„Cookery-book“ for the XC164CS

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Introduction

„Cookery-book“ for your first programming example for the XC164CS Step AA Starterkit-Board in 9 Steps:

Recipes

I.) Application

```
1 ... LED P9_P4 ON
2 ... LED P9_P4 OFF
3 ... LED P9_P4 blinking
your choice: _
```

XC16x Board

Power Supply

the correct Jumper Setting (please refer to the XC16Board Hardware Manual) serial cable to the notebook

II.) DAvE – program generator

- you need a installed version of the DAvE 2 CD ROM
- you need the DAvE Update for XC16x microcontrollers (XC164CS_v21.DIP)

III.) Using DAvE
microcontroller initialization for your programming example (either:)

IV.)
using the KEIL Development Tools (C/EC++ Compiler) Programming of your application (e10k) with KEIL tool chain (μVision2) (or:)

V.)
using the TASKING Development Tools (C/C++/EC++ Compiler) Programming of your application (e10t) with TASKING (Altium) tool chain (EDE)

VI.) MEMTOOL Installation
You need this Tool for the programming of the On-ChipFlash in the XC164CS.

VII.) Using MEMTOOL

- for KEIL: programming of **e10k.h86** into the OnChipFlash memory
- for TASKING: programming of **e10t.hex** into the OnChipFlash memory

VIII.) HyperTerminal – Settings
using a terminal program (settings)

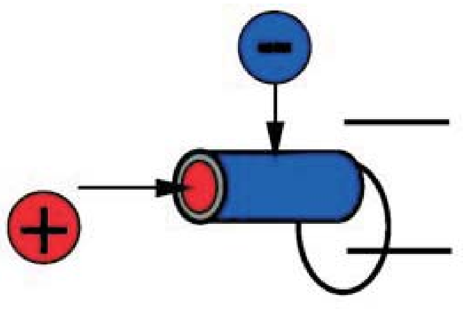
IX.) Using HyperTerminal
Screenshots of your running application

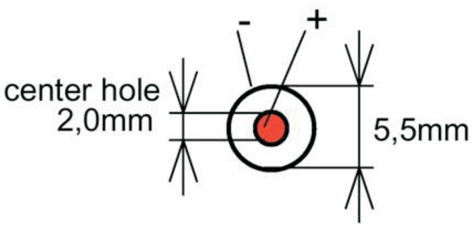
I.) XC16x Board

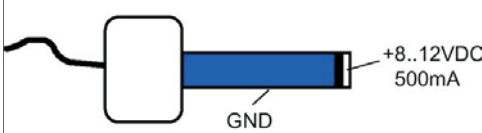
Please refer to the XC16Board Hardware Manual.

1.) Power Supply

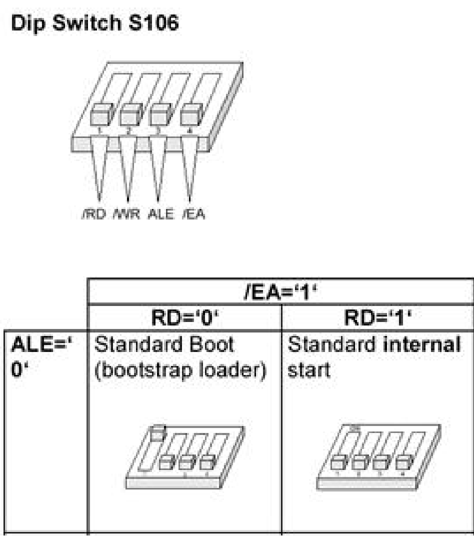
The XC16x Board requires an external power supply.







A regulated DC power supply from 9 to 12 Volts can be connected to the power connector.



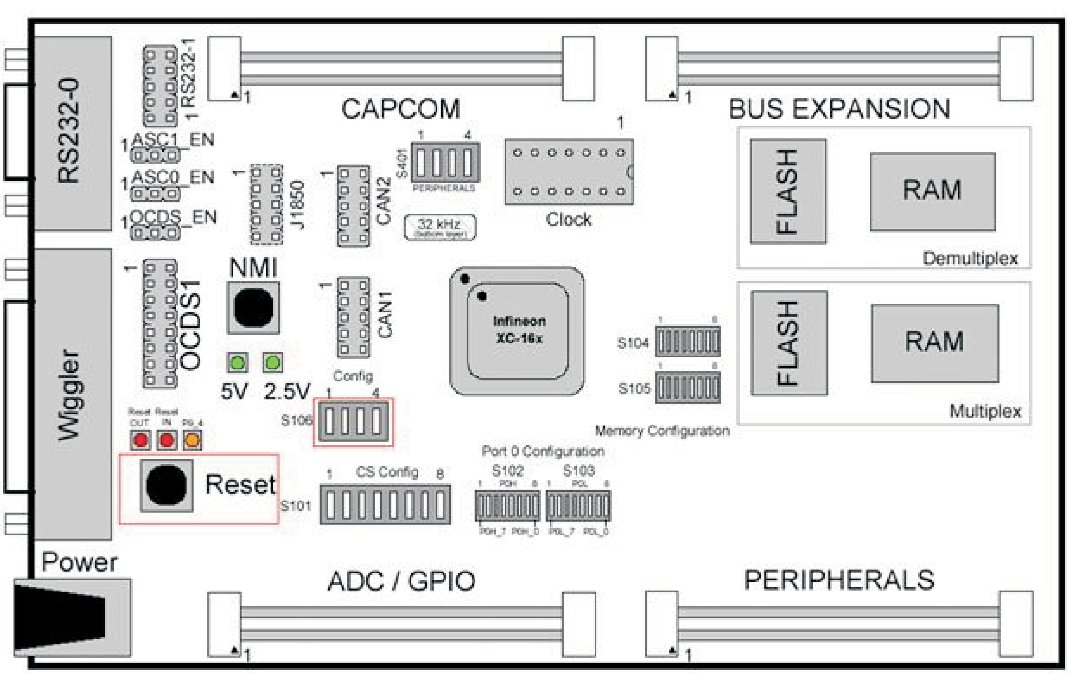
2.) Bootstrap Loader ⇔ Standard Internal Start

II.) DAvE – Update Installation for XC16x microcontrollers

1.) Copy the files **XC161CJ_v21.DIP** and **XC164CS_v21.DIP** under the installation path of DAvE (**C:\Programme\DAvE**).

2.) Start DAvE

3.)



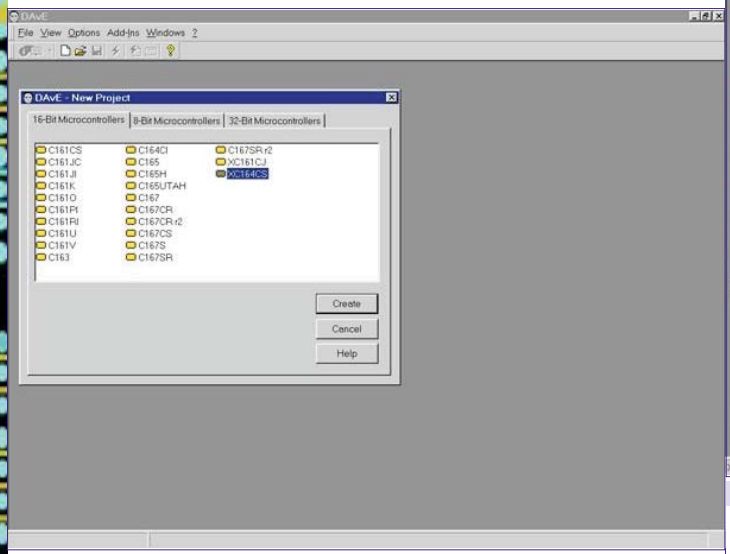
- View
- Setup Wizard
- Default: * Installation
- Forward>
- Select: * I want to install products from the DAvE's web site
- Forward>
- Select: C:\Programme\DAvE
- Forward>
- Select: Available Products
- ✓ XC161CJ
- ✓ XC164CS
- Forward>
- Install
- End

DAvE is now ready to generate code for XC161CJ and XC164CS microcontrollers.

III.) DAvE - Initialization after Power-On

1. Step: Start the programm generator DAvE and select the XC164CS microcontroller

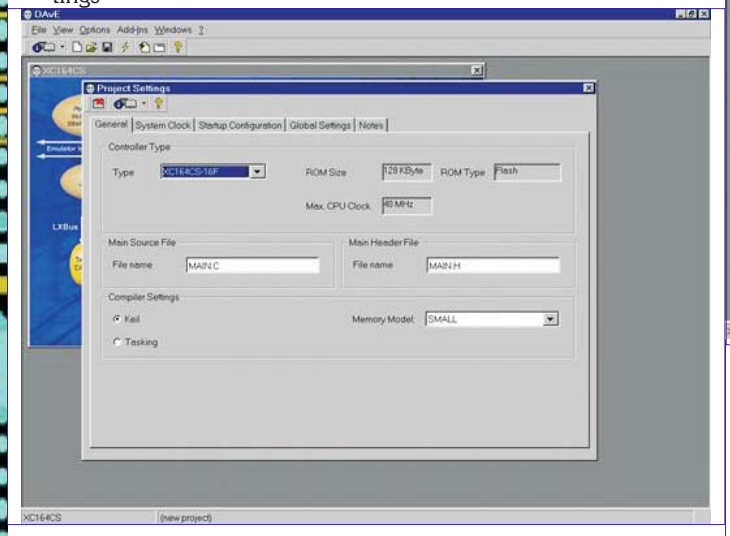
File;



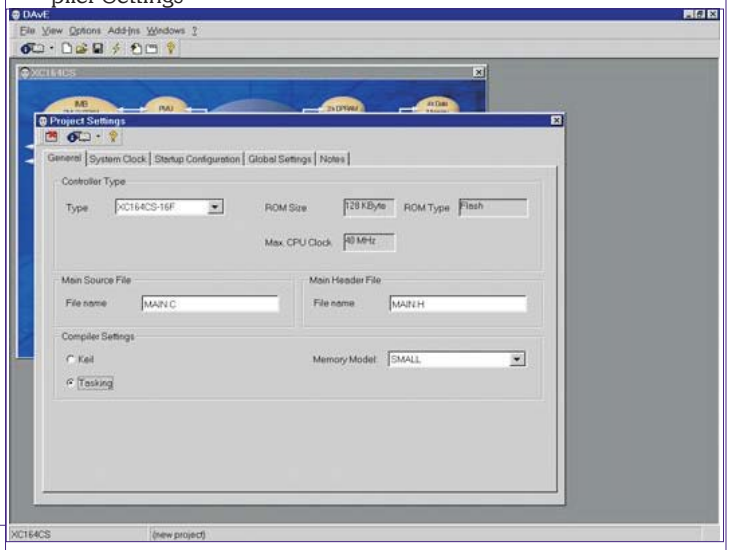
New;
16-Bit Microcontrollers;
XC164CS;
Create:

