# User Documentation for TMS320F241/F243 Serial Boot Loader

**1.0 Introduction:** This document introduces the Flash Boot Loader Utility for the TMS320F241/F243 DSP controller. This is a "User's Guide" and does not attempt to document the internal details of the Boot Loader Utility. For details of functioning refer to the Application Note "Flash Serial Boot Loader for the TMS320F241/F243". (This appnote is included in this package in Appnote.pdf). The TMS320F241 device as shipped from the factory has the boot loader programmed in the flash.

**1.1 Purpose:** The Flash Serial Boot Loader is intended to allow programming of the Flash on the TMS320F241 Device over the serial port, rather than depending on the JTAG interface. This allows the Flash Software upgrading and modification over the serial port, under field conditions using only a standard PC and the serial port on the TMS320F241.

**1.2 Hardware Requirements:**

**1.2.1 BIO pin status:** The TMS320F241 Boot Loader looks at the "BIO" pin to determine whether to transfer control to the User Software or run the Boot Load Algorithms. So the BIO pin must be available in such a manner that it can be pulled high or low depending on whether the programming mode or normal operation is desired. Table 1 shows the relation between the operation of the Boot Loader and the BIO pin.

**Table 1. Boot Loader Operation Control with BIO pin.**

| BIO State | Operation |
|---|---|
| High | Boot Loader enters programming mode. |
| Low | User Code entered at 0x40. |

**1.2.2 Level Translation:** The serial port must be provided with an RS232 level translation and driver hardware.

> **Caution:** Note that level translation must be provided between the TMS320F241 and a standard RS232C compatible serial interface. The levels on the TMS320F241 pins are not RS232C compatible. An attempt to connect the RS232 line directly to the TMS320F241 may cause permanent damage to the device.

## 1.3 Procedure for incorporating the boot loader in User Software:

To incorporate the boot loader into user code the software must branch to the location 0x1F00 on reset / power up. To do this change the Reset Vector to look like this:

```
RESET          B    1F00H
```

Other than this the Boot Loader Operation is completely transparent to the user code.

Now when the device is reset (assuming MP/$\overline{MC}$=0 ) the controller starts execution in Microcomputer mode at 0x0000, in on-chip flash memory. This will transfer control to the Boot Loader entry point. The Boot Loader looks at the status of the BIO pin and if it is high, the Boot Loader invokes the communications routine to download software from the Host. If it is low, the control is transferred to the location 0x0040.The User software therefore must have 0x0040 as the primary entry point. No other change is required to utilize the Serial Boot Loader Utility. The only other restriction on the user code is that there must be free space between 0x1F00 to 0x1FFF for the Resident Portion of the Serial Boot Loader.

## 1.4 Procedure to Program the Flash with the Boot Loader:

a. Assemble and link the user code to get a ".out" file for example

USERCODE.OUT

b. Copy this file to the directory in which you have unzipped the Serial Boot Loader Utility.

```
COFF1-to-HEX Converter for TMS320F240 RS232 Flash Programmer
Version2.0b
(c) Copyright 1998 Texas Instruments
Filename:
```

c. Invoke the utility F240_HEX.EXE from a DOS window. This starts up and gives a prompt for Filename.
Now type in USERCODE.OUT and press enter. The F240_HEX will display status and exit.
d. Once a hex file is successfully obtained, you are ready to program the user code into the flash. Connect the serial communications cable from the hardware containing the 'F241 to the COM1/COM2 port of the PC. Ensure appropriate status of BIO.
e. Invoke the programming utility by typing "spf24xb? USERCODE.HEX" at the command prompt, or put this into a batch file called for example, progflash.bat.

**Note**: ? is either 1 or 2, the number of the appropriate COM port.

The Boot Loader will start the baud rate lock algorithm and proceed with programming of the flash. Once complete it will display "Finished" and exit. Close the Boot Loader Windows, power off the target hardware, change BIO state to "LOW", and reset the hardware. The target will begin to execute the new program.

After the user code is programmed in the Flash the Boot Loader is automatically refreshed in the Flash from 0x1F00 to 0x1FFF. This is transparent to the user and the user does not need to do anything to refresh it. To do another code change, repeat the procedure exactly as per the first programming.

# An Important Note:

**The Binary Algorithms for programming the Flash on the TMX F241/F243 Silicon version 1.1 are different and are incompatible with the TMS320F240. Also the Silicon Version 2.x Flash Algorithms are expected to be incompatible with the Version 1.1 Flash Algorithms. So it is important to check the exact version required. The Boot Loader Code itself is identical for the F241/243 silicon versions but is not the same as the code for the TMS320F240.**