How to use ICC12 with Adapt912B32 and FLASH Loader

This document will show and demonstrate the use of ImageCraft ICC12 Latest **Version 6** with Technological Arts' Adapt912B32 module.

The FLASH Loader written by Gordon Doughman Arts and can be found at <u>www.freescale.com</u> website. The FLASHLoader will be used here to erase and program FLASH after the compilation of a test program. Other method can be used to also erase and program the FLASH but in this example it will be the FLASH Loader.

This document assumes that the user is familiar with C and so will not teach how to program C here.

ImageCraft Links:

About		×
	ICC12 Version 6.16A Built Jan 26 2004 21:58:29 (650) 493-9326 FAX: (650) 493-9329	
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<u>http://www.freescale.com/</u> <u>http://www.freescale.com/files/soft_dev_tools/software/app_software/dbug_rom_</u> <u>monitors/MC68HC912B32EVBFW.zip</u>

Getting Started:

Double click on the ICC12 icon. If a user has not read the ICC12 manual and just open the IDE one will wonder what to do next. Well wonder no more.

Note the 3 window panes. The top left most is greyed out and the right is the project window. The left bottom pane is where the error messages are displayed during compilation.

Before creating a new Project, the hardware target in the Compiler Options must be setup properly for the target MCU. This is to ensure that the compiler will setup the type of MCU the C program will compile for. In this example it is the Adapt912B32.



Compiler Setup:

Click on Project Menu – Options – Target Tab.

ImageCraft IDE for ICC12 (PROFESSIONAL)		<u> </u>
File Edit Search View Project RCS Tools Termina	inal Help	
Image: Second	Ctrl+F11	
Reopen	•	
Make Project Rebuild All	F9 Shift+F9	
Add File(s) Add Topmost Opened File Remove Selected File(s)	Shift+F11	
Options Manual Sort Browser Window	low	
Close Save As		
[No Open File]	[No Open Project]	11.

Please note the Device Configuration. Click on the pull down arrow to change the device type.

Compiler Options	×		
Paths Compiler Target Device Configuration 912B32 9512Dx128 / Ax128 / E128 small (int only, no 9512Dx256 / Ax256 / H256 olong (+ long, and 9512Dp256 4K EEPROM Mode float (full function) 9512Dx512 / Ax512 word Alignment 912B32 Internal EEPROM word Alignment 912D60/A No Startup/Lib Non-default Startup Non-default Startup	modifier) modifiers))		
For Expanded Memory, "Linear S2" and "Map Vector Page" should generally be used. You may need to use the SRecCvt program. Click Help for details. STD and Demo version can access up to 64K of expanded memory. PRO version has no			
OK Cancel Set As Default Load Default	<u>H</u> elp		

Scroll up or down to select 912B32 as shown.

Select 912B32.

Compiler Options	X			
Paths Compiler Target				
Device Configuration 912832 Memory Addresses Program Memory Data Memory Stack Pointer OxCOO	PRINTF Version Image: Small (int only, no modifier) Image: Image: Small (int only, no modifiers) Image: Ima			
For Expanded Memory, "Linear S2" and "Map Vector Page" should generally be used. You may need to use the SRecCvt program. Click Help for details. STD and Demo version can access up to 64K of expanded memory. PRO version has no OK Cancel Set As Default Load Default Help				

Device Configuration:

Program Memory: **0x8000** Data Memory: **0x0800** Stack Pointer: **0x0C00**

The program code is allocated to start from 0x8000. The internal RAM is to start from 0x0800 and the stack is to start from 0x0C00 and work downward.

On the compiler tab there are several choices of S-record output as shown.

Compiler Options	×
Paths Compiler Target	
Strict ANSI C Checkings	
Accept Extensions (C++ comments, binary constants)	
int size enum (for backward compatibility)	
Macro Define(s): Undefine(s):	
Output Format Motorola S19	
NOTE: Debug information for structure	
members is only generated by the PRO version	
Execute Command After Successful Build:	
OK Cancel Set As Default Load Default <u>H</u> elp	1

Select which one that suits you.

Compiler Options			
Paths Compiler Target			
Strict ANSI C Checkings			
 Accept Extensions (C++ comments, binary constants) 			
🔲 int size enum (for backward compatibility)			
Macro Define(s): Undefine(s):			
Output Format Motorola S19			
Motorola S19 S19 with Source Level Debugging S19 with ASM/Source Level Debugging Intel HEX			
members is only generated by the PRO version			
Execute Command After Successful Build:			
OK Cancel Set As Default Load Default <u>H</u> elp			

Starting a new Project:

Once the compiler options are setup, a new project can be created. Click Project menu – New.