2. Step – Choose the Project Settings as you can see in the Screenshots

General: For the KEIL Compiler choose Keil in the Compiler Settings



General: For the TASKING Compiler choose Tasking in the Compiler Settings



System Clock: - do not change configuration, CPU Clock will be 20 MHz

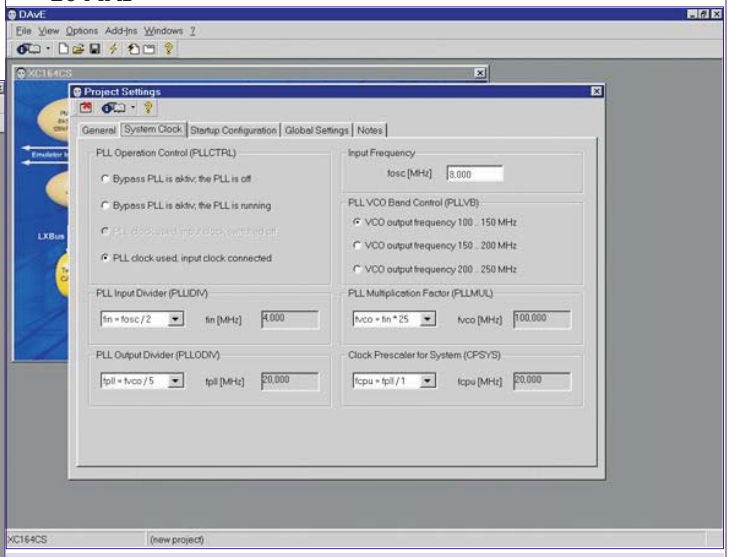
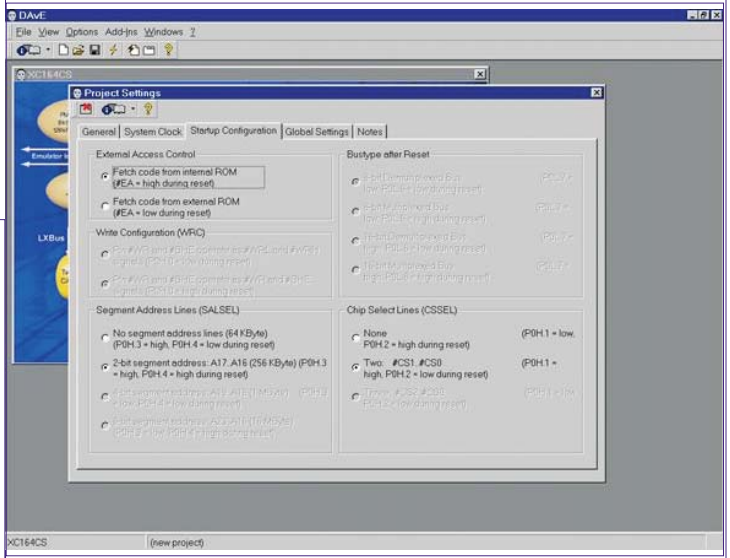
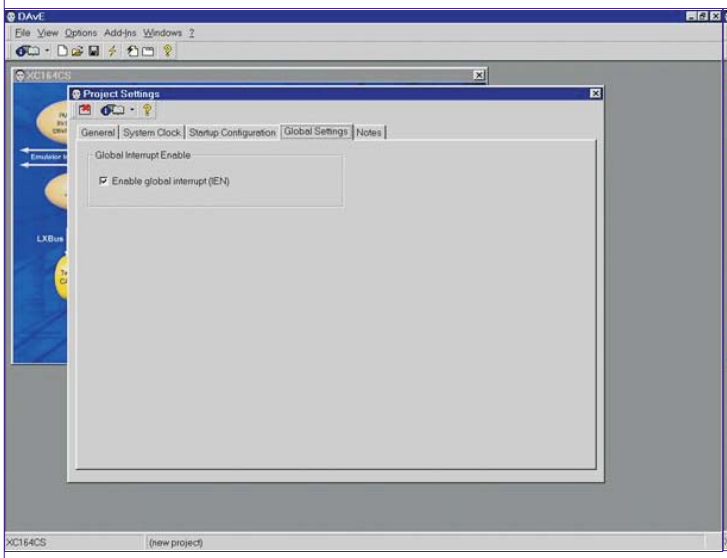


Bild 4

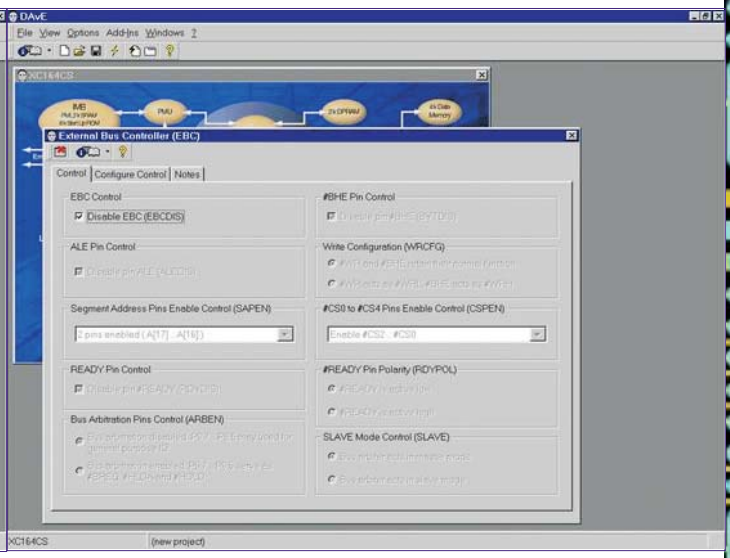
Startup Configuration: External Access Control: Select: Fetch code from internal ROM



Global Settings: do not change configuration

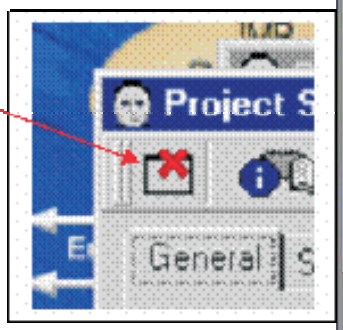


Exit this dialog now by clicking X in the close button



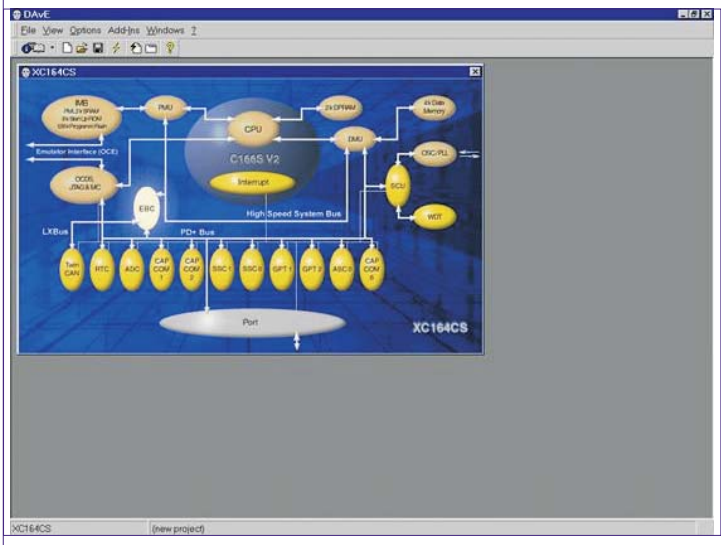
Notes: if you wish, you can insert here your comments

Exit this dialog now by clicking X in the close button:

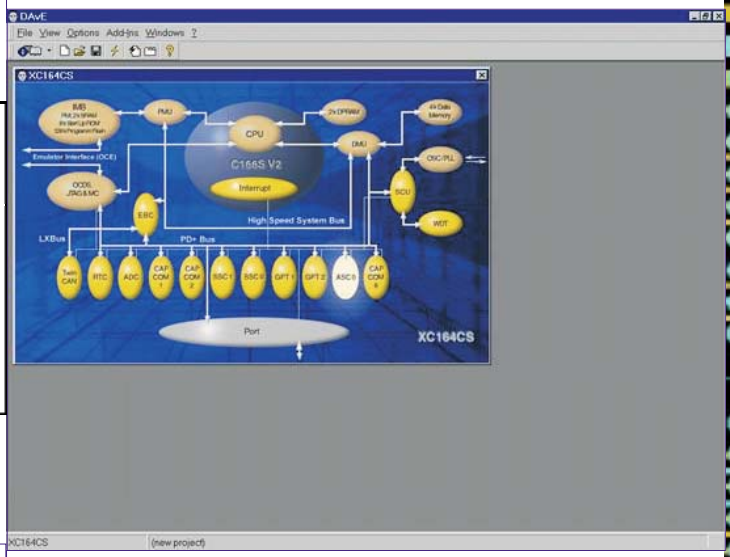


3. Step: Configuration of the EBC: (configure as you can see in the screenshots)

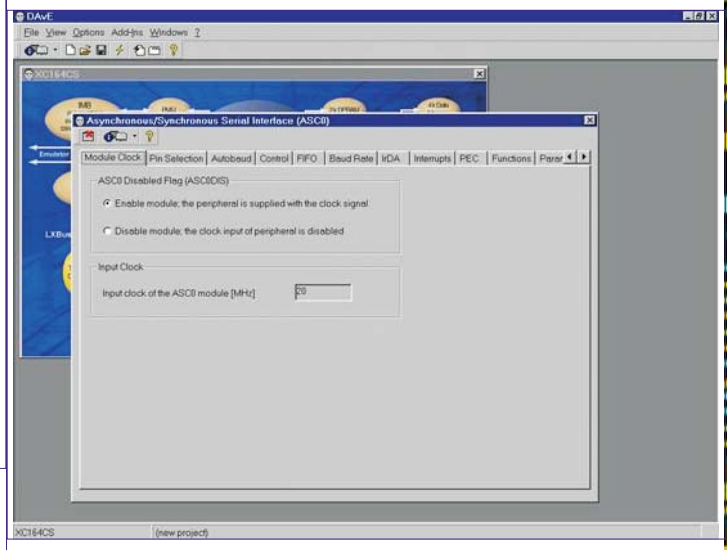
EBC: Control: click Disable EBC (EBCDIS)



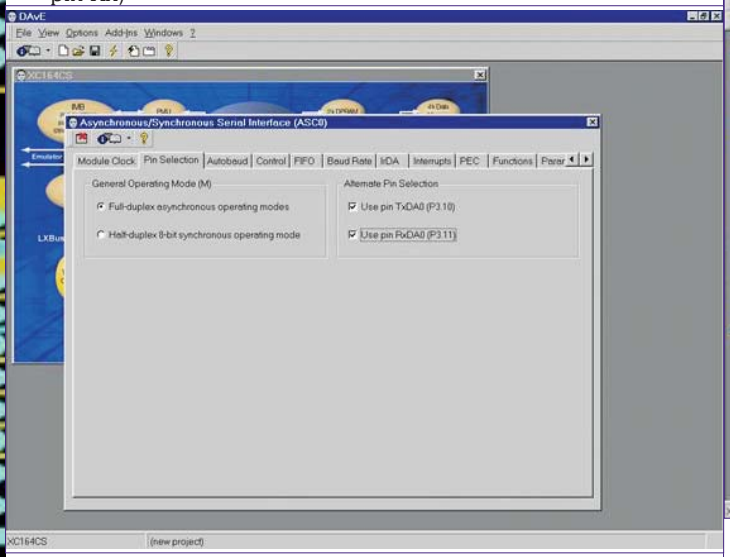
4. Step – Configuration of the ASC0



Module Clock: (do nothing)

