processors:

- Intel® 80321 (80321)
- Intel® 80331 (80331)
- Intel® 80332 (80332)
- Intel® 80333 (80333)
- Intel® 8134x (81341/81342/81348)

Note: Earlier I/O processors are supported by FRU 6.0 (Intel Order #274060)

2.3 Supported Flash

FRU 6.07 supports 2, 4, and 8 MB Intel® StrataFlash®.

2.4 Flash Image Requirements

The firmware image must be a binary file. Hexadecimal, S-record, and elf files do not work with the FRU. When the Flash image is small enough to fit on the floppy disk, it can be stored on the floppy disk with the FRU. Otherwise, it must be stored on the host system hard drive.



2.5 Reset Mode and Time-out Mode

For the FRU to work properly, it must be able to access the processor with PCI configuration cycles and it must not be in competition with the core or cores when it is accessing the Flash. This is accomplished by reset strapping on the I/O processor peripheral bus. The datasheet for the particular processor describes the effects of the reset straps. For the 80321, 80331, 80332, and 80333, these processors must be strapped to hold the core in reset and to allow configuration cycles so that the FRU can erase and program the Flash.

On the evaluation boards, there are dip switches for this purpose. After programming the Flash, these two switches are then changed back so that the code can run on the core. In short, on all of the evaluation boards for these processors, switches 2 and 3 are turned On to program with the FRU, and then switches 2 and 3 are turned Off to run the board.

The 8134x family of processors has more flexibility in programming. These processors can be programmed as described above, which is called reset mode, or the cores can be forced into reset by the FRU. The 8134x has core reset bits that can be set when PCI configuration cycles are enabled, either through reset strapping or by enabling the firmware timer, which enables configuration cycles after the timer runs out. This method is called time-out mode, and in this case, the FRU detects that the cores are not in reset, forces the cores into reset, and then proceeds as normal. Therefore, the 8134x evaluation board can have many reset strapping configurations and the FRU is still able to program the Flash.

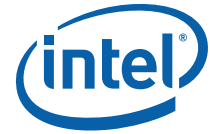
When the jumper for CONTROLLER_ONLY# is installed, the FRU still works. The only case where the FRU absolutely does not work, is when configuration cycles are disabled (switch 2 is Off) and the firmware timer is disabled (switch 9 is On). In this case, the processor signals retry indefinitely, the BIOS is held Off, and the host system never boots. So, switch 9 must be Off, or switch 2 must be On, or both.

In all cases, refer to the I/O processor evaluation platform manual and Datasheet to understand the dip switches and jumpers.



3.0 How to Create a FRU Boot Disk

1. Do a "full" format of the floppy disk.
This can be done at the DOS prompt or by using My Computer.
 - a. When using the DOS-prompt technique: Type format a: /s and press Enter.
 - b. When using My Computer:
 - Double-click the My Computer icon.
 - Click the A: drive.
 - In the menu bar, select File > Format.
 - In the dialog box that appears, enable the Full and Copy system files options.
 - Click Start.
2. DOS4GW.exe is required to extend the address range. It acts as a 32-bit extension for the kernel. This file can be downloaded from <http://www.openwatcom.org/>.
 - a. Copy this file onto the floppy disk.
3. Unzip the file FRUCMD_0607.zip and copy "frucmd.exe" onto the floppy disk.
4. Use Windows Explorer or the DOS prompt to ensure that the following files are on the floppy disk:
 - COMMAND.COM
 - Dos4gw.exe
 - DRVSPACE.BIN
 - Frucmd.exe
 - IO.SYS
 - MSDOS.SYS



4.0 How to Use FRU

4.1 Preliminaries

With host computer turned Off and the evaluation board in Reset or Time-out mode, insert the evaluation board into a PCI-X or PCI Express slot on the host computer motherboard. Insert the FRU boot disk in the A:\ drive, and turn On the host computer.

4.2 Launching FRU

Allow time for host computer to boot completely. To launch the FRU, type "frucmd.exe" or just "frucmd" at the A:\ prompt. The command line mode is a DOS screen.