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	Open Open All Files Close All Files	Ctrl+F11	Est.	roject Browser
	Reopen	•		
	Make Project Rebuild All	F9 Shift+F9		
	Add File(s) Add Topmost Opened File Remove Selected File(s)	Shift+F11		
	Options Manual Sort Browser Window			
	Close Save As			
	[No Open File]		[No Open Project]	\$19

The ICC12 will prompt to save the new project. The user should decide whether to create a new directory to save the new project. In this example a new directory called *Test* is created and the file is saved as file *test.prj*.

Save New Pro	oject As	<u>?</u> ×
Save in: 🕯	Local Disk (C:) 💽 🗢 🖆 🎬 🕇	
🚞 Temp	Cina usr	
🚞 Temp1	🚞 WINDOWS	
Comp2	🚞 WUTemp	
Contemp 3	Test	
Cemp4		
Temp5		
File name:	Оре	n
Save as type:	Project Files (*.prj)	;el

Type the filename as *test.prj* and click on the Save button.

Save New Pro	ject As	<u>?</u> ×
Save in: 🗀	Test 🔽 🗢 🛍 🗰 🕇	
File name:	test.pr Save	8
Save as type:	Project Files (*.prj)	el

Note that the project window has changed to add Files, Headers and Documents.

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File Edit Search	View Project RCS Tools Terminal Help		
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			Project Browser
	[No Open File]	C:\Test\test.prj	S19

Creating a new file to the project:

To add files to the project, click on the File menu – new as shown.



Note that ICC12 created an untitled file. Save the file as BlinkLED.C.



ICC12 will open an explorer window to help save the file. Type BlinkLED.c then press the save button.

Save File As			<u>?</u> ×
Save in: 🔀	Test 💌 🗲 🖻	D 💣 🎟 -	
, File name:	BlinkLED.c	Sav	•
Course have			
Save as type:	Source Files (".c; ".s)	Lanc	ei

Note that ICC12 has renamed the file to BlinkLED.c.

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BlinkLED.c			Project Browser
1:1	C:\Test\BlinkLED.c	C:\Test\test.prj	\$19

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BlinkLED.c	Open Open All Files Close All Files	Ctrl+F11	Project Browser	
	Close Ail File(S) Reopen Make Project Rebuild All Add File(S) Add Topmost Opened Remove Selected File Options Manual Sort Browser 1 Close Save As	F9 Shift+F9 File (s) Window	Headers Documents	
1: 1	C:\Test\Blin	hkLED.c	C:\Test\test.prj S19	//

To add BlinkLED.c to the Project, click on the Project menu – Add File(s)

ICC12 will open an explorer window to help and locate the file of interest.

Add Files	?	×
Look in: 隘) Test 🔽 🗲 🖻 📸 🎟 -	
BlinkLED.c		
File name:	BlinkLED.c Open	
Files of type:	Source Files (*.c, *.s, *.h) Cancel	
	Open as read-only	

Note that the right window pane has changed to include BlinkLED.c under the Files Project.

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BlinkLED.c			Project Browser
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Locate **vectors.c** and copy file to Test directory. The major reason why this must be done is because of project to project dependency. It is not good to keep editing a single **vectors.c** if other projects are using this same file. It becomes a problem to keep track of the changes made to the different projects.

To add *vectors.c* to the Project, click on the Project menu – Add File(s)

Add Files	?	×
Look in: [Test 🔽 🗢 🛍 🖬 -	
BlinkLED.c		
Vectors.c		
File name:	vectors.c Open	
Files of type:	Source Files (*.c, *.s, *.h)	
	Dpen as read-only	

Note that ICC12 has changed to include *vectors.c* It is important to note that the **vectors.c** was written for the 68HC912B32 and 812A4 MCUs. This example edits the line *#pragma abs_address:0xffd0* to *#pragma abs_address:0xf7d0*

The original vector address **0xFFD0** is changed to **0xF7D0**. This is because the FLASH Loader resides from **\$F800** to **\$FFFF**.