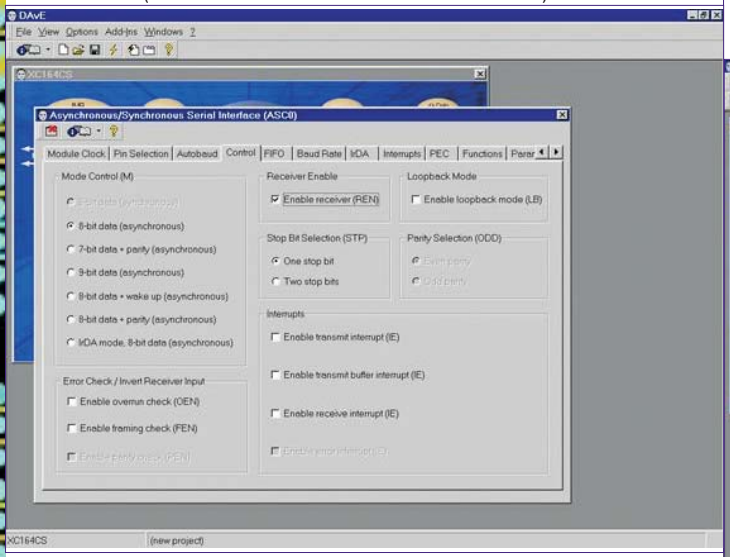


Pin Selection: (Alternate Pin Selection: click Use pin Tx, click Use pin Rx)



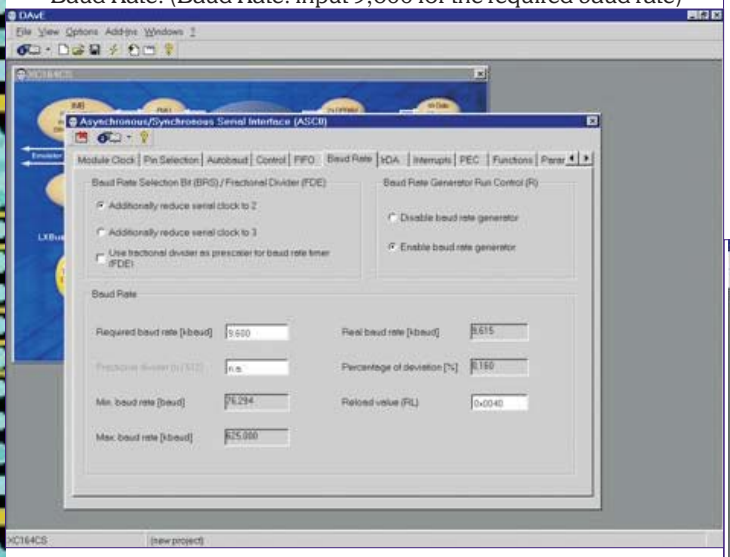
Autobaud: (do nothing)

Control: (Receiver Enable: click Enable receiver)



FIFO: (do nothing)

Baud Rate: (Baud Rate: input 9,600 for the required baud rate)

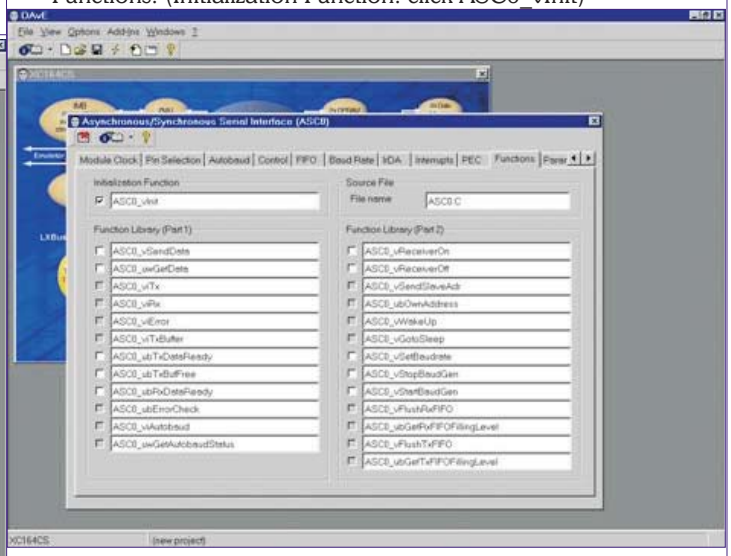


IrDA: (do nothing)

Interrupts: (do nothing)

PEC: (do nothing)

Functions: (Initialization Function: click ASC0_vInit)

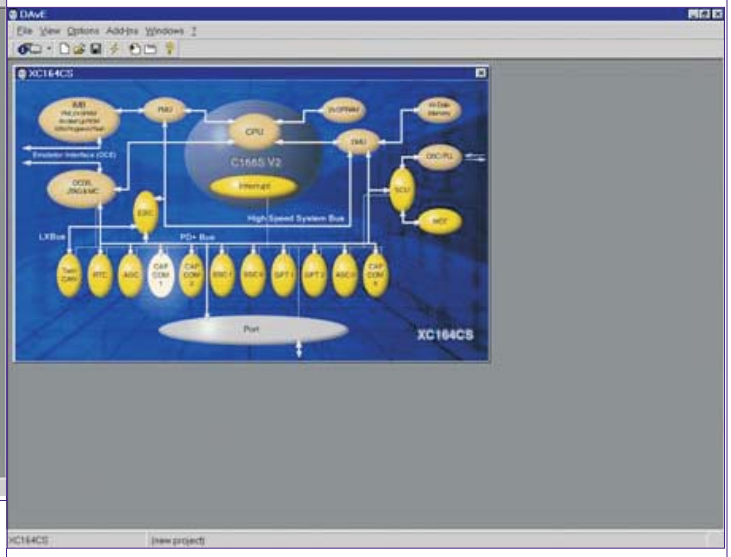


Parameters: (do nothing)

Notes: (if you wish, you can insert here your comments)

Exit this dialog now by clicking X in the close button.

5. Step: – configure Timer T0 in CAPCOM 1



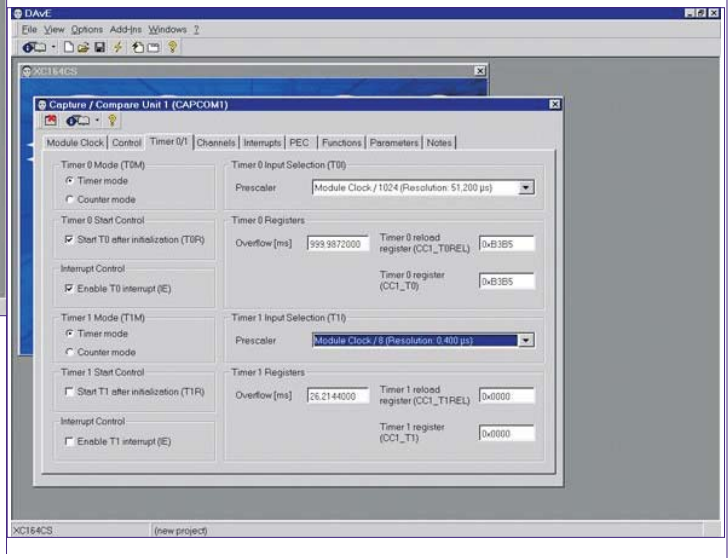
Module Clock: (do nothing)

Control: (do nothing)

Timer 0/1: (Timer 0 Start Control: click Start T0 after initialization (T0R))

Timer 0/1: (Interrupt Control click Enable T0 interrupt (IE))

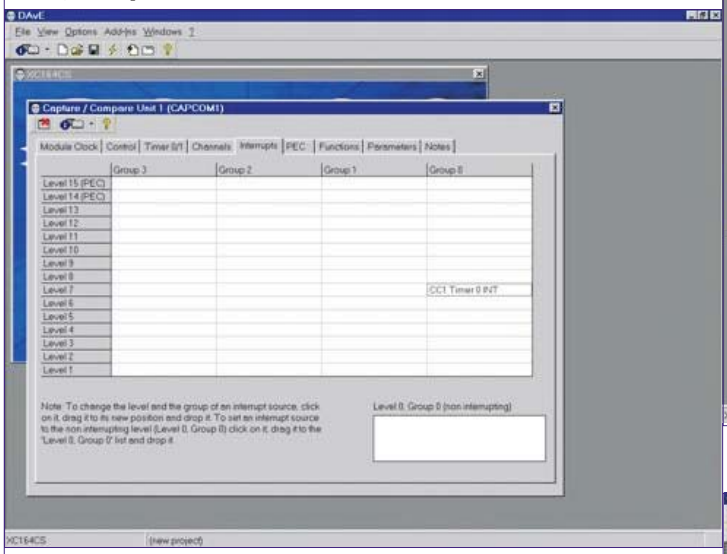
Timer 0/1: (Timer 0 Input Selection (T0I): Prescaler: choose Module Clock/1024)



Timer 0/1: (Timer 0 Registers: Timer 0 reload register: input 0xB3B5 for 1 second)

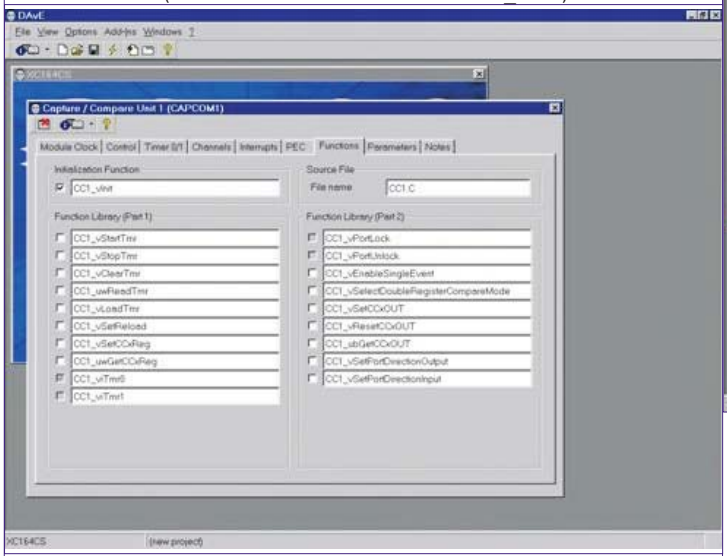
Channels: (do nothing)

Interrupts: (drag and drop the CC1 Timer 0 INT to Interrupt Level 7, Group 0)



PEC: (do nothing)

Functions: (Initialization Function: click CC1_vInit)

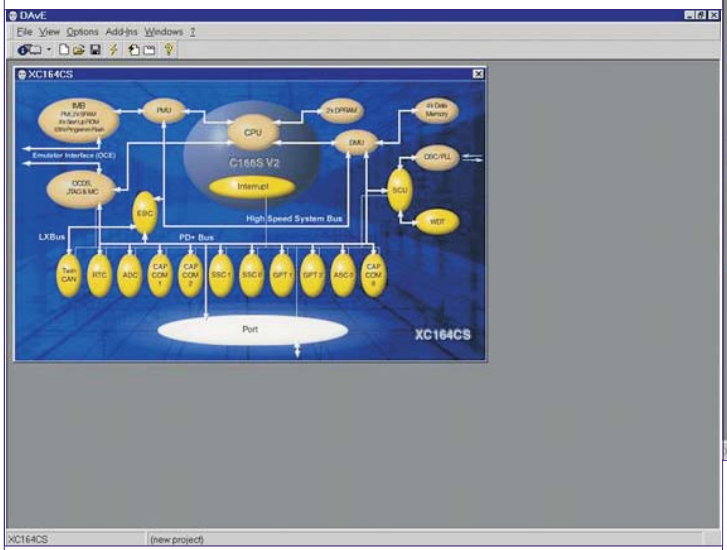


Parameters: (do nothing)

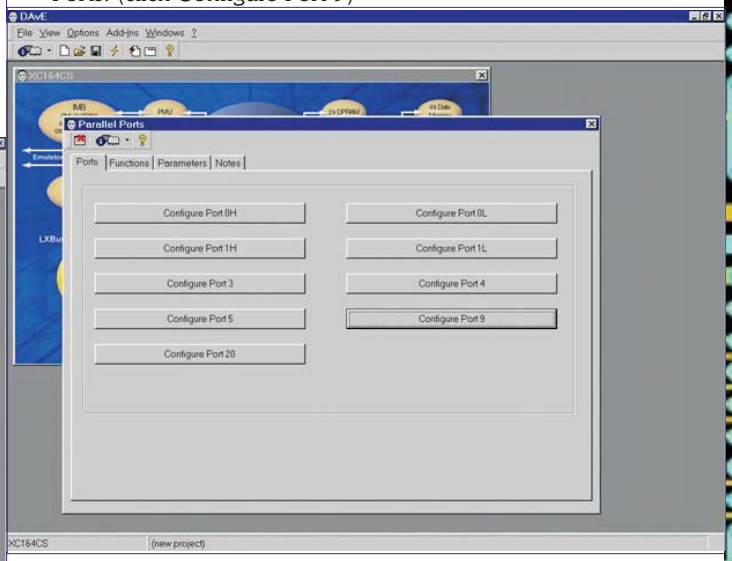
Notes: (if you wish, you can insert here your comments)

Exit this dialog now by clicking X in the close button.