4.3 Command Line Mode

4.3.1 Options

When the command line mode of FRU is launched, the following DOS screen appears:

```
A:\>frucmd

DOS/4GW Protected Mode Run-time Version 1.97

Copyright (c) Rational Systems, Inc. 1990-1994

FRUCMD, version 6.07

Copyright (c) 1998-2005 Intel Corporation

usage: frucmd [options]

Options for using frucmd:

Compare flash: -C -F <file> -A <flash offset(hex)>

File download: -D -F <file> -A <flash offset>

Erase flash : -E -A <start addr(hex)> -L <byte count or 0 for all>

File Upload : -U -F <file> -A <start addr(hex)> -L <byte count>

List IOPs : -P

Specifying a -N <iop number> option with the Compare, Download, Erase, and Upload
commands execute the command only for the specified IOP (this is useful when more
than one IOP exists). Use the -P option to list all the IOPs.
```

```
A:\>
```

DOS is not case sensitive, so upper or lower case can be used.



4.3.2 Download

-D -F <file> -A <flash offset>

Example 1. A:\>frucmd -D -F c:\temp\redboot.bin -A 0x0

This option copies a binary file to the Flash. The full path of the file must be specified. When no offset is specified, the download starts at the beginning of the Flash. When the input file is to be downloaded at a location other than the start of the Flash (byte 0), then the start address offset in the Flash, from byte 0, is specified in hexadecimal with or without the leading "0x" prefix.

4.3.3 Upload

-U -F <file> -A <start addr(hex)> -L <byte count>

Example 2. A:\>frucmd -U -F c:\temp\upload.bin -A 0x0 -L 204928

This option copies the contents of a region of Flash and stores it as a file on the host computer. When the Flash image file exists, check the length of the file by using the "dir" command in DOS. DOS has single-byte granularity where Explorer gives an approximate file size, and an exact file size is needed for this option. The file length is specified in decimal. Enter the full path and file name to create a new file or to overwrite an existing one.

4.3.4 Erase Flash

-E -A <start addr(hex)> -L <byte count or 0 for all>

Example 3. A:\>frucmd -E -A 0x0 -L 0

This option erases a specified region of the Flash. The erase operation begins at the offset specified by the start address from byte 0 of the Flash and ends after the number of bytes specified by the -L option. When no offset is specified, the erase operation starts at the beginning of the Flash. When the length is specified as '0', the erase operation continues to the end of the Flash. When neither the offset nor the length is specified, the entire Flash is erased.

4.3.5 Compare Flash

-C -F <file> -A <flash offset(hex)>

**Example 4. A:\>frucmd -C -F c:\temp\cyrn_z.bin -N 0
A:\>frucmd -C -F c:\temp\redboot.bin -N 1**

This option compares a binary Flash image file on the host computer to a region of the Flash. The full path to the binary file must be specified. When there is an offset to the beginning of the Flash, the offset must be specified.

4.3.6 List IOPs

-P

Example 5. A:\>frucmd -P

This option lists all of the I/O processors in reset mode or time-out mode.



4.3.7 Help

-h or -?

Example 6. A:\>frucmd -h
A:\>frucmd -?

This option prints the following to the screen:

```
A:\>frucmd -?
DOS/4GW Protected Mode Run-time Version 1.97
Copyright (c) Rational Systems, Inc. 1990-1994

FRUCMD, version 6.07

Copyright (c) 1998-2005 Intel Corporation

usage: frucmd [options]
Options for using frucmd:
Compare flash: -C -F <file> -A <flash offset(hex)>
File download: -D -F <file> -A <flash offset>
Erase flash : -E -A <start addr(hex)> -L <byte count or 0 for all>
File Upload : -U -F <file> -A <start addr(hex)> -L <byte count>
List IOPs : -P
```

Specifying a -N <iop number> option with the Compare, Download, Erase, and Upload commands execute the command only for the specified IOP (this is useful when more than one IOP exists). Use the -P option to list all the IOPs.



5.0 Conclusion

The Flash Recovery Utility downloads, uploads, erases, and verifies the Flash, and it is a software tool that accomplishes these tasks without any additional hardware. For applications that use Flash, the Flash Recovery Utility is a very useful development tool.