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vectors.c BlinkLED.c			Project Browser
<pre>* In the SCI entr * DUMMY_ENTRY, * to * SCIHandler, */ #if defined(_HC12) /* add any interru */ #pragma nonpaged_: #endif extern void _start #define DUMMY_ENT #pragma abs_addres /* change the abov */ void (*interrupt_y { /* to cast a o (void (*)() */ /* 812A4 vector if you use add one ent DUMMY_ENTRY, DUMMY_ENTRY, DUMMY_ENTRY, DUMMY_ENTRY, ENTRY *</pre>	<pre>cy, change: lot vectors in here too function _start c(void); /* entry poin RY (void (*) (void))OxFF. ss:OxdfdO //e address if your vector /ectors[]) (void) = constant, say Oxb600, un ()Oxb600 ors starts at Oxff80, b Key Wakeup H, change to cry to the beginning */ /* BDLC */ /* ATD */ /* RESERVED */ /* CCT */ CNTest/vectors.c</pre>	for HC12 paged compilation nt in crt??.s */ FF or starts elsewhere se ut most entries are not used he start address to OxffCE and /* Key Wakeup J */ /* ATD */ /* SCI 1 */ bull000_bdates00 ²⁰⁰ _dimit_cret0v200 C\TestNest.prj	TEST BlinkLED.c Vectors.c Headers Documents

Write the codes below into BlinkLED.c file. Once it is written we can then

compile/make/build the code.



```
#include "912b32.h"
void blink_delay(void);
void main()
{
       COPCTL = 0x00;
                                      //Clear COP to disable Watchdog
       DDRP = 0xFF;
       PORTP = 0xFF;
       blink_delay();
      while(1)
 {
       PORTP = 0xFF;
                                       //LED on
       blink_delay();
       PORTP = 0x00;
                                       //LED off
       blink_delay();
      }
}
void blink_delay(void)
{
int i;
      for(i=0;i<64000;i++)
      {
                                 ;
      }
```

}

Compiling/Build/Make the file:

To make the file click Project menu – make project as shown.

ImageCraft IDE for ICC12 (PROFESSIONAL)	× • •
File Edit Search View Project RCS Tools Terminal Help	
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Open Ctrl+F11	Project Browser
Open All Files	
#include "9: Close All Files	
Reopen >	
void blink (vietors.c
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Add File(s) Shift+F11	
DDRP = Add Topmost Opened File	
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PORTP = 0xFF; //LED of	a
DODTE = OWOG	
blink delev():	
) Drink_actay();	
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void blink_delay(void)	
int i;	
for (1=0;1<64000;1++)	
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*	
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Note the bottom window pane will show messages to display how the build progressed. Any errors, if any, are shown in this window. The build was without error so we can progress to erasing and programming the 912B32.

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File Edit Search View Project RCS Tools Terminal Help	
BinkLED.c	Project Browser
#include "912b32.h"	
void bilnk_delay(void);	vectors.c
	Headers
COPCTL = 0x00; //Clear COP to disable Watchdog	Documents
DDRP = OXFF	
blink_delay();	
PORTP = 0xFF; //LED on	
blink_delay();	
PORTP = UXUD; //LED OTT	
> > >	
word blink delev(word)	
int i;	
for (i=0; i<64000; i++)	
) · · · · · · · · · · · · · · · · · · ·	
icc12w -o test -LC:\icc\lib\ -btext:0x8000 -bdata:0x0800 -dinit en:0xC00 -fmote14	
Done.	
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	👼 test.prj	1 KB	EmbeddedGNU Proj	9/12/2005 1:17 PM	
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_	📼 vectors.c	2 KB	C source file	9/12/2005 1:17 PM	
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	👼 test.lk	1 KB	LK File	9/12/2005 1:17 PM	
	👼 test.lst	4 KB	list file	9/12/2005 1:17 PM	
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Note the other extraneous files are created after a make.

Using WordPad to check the content of *test.s19* file. Note that the S-records are of different lengths.

Examining S-record:

If one looks closely at the S-record one can see S1 to be of different lengths. This is atypical S-record generated by ICC12.

As stated previously, FLASH Loader occupies **\$F800** to **\$FFFF** therefore the vector address at below **\$F800**.

Note the content of the memory address at *F7FE:* is *8000*, the pseudo RESET vector.

The S-record below is the start of code. The content of address beginning at \$8000 to \$8050

S10E**8000**CF0C0016806B87CE08008EAA S110800B080027056A000820F6CE8070CD1D S111801808008E80702706180A307020F516B6 S1078026802A20FE8A S111802A790016C6FF7B0057C6FF7B00561672 S1108038804D200EC6FF7B005616804D794A S1118045005616804D20F03D34B7751B9ECCBE S111805300006C1E2007EC1EC300016C1EEC26 S10D80611E8CFA0025F2B757303DDB

Programming the Adapt912B32:

Open ICC12 terminal window by Selecting Show Terminal Window. Connect Serial cable to any available PC COM port and the other end to Adapt912B32.