6. Step: – configure Port 9 Pin 4 to Output

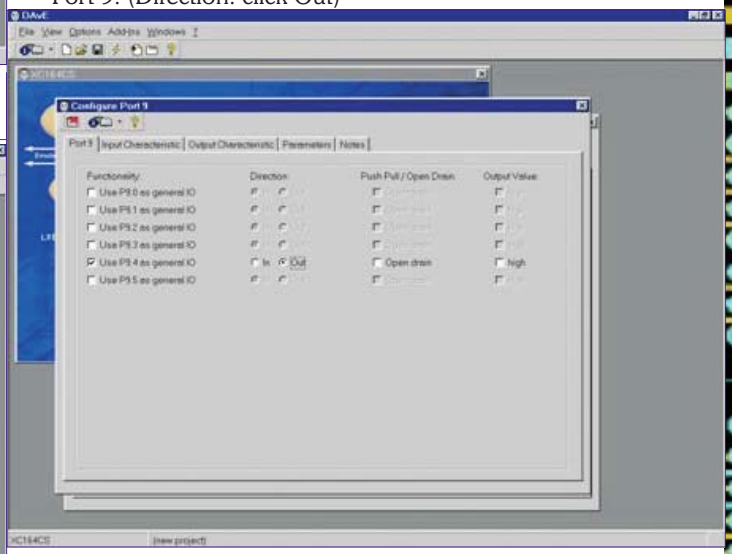


Ports: (click Configure Port 9)



Port 9: (Functionality: click Use P9.4 as general IO)

Port 9: (Direction: click Out)



Input Characteristic: (do nothing)

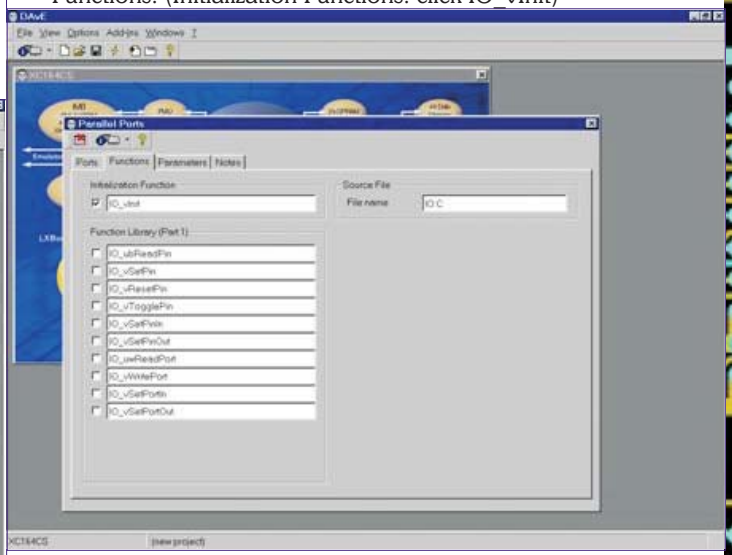
Output Characteristic: (do nothing)

Parameters: (do nothing)

Notes: (if you wish, you can insert here your comments)

Exit this dialog now by clicking X in the close button.

Functions: (Initialization Functions: click IO_vInit)



Parameters: (do nothing)

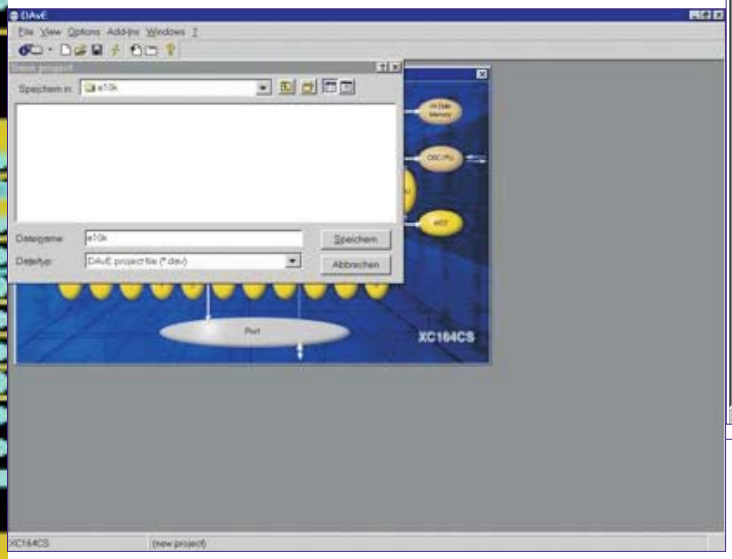
Notes: (if you wish, you can insert here your comments)

Exit this dialog now by clicking X in the close button.

7. Step – Save the project

File Save

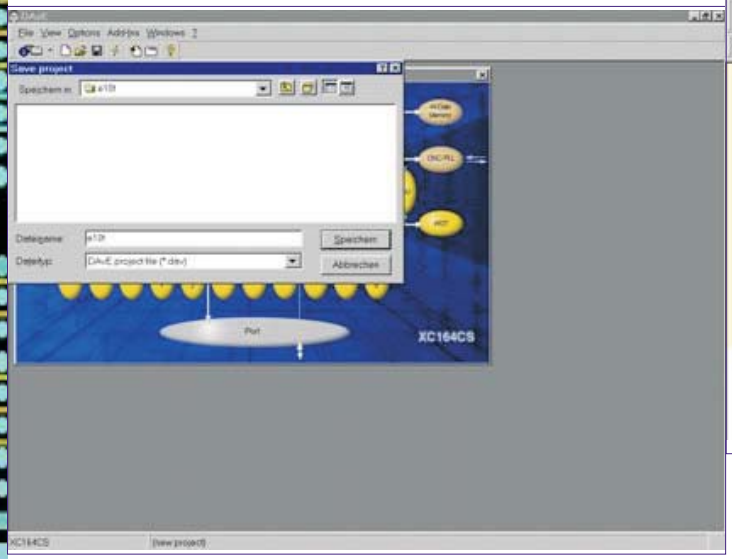
For the KEIL Development Tools



Location: C:\e10k

Filename: e10k

For the TASKING Development Tools



Location: C:\e10t

Filename: e10t

Save

8. Step – Generate Code

File

Generate Code or 

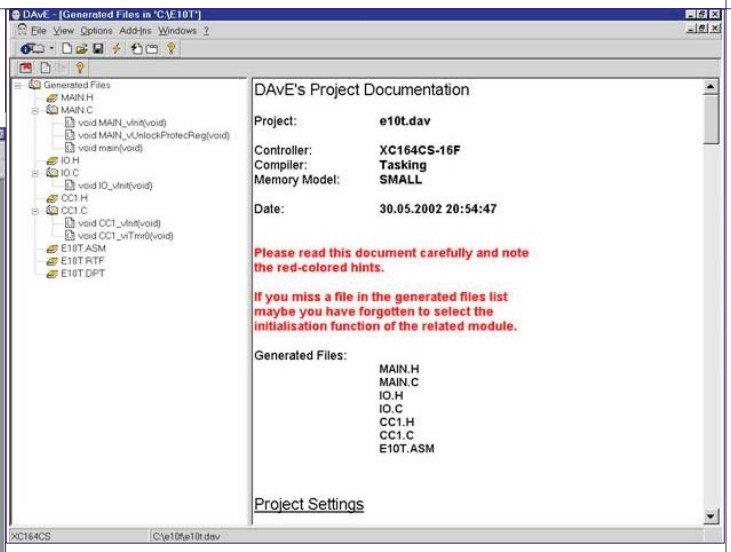
DAvE will show you all the files he has generated (File Viewer opens automatically).

File

Exit

Save changes?

