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Bootloading the TMS320C548 Using the BSP in Standard Mode

Philip M. Jones II   *Digital Signal Processing Solutions*

Abstract

This document describes how to create a boot package and bootload one Texas Instruments (TI™) TMS320C548 digital signal processor (DSP) with another TMS320C54x DSP.

Contents

Design Problem

When using the TMS320C548 DSP in multichip solutions, a question often arises: How can I create a boot package and bootload one C548 with another C54x DSP

Solution

The information discussed here describes a 16-bit standard serial boot. The reader should be familiar with the information written in the *TMS320C54x CPU and Peripheral Reference Set Volume 1* (SPRU131C) as well as the TMS320C548/549 Bootloader Technical Reference (SPRU288) and ROM code examples.

Step 1. Connecting the C548 DSP to Another C54x DSP

Figure 1. Connections for the Serial Port Interface
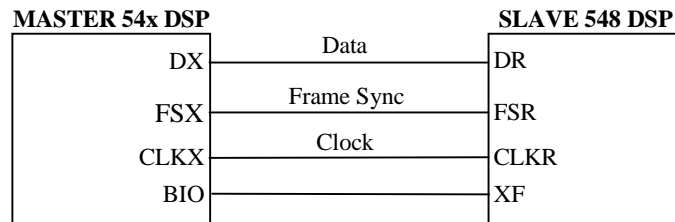
The DSP connections are as follows. The C548 XF flag connects to the C54x BIO pin. The C548 sets XF low when ready to receive. The C54x polls the BIO pin. When the BIO pins goes low, the C54x begins transmitting the boot package.

Step 2. Creating the C548 Boot Package With Assembly Language Tools

It is important to use version 1.2 (or higher) of the tools, assembler, linker and hex utility when implementing the following.

To create the boot package, first write the code to be boot loaded.

Example 1. Listing File

```
TMS320C54x COFF Assembler Version 1.20        1998
Copyright (c) 1997        Texas Instruments Incorporated

MY CODE                                         PAGE    1

1                   *EX.
2                   ********************************
3                   * Simple Boot load Test Program *
4                   ********************************
6                                   .def START
7
8  000000                          .text
9  000000 F495  START:            NOP      ; YOUR CODE HERE
10 000001 F495                    NOP
11 000002 F495                    NOP
12 000003 F495                    NOP
13 000004 F495                    NOP
14 000005 F000                    ADD #10,A
   000006 000A
15                                .end

No Errors, No Warnings
```

a) When assembling your boot code, use the -v548 option. This determines which processor instructions are built.

```
asm500 –v548 mycode.asm
```

b) Next, link the assembly code.

```
lnk500  mycode.obj –o mycode.out
```

c) Now that the source has been assembled and linked, you have a COFF output file that can be used by the hex utility. Here are descriptions of the hex utility options you will need.

-o *filename*	Specify an output filename
-e *value* (hex)[†]	Positions the PC to begin at specified address
-boot	Converts all sections into bootable form
-bootorg SERIAL	Specifies the source of the boot loader table as the serial port
-memwidth *value*	Defines the system memory word length (default 16)
-romwidth *value*	Specifies the ROM device width (default depends on format)
-spc *value* (hex)	Sets the serial port control register value (hex)
-spce *value* (hex)	Sets the serial port control extension register value (hex)
-a (filename)	Selects ASCII-Hex

† Can be 23 bits if programming the XPC.

More information on how to control the output of the hex utility can be found in the *TMS320C54x Assembly Language Tools User's Guide* (SPRU102A) and the *TMS320C54x Code Generation Tools Getting Started Guide*, release 1.20 (SPRU147B).

Here is an example of the command file invoking the hex utility:

```
mycode.out       /* input file     */
-o mycode.asci  /* output file    */
-a              /* ascii format   */
-memwidth 16
-romwidth 16
-boot
-e 0000h
-bootorg Serial
```

Output of the hex utility.

```
10 AA 00 18 00 03 08 00 00 10 00 00 00 00 00 07 00 00
03 00 F4 95 F4 95 F4 95 F4 95 F4 95 F0 00 00 0A 00 00
```

d) Now that the hex utility ASCII file is made, it is necessary to take the image and place it into the memory of the Master 54x. To make this task easier, an ASCI2ASM1.exe file can be used. The Asci2asm1 file generates an assembly file that extracts each 16-bit word and places it in an assembly language data table.

This can be found at URL:
ftp://www.ti.com/mirrors/tms320bbs/dsputils/ASCI2ASM1.exe

To invoke the executable file, the input file and output file MUST be typed on the command line. Be careful not to call your newly generated *.asm file by the same name as your original *.asm file. You may lose you original source code.

```
Asci2asm1 mycode.asci mycode2.asm boot

Input  filename:      mycode.asci
Output filename:      mycode2.asm
Table .sect name:  "Boot"

Include Start and End labels (Y/N)?N
LABELS NOT USED
Conversion successful !
```

The resulting output will resemble a set of data.

```
.sect "Boot"
.word 010AAh        ..Specifies 16-bit boot
.word 00018h        ..SPC value
.word 00003h        ..SPCE value
.word 00800h        ..ARR value
.word 00010h        ..BKR value
.word 00000h        ..Entry point (XPC)
.word 00000h        ..Entry point
.word 00007h        ..Size of first section
.word 00000h        ..Destination of first section (XPC)
.word 00300h        ..Destination of first section
.word 0F495h        ..Code word
.word 0F495h        ..Code word
.word 0F495h        ..Code word
.word 0F495h        ..Code word
.word 0F495h        ..Code word
.word 0F000h        ..Code word
.word 0000Ah        ..Code word
.word 00000h        ..End of boot
.end
```

The hex utility options produce an ASM file similar to the one shown above.

Finally:

Now that you have connected the C548 DSP to another C54x DSP and created the 548 boot package with the assembly language tools, you are ready to take the boot package and load the file into memory. Because the boot package is an array of data, it can be stored in RAM-like coefficients.

References

TMS320C54x CPU and Peripheral Reference Set Volume 1, Literature number SPRU131C, Texas Instruments.

TMS320C548/549 Bootloader Technical Reference, Literature number SPRU288, Texas Instruments.

TMS320C54x Assembly Language Tools User's Guide, Literature number SPRU102A, Texas Instruments.

TMS320C54x Code Generation Tools Getting Started Guide, Release 1.20, Literature number SPRU147B, Texas Instruments.

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<u>PRODUCT INFORMATION CENTERS</u>

Americas
Phone   +1(972) 644-5580
Fax   +1(972) 480-7800
Email   sc-infomaster@ti.com

Europe, Middle East, and Africa
Phone
  Deutsch   +49-(0) 8161 80 3311
  English   +44-(0) 1604 66 3399
  Español   +34-(0) 90 23 54 0 28
  Francais   +33-(0) 1-30 70 11 64
  Italiano   +33-(0) 1-30 70 11 67
Fax   +44-(0) 1604 66 33 34
Email   epic@ti.com

Japan
Phone
  International   +81-3-3344-5311
  Domestic   0120-81-0026
Fax
  International   +81-3-3344-5317
  Domestic   0120-81-0036
Email   pic-japan@ti.com

Asia
Phone
  International   +886-2-23786800
  Domestic
    Australia   1-800-881-011
     TI Number   -800-800-1450
    China   10810
     TI Number   -800-800-1450
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     TI Number   -800-800-1450
    Taiwan   080-006800
    Thailand   0019-991-1111
     TI Number   -800-800-1450
    Fax   886-2-2378-6808
    Email   tiasia@ti.com

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