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File Edit Search	View Project RCS Tools	Terminal Help		
_ <u>D</u> 🔁 🔲 🖒	🏂 👉 💼 🗣 🕰 <mark>-</mark>	Show Terminal Window		
BlinkLED.c				Project Browser
#includ	le "912b32.h"	Capture		E-IST
				E- Biski ED a
void bl	link_delay(void);			vectors.c
Voiu me	ain()			- 🕒 Headers
) co	OPCTL = 0x00;	//Clear COP to disable Watc	hdog	😋 Documents
DE)RP = OxFF;			
PC	ORTP = OxFF;			
bl	link_delay();			
with (nile(1)			
PC	ORTP = OxFF;	//LED on		
10	DRTP = 0x00.	//LED off		
b1	link delay();	// HED OIL		
)				
, i i i i i i i i i i i i i i i i i i i				
void bl	link delay(void)			
(
int i;				
I I I I	(1=0;1<64000;1++)			
i i	;			
)				
1:1	C:\Temp1\	Test\BlinkLED.c	C:\Temp1\Test\test.prj	\$19

Set the COM port parameters under Tools-Environment Options and then Terminal tab.

ImageCraft IDE for ICC12 (PROFESSIONAL)		
File Edit Search View Project RCS Tools Terminal Help		
🛅 🚰 🔲 💣 😹 💼 🕵 Environment Options		
Converting S-Record File: test.s19 S-Record File Conversion Complete Done.	Download File: C:\Asm\0 venController\V100\0v Browse Download! Open Com Port Show Editors	Project Browser
Terminal Window	C:\Test\test.prj	\$19

Select the COM of your choice, BAUD = 9600, Flow Control = None and ASCII Transfer Protocol to Wait for * (Flash). Press OK button to continue.

Environment Option	s	×
Preferences Termina	al	
COM Port COM 1 COM 2 COM 3 COM 4 Baudrate: Terminal Font	Flow Control None Hardware (CTS/RTS) Software (^S/^Q) Keep DTR Active ASCII Transfer Protocol None Line delay (ms.) 10 Wait for ^{1st} (Flash)	
OK (Cancel <u>H</u> elp	

In the middle is the *Open Com Port* button. Double check the serial Connections between Adapt912B32 and at the back of the PC. Click to connect.



Warning!: Make sure Vfp SW3 is in OFF position before powering unit. Failure to do this will damage the MCU. Move *Mode Select JB2 PAD0:PAD1 = 1:1*. Power up unit or press the RESET button if already powered up.



ImageCraft IDE for ICC12 (PROFESSIONAL)		
File Edit Search View Project RCS Tools Terminal Help		
<e>rase, (P)rogram or (L)oadEE:</e>	Download File: C:\Asm\TechArt\NE64\Adapt9S1 Browse Download	Project Browser
	Close Com Port	
	<u>Show Editors</u>	
C:\icc\bin\imakew -f test.mak iccl2w -c -IC:\icc\include\ -e -1 C:\Temp1\Test\Bi iccl2w -c -IC:\icc\include\ -e -1 C:\Temp1\Test\Va iccl2w -o test -LC:\icc\lib\ -btext:0x8000 -bdata:0: Done.	linkLED.c ectors.c x0800 -dinit_sp:0xC00 -fmots1:	
ji eminal Window	JC: Viemp i Viest Mest, prj	1513 //.

The FlashLoader allows one to Erase, Program the FLASH or EEPROM.

Erase command:

The command to erase FLASH is the letter *E* or *e* as shown. The error message *Vfp Not Present* will show up if the Vfp switch SW3 is not in the ON position. Slide the Vfp switch to ON. An *Erased* message will show for a successful erasure of FLASH as shown.



Programming:

To program select the letter **P** or **p** command as shown.



Once the programming is invoked, the MCU is now waiting to be programmed. Press the **Browse** button to help locate the **test.s19** file. Select **test.s19** then press the **open** button.



Once the correct file is selected, press the **Download** button to initiate upload to Adapt912B32. A progress Bar will indicate that the file is being transferred. After which an error box will pop up. Press **OK** button to continue.



Press the *CR or Enter* key to bring up the FLASH loader menu. Note the *Programmed* message as shown. This is to show that the FLASH was programmed successfully.



Move *Vfp switch SW3* = *OFF* and *JB2 PAD0:PAD1* = *0:0* and press the RESET button. The LED on the Adapt912B32 that is connected to PP7 will begin to blink.

This concludes the use of ICC12 with Adapt912B3260 to using the FLASH Loader.