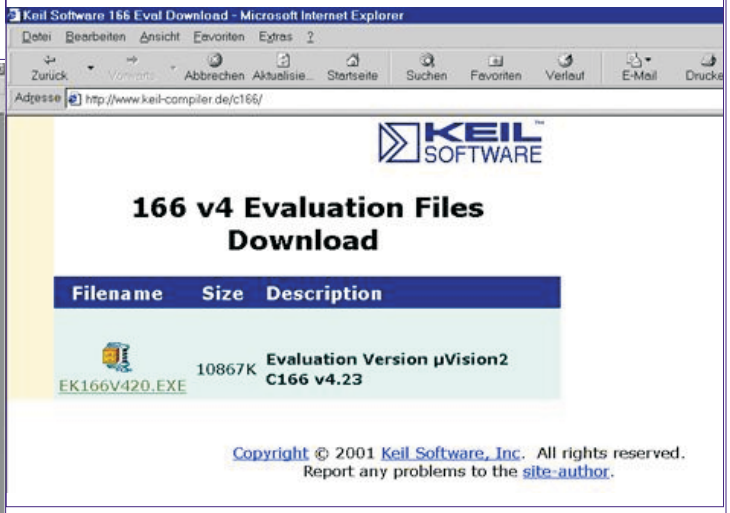
click Yes



IV.) Using of the KEIL - µVision 2 Development Tools

1. Step: – Install the Tool chain - here you can download the Keil Development Tools

http://www.keil-compiler.de/c166/



Execute ek166v423.exe and choose C:\KeilDemo for the installation path

2. Step: Start Keil µVision and open the DAvE Project

If you see an open project – close it: Project - Close Project

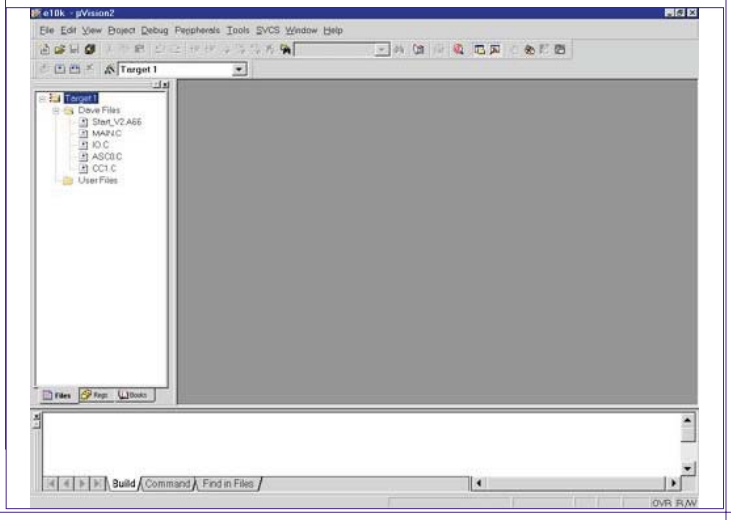
Project - Open Project

choose: C:\e10k

choose: File type: Dave Project Files

choose: e10k.dpt

Open



3. Step: include the DAvE Header Files

mouse position: Files window: Dave Files: click right mouse button

Add Files to Group ´Dave Files‘

input filename *.h

mark Asc0.h Cc1.h Io.h Main.h

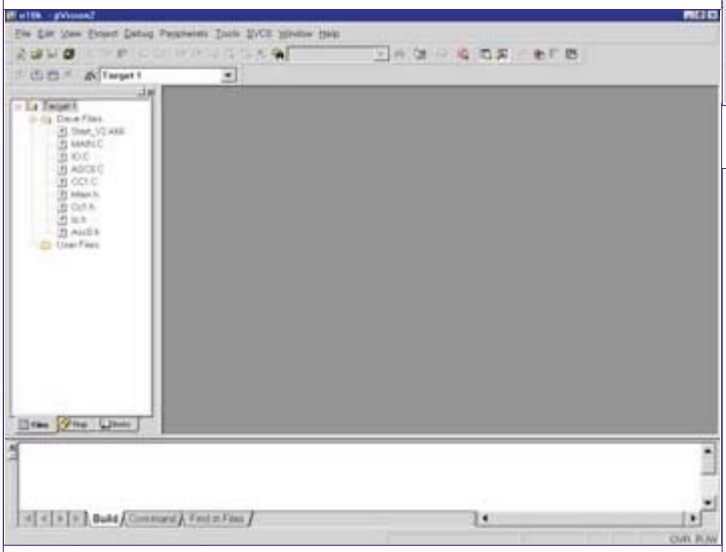
Add

do this 4 times:

Type: choose: Custom file

OK

Close



4. Step: include the ConfPLL+Syscon3.c File

mouse position: Files window: User Files: click right mouse button

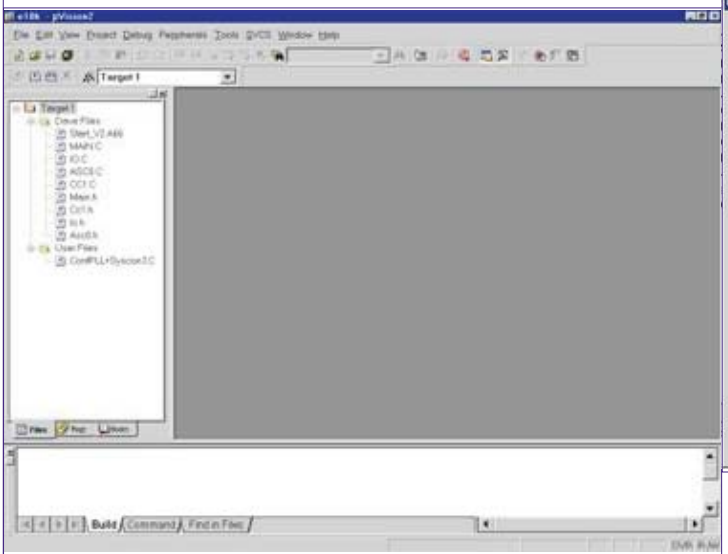
Add Files to Group ´User Files‘

input filename *.c

mark ConfPLL+Syscon3.c

Add

Close



5. Step: Configure the Options for the Header Files:

right mouse button click Main.h

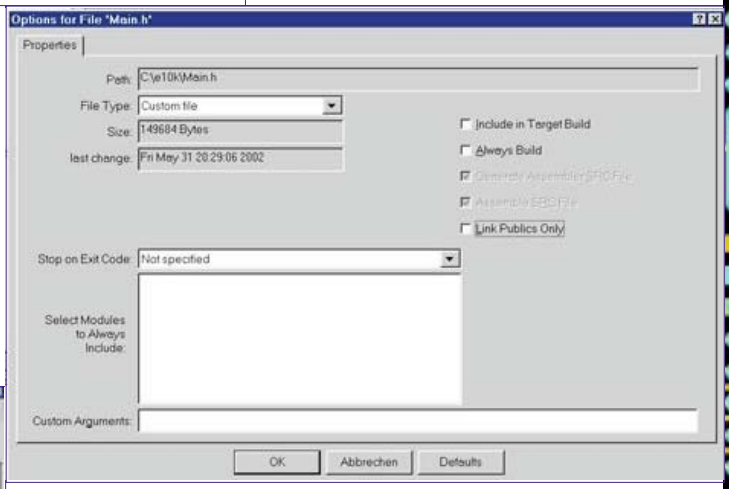
Options for File Main.h

click ? Include in Target Build

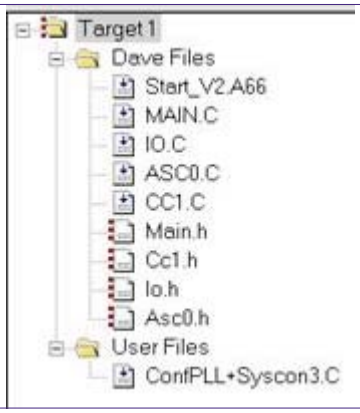
click ? Always Build

click ? Link Publics Only

OK



repeat this for the header files Cc1.h Io.h Asc0.h



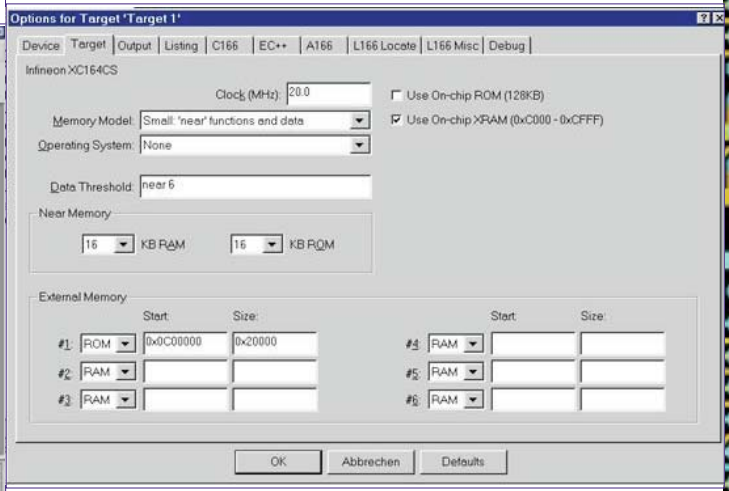
6. Step: Configure Compiler, Assembler, Linker, Locater, Hex-Converter and Build – Control

right mouse button (Files window) click Target1

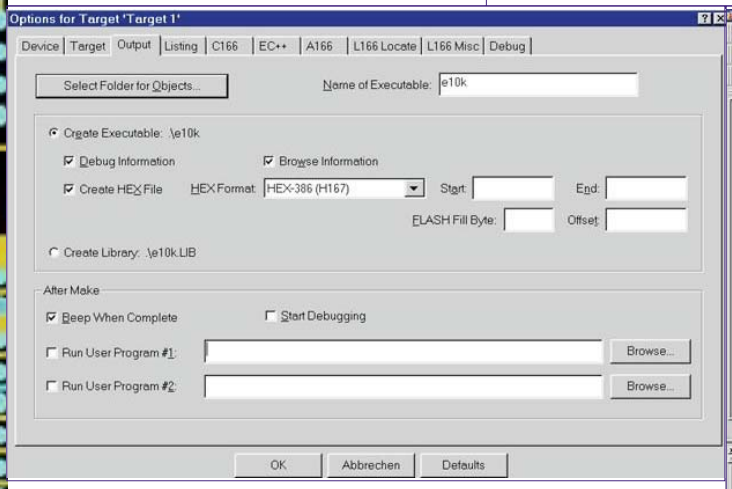
Options for Target ´Target1‘

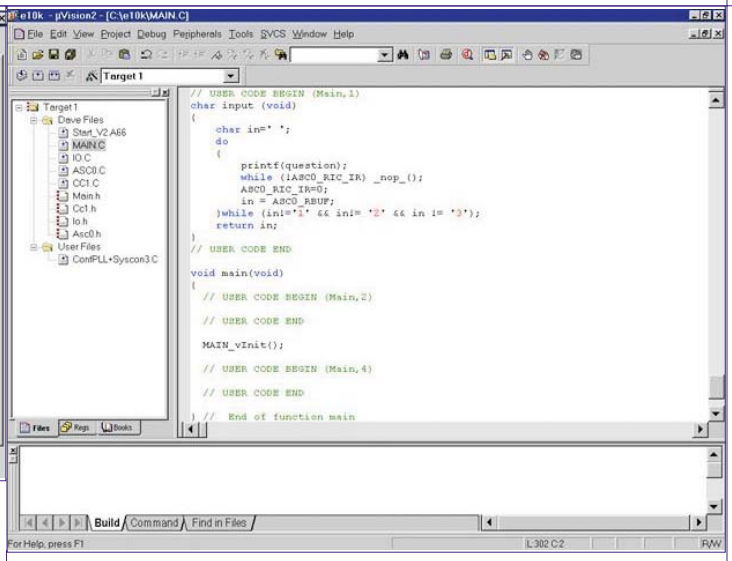
click ? Use On-chip XRAM

External Memory #1: select ROM, insert Start: 0x0C00000, insert Size: 0x20000

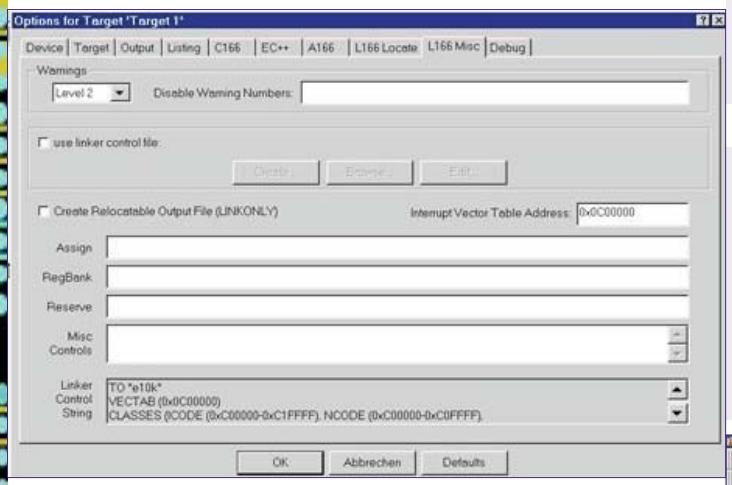


Output: click ? Create HEX File, choose HEX Format HEX-386(H167)





Listing (do nothing)
C166 (do nothing)
EC++ (do nothing)
A166 (do nothing)
L166 Locate (do nothing)

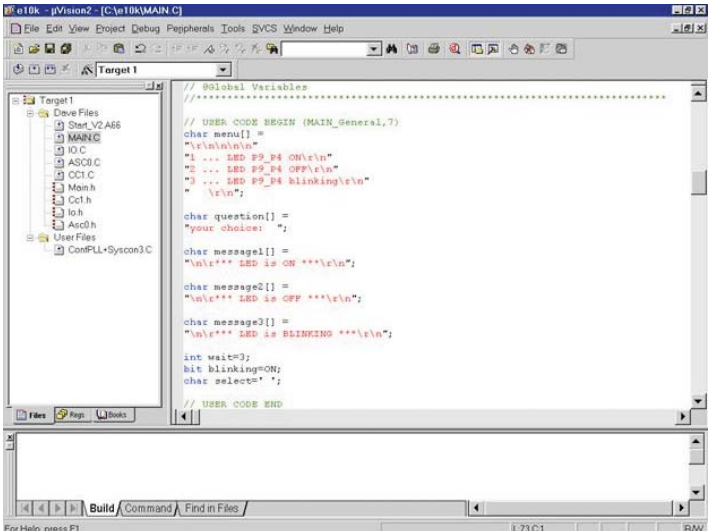


L166 Misc: insert Interrupt Vector Table Address 0x0C00000
Debug (do nothing)
OK

7. Step: Insert your application specific program

double click main.c and insert Global Variables

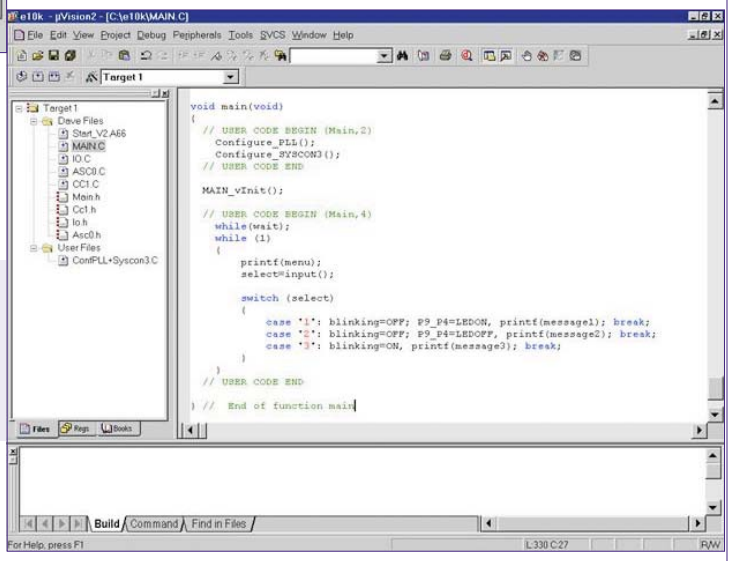
```
char menu[] =
"\r\n\n\n\n"
"1 ... LED P9_P4 ON\r\n"
"2 ... LED P9_P4 OFF\r\n"
"3 ... LED P9_P4 blinking\r\n"
" \r\n";
char question[] =
"your choice: ";
```




```
char message1[] =
"\n\r*** LED is ON ***\r\n";
char message2[] =
"\n\r*** LED is OFF ***\r\n";
char message3[] =
"\n\r*** LED is BLINKING ***\r\n";
int wait=3;
bit blinking=ON;
char select=' ';
```

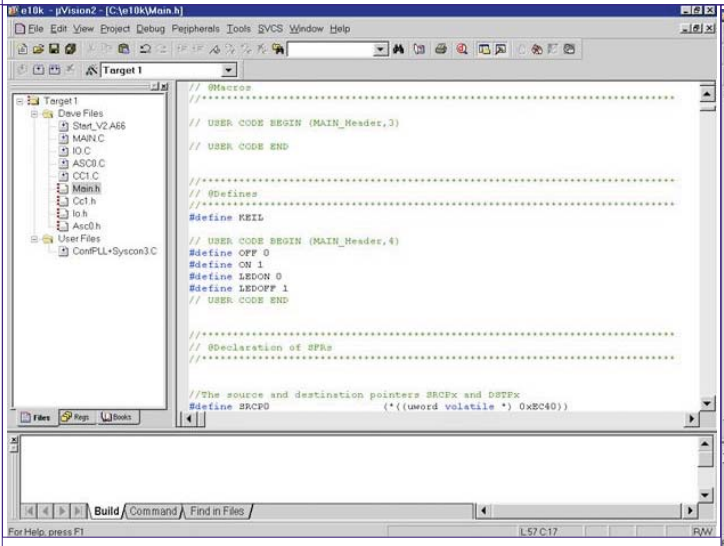
insert the function input()

```
char input (void)
{
 char in=' ';
 do
 {
 printf(question);
 while (!ASC0_RIC_IR) _nop_();
 ASC0_RIC_IR=0;
 in = ASC0_RBUF;
 }while (in!='1' && in!= '2' && in != '3');
 return in;
}
```



insert the following code in the main() function

```
 Configure_PLL();
 Configure_SYSCON3();
 while(wait);
 while (1)
 {
   printf(menu);
   select=input();
   switch (select)
   {
   case '1': blinking=OFF; P9_P4=LEDON, printf(message1); break;
   case '2': blinking=OFF; P9_P4=LEDOFF, printf(message2); break;
   case '3': blinking=ON, printf(message3); break;
   }
 }
```



double click main.h and insert the following Defines

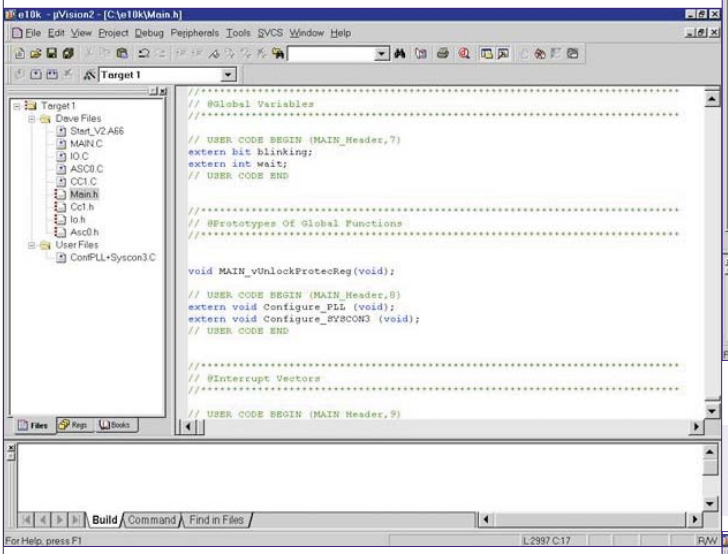
```
#define OFF 0
#define ON 1
#define LEDON 0
#define LEDOFF 1
```

insert Global Variables

```
extern bit blinking;
extern int wait;
```

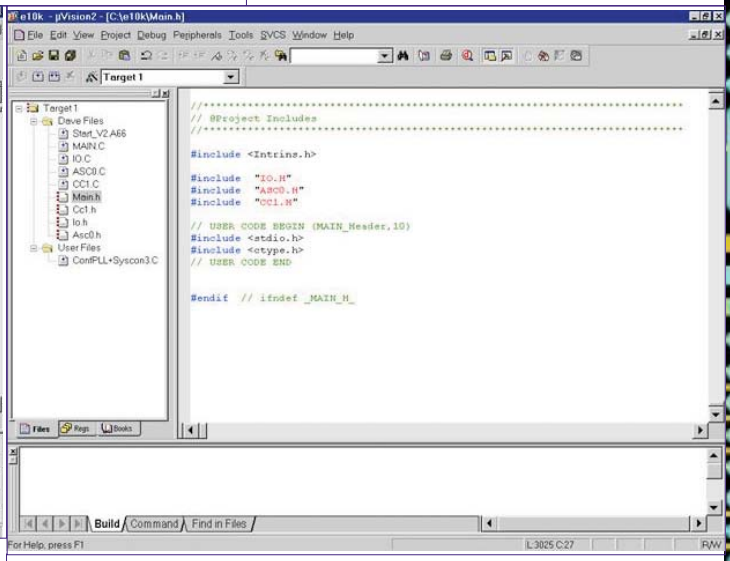
insert Prototypes

```
extern void Configure_PLL (void);
extern void Configure_SYSCON3 (void);
```



insert Includes (for printf())

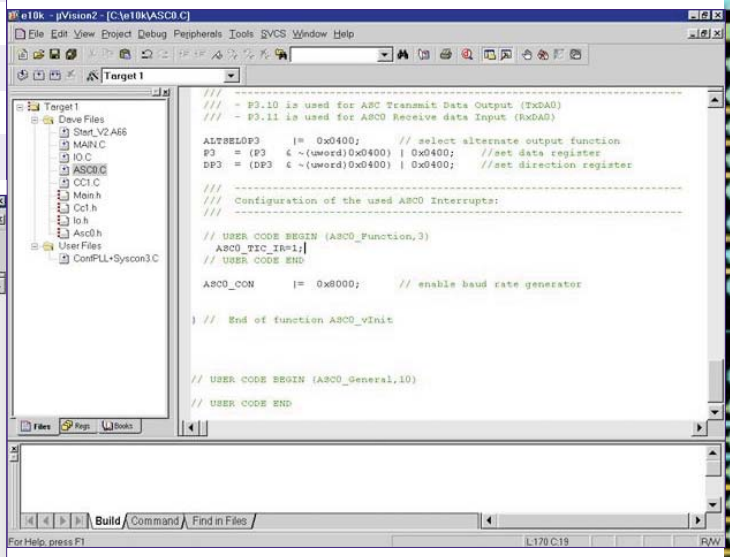
```
#include <stdio.h>
#include <ctype.h>
```



double click ASC0.C

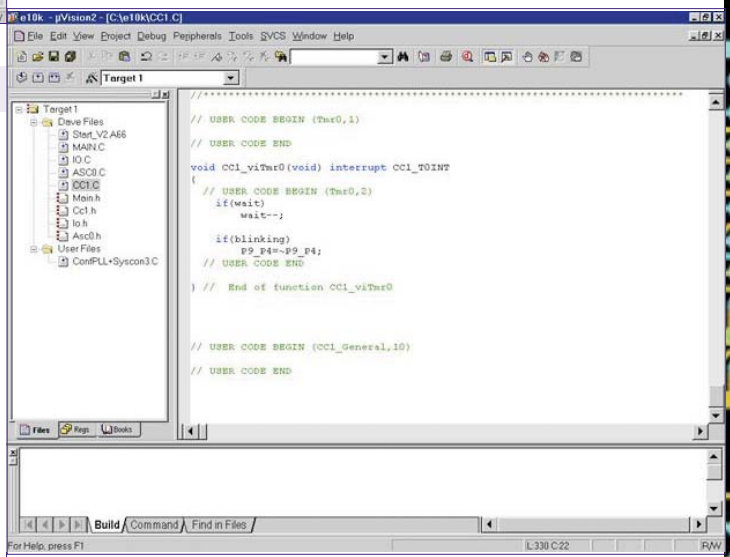
insert in the ASC0_vInit() function: (to start printf())

```
ASC0_TIC_IR=1;
```



double click CC1.C
insert code for T0 interrupt service routine

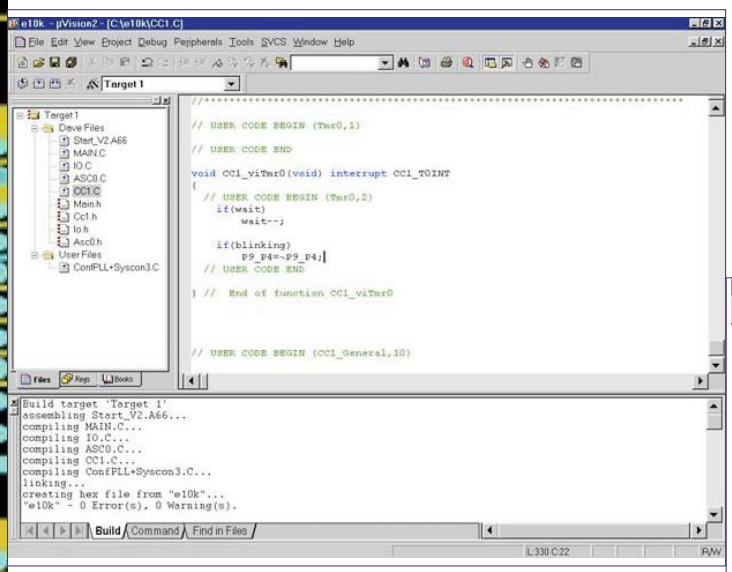
```
if(wait)
  wait--;
if(blinking)
  P9_P4=~P9_P4;
```



8. Step: Generate your application program – generate the hex file for Memtool:

Project

Rebuild all target files



Now you can close your project and µVision 2:

Project

Close Project

File

Exit

Now you can program the hex output file e10k.H86 with Memtool in the OnChipFlash (Program Memory) of the XC164CS microcontroller.

V.) Using of the TASKING - EDE Development Tools

1. Step: – Install the Tool chain - here you can download the Tasking Development Tools:

http://www.tasking.com/products/C166-ST10/demo_req.html

Download dc166-75p-zip

Extract with WinZip

Execute setup.exe and choose C:\dc166 for the installation path

2. Step: Start Tasking EDE, select directory and include the DAvE Files

If you see an open project – close it: Project – Project Space - Close

File

Change Directory

choose C:\e10t

OK

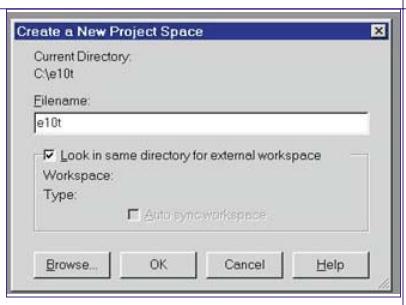
Project

Project Space

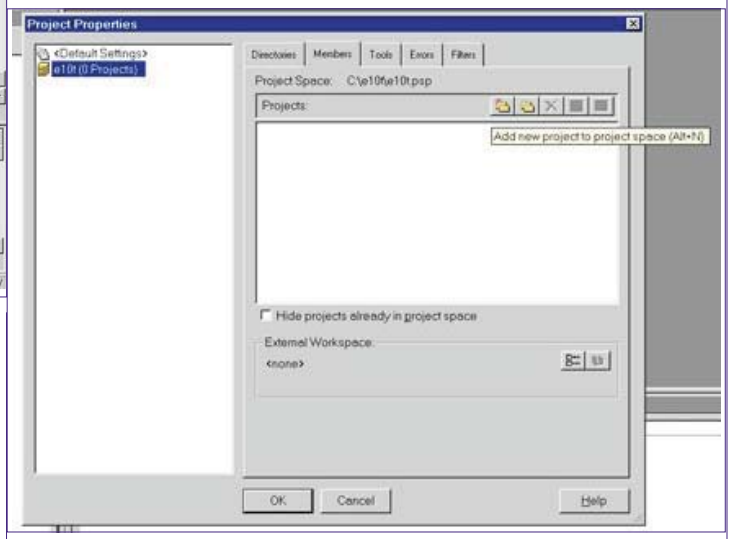
New

choose e10t

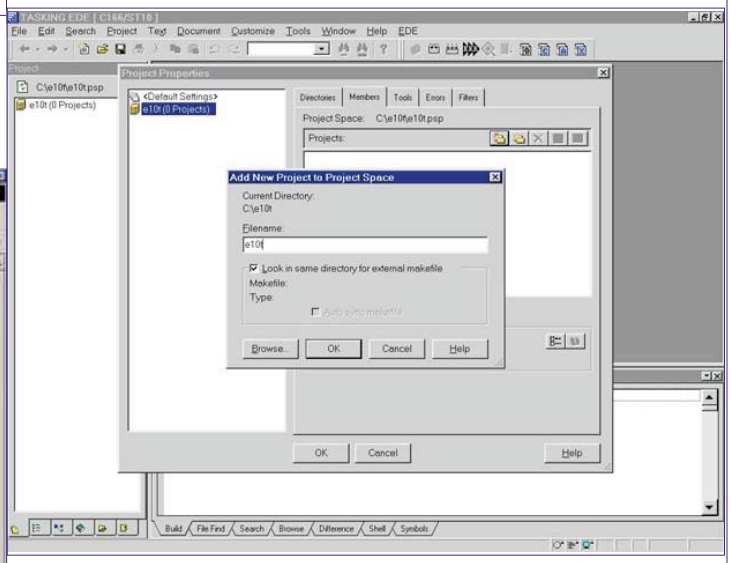
OK



Add new project to project space

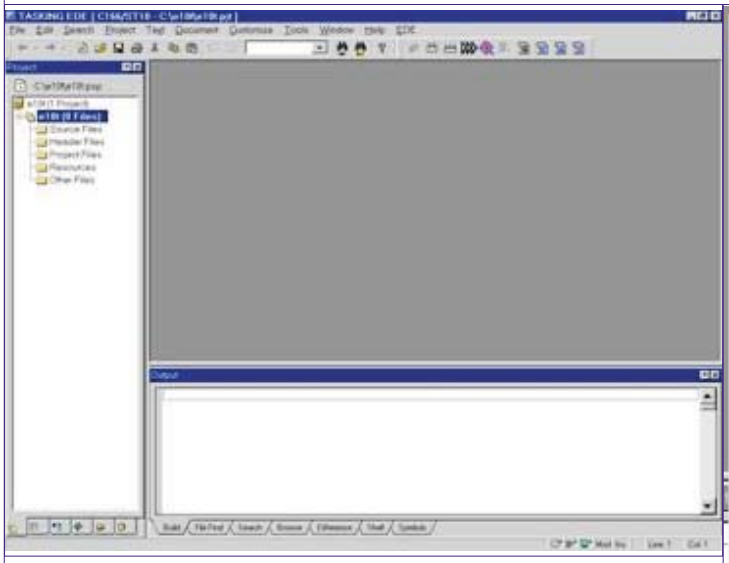


Filename: insert e10t

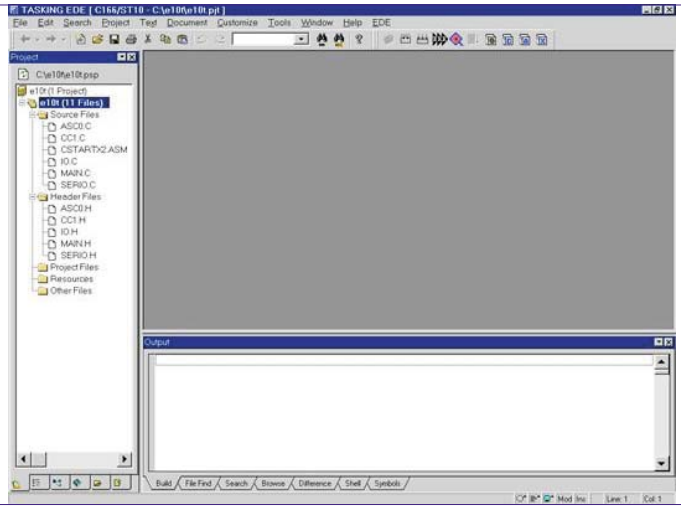


OK

OK

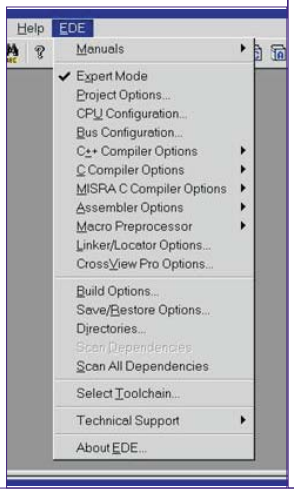


(File View window) right mouse button click e10t (0Files)
Add Existing Files
Browse
insert File-name (Dateiname) *.asm
select Cstartx2.asm
Open (Öffnen)
OK
repeat this with:
*.c (Asc0.c CC1.c Io.c Main.c Serio.c)
and
*.h (Asc0.h CC1.h Io.h Main.h Serio.h)

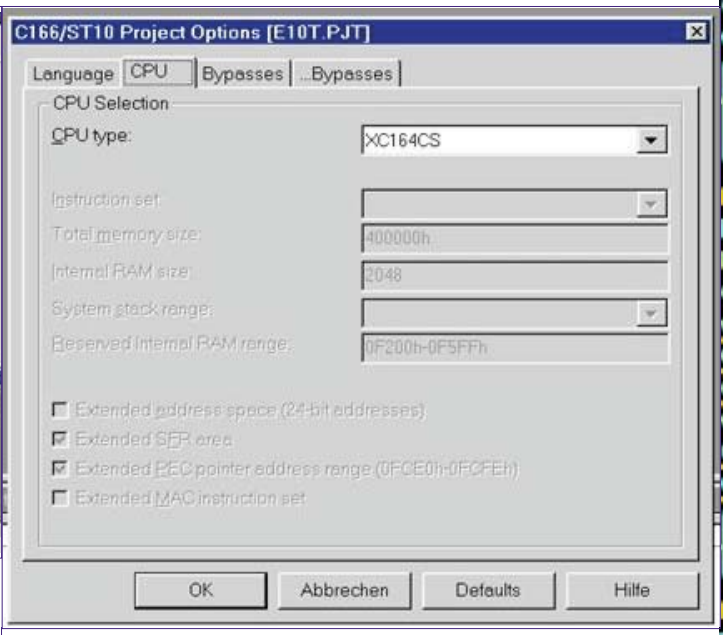


3. Step: Configure Compiler, Assembler, Linker, Locater, Hex-Converter and Build – Control

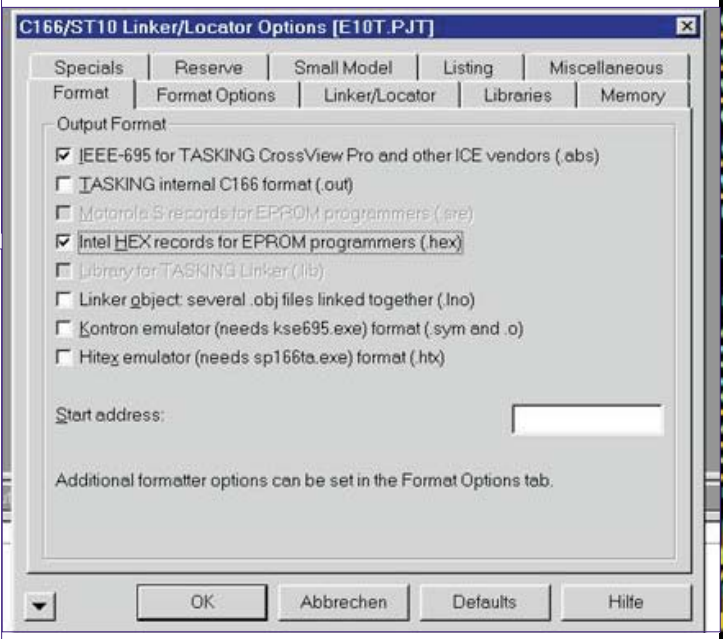
click EDE
✓ Expert Mode



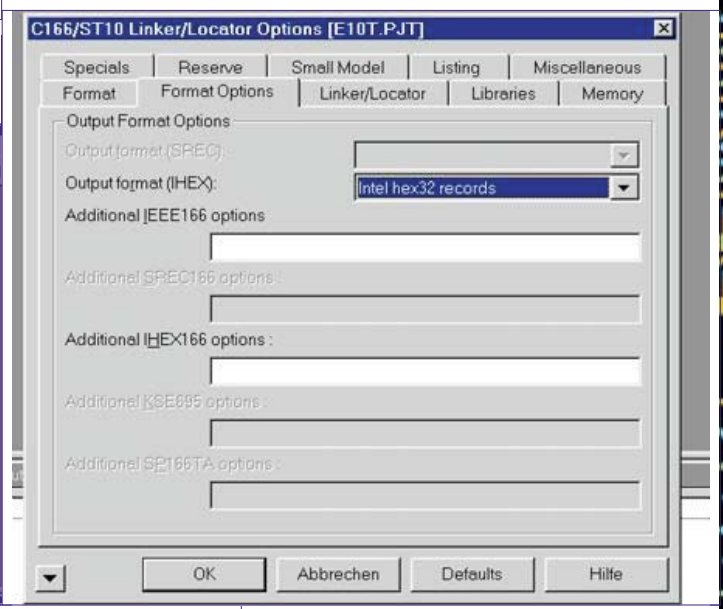
EDE - Project Options - CPU; CPU type: choose XC164CS OK



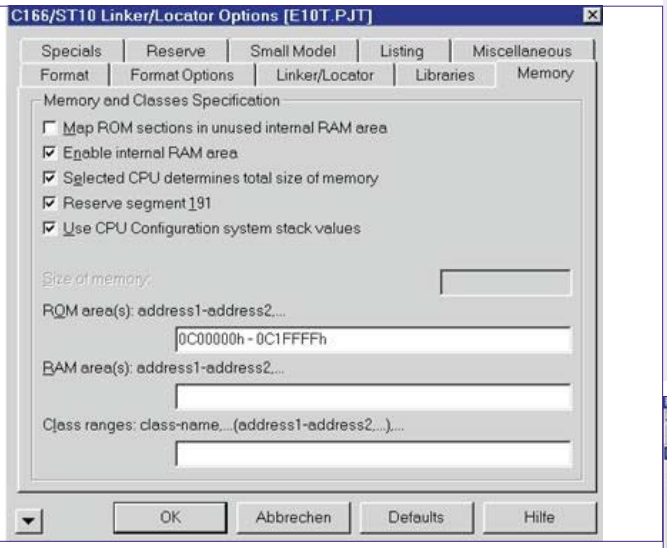
EDE - Linker/Locater Options - Format
✓ Intel HEX records for EPROM programmers (.hex)



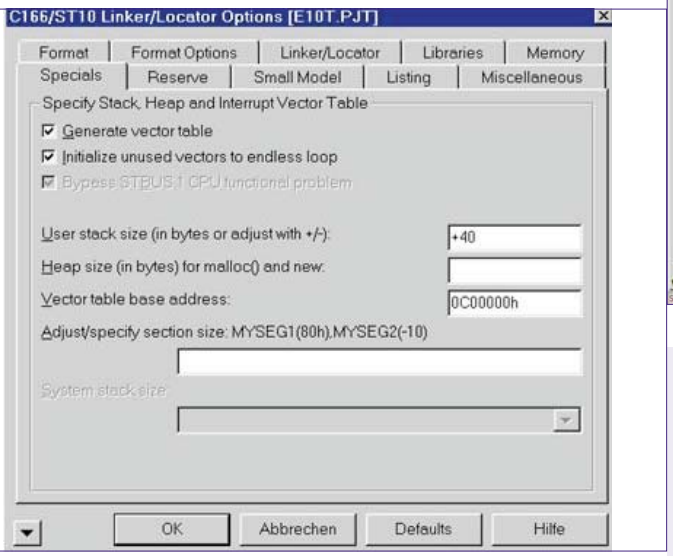
EDE - Linker/Locater Options – Format Options
Output format (IHEX): choose Intel hex32 records



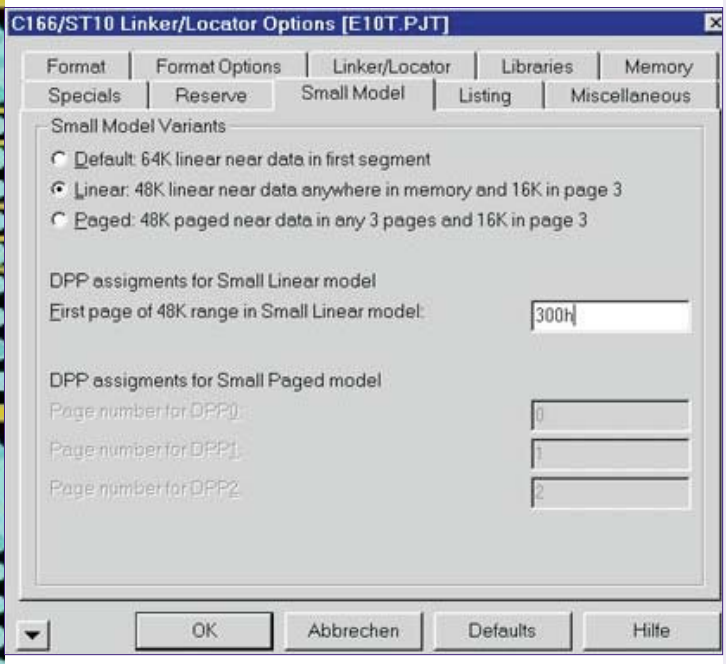
EDE - Linker/Locater Options - Memory
Rom area(s) – input 0C00000h – 0C1FFFFh



EDE - Linker/Locater Options – Specials
insert Vector table base address 0C00000h



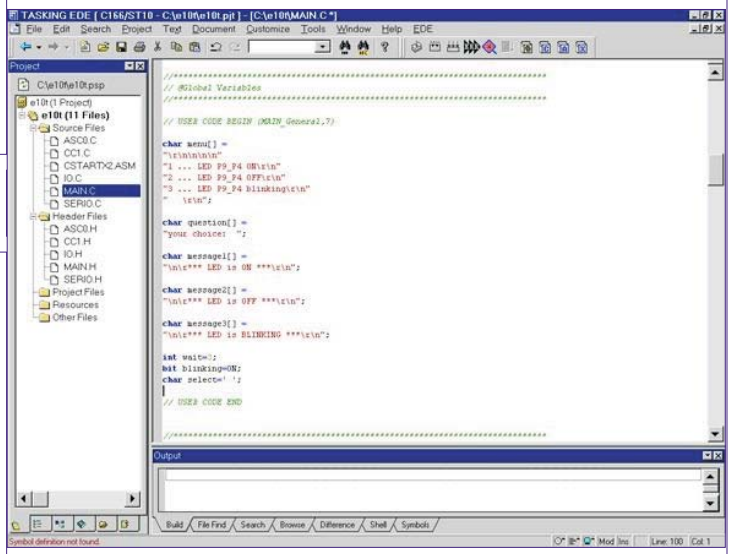
EDE - Linker/Locater Options – Small Model
click ? Linear: 48K
insert First page of 48K range in Small Linear model: 300h



4. Step: Insert your application specific program:

double click main.c: insert Global Variables

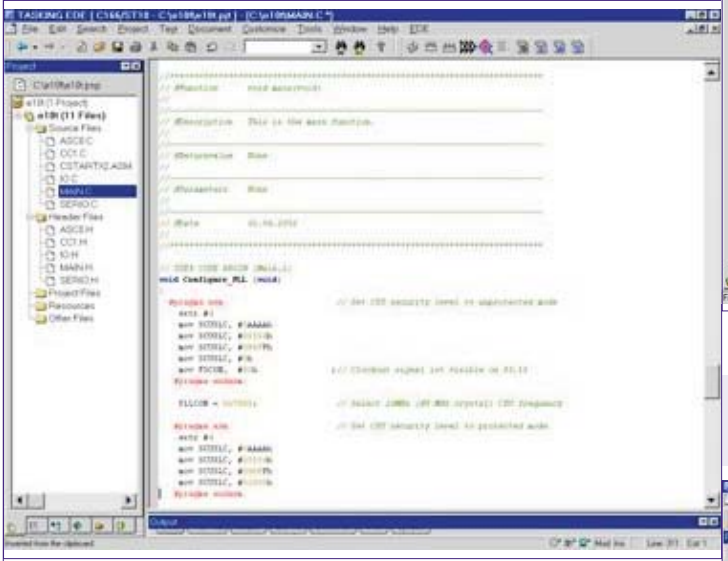
```
char menu[] =
"\r\n\n\n\n"
"1 ... LED P9_P4 ON\r\n"
"2 ... LED P9_P4 OFF\r\n"
"3 ... LED P9_P4 blinking\r\n"
" \r\n";
char question[] =
"your choice: ";
char message1[] =
"\n\r*** LED is ON ***\r\n";
char message2[] =
"\n\r*** LED is OFF ***\r\n";
char message3[] =
"\n\r*** LED is BLINKING ***\r\n";
int wait=3;
bit blinking=ON;
char select=' ';
```

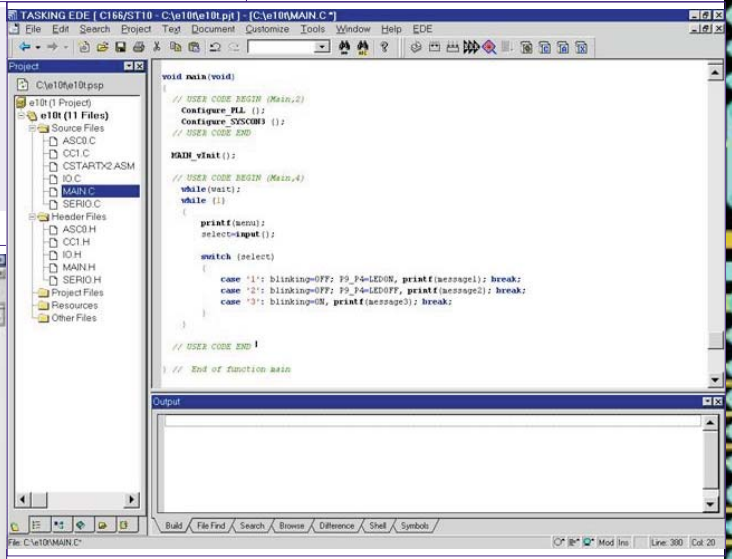


main.c: insert User Code

```
void Configure_PLL (void)
{
 #pragma asm  // Set CPU security level to unprotected mode
 extr #4
 mov SCUSLC, #0AAAAh
 mov SCUSLC, #05554h
 mov SCUSLC, #096FFh
 mov SCUSLC, #0h
 mov FOCON, #80h ;// Clockout signal ist visible on P3.15
 #pragma endasm
 PLLCON = 0x7889; // Select 20MHz (@8 MHz crystal) CPU frequency
 #pragma asm // Set CPU security level to protected mode
 extr #4
 mov SCUSLC, #0AAAAh
 mov SCUSLC, #05554h
 mov SCUSLC, #096FFh
 mov SCUSLC, #01800h
 #pragma endasm
}
void Configure_SYSCON3 (void)
{
 #pragma asm  // Set CPU security level to unprotected mode
 extr #4
 mov SCUSLC, #0AAAAh
 mov SCUSLC, #05554h
 mov SCUSLC, #096FFh
 mov SCUSLC, #0h
 mov FOCON, #80h ;// Clockout signal ist visible on P3.15
 #pragma endasm
 #pragma asm
 extr #01h ;// Extended SFR access.
 MOV SYSCON3, #0h ;// alle Peripherals aktivieren
 #pragma endasm
 #pragma asm // Set CPU security level to protected mode
 extr #4
 mov SCUSLC, #0AAAAh
 mov SCUSLC, #05554h
 mov SCUSLC, #096FFh
 mov SCUSLC, #01800h
 #pragma endasm
}
char input (void)
{
 char in=' ';
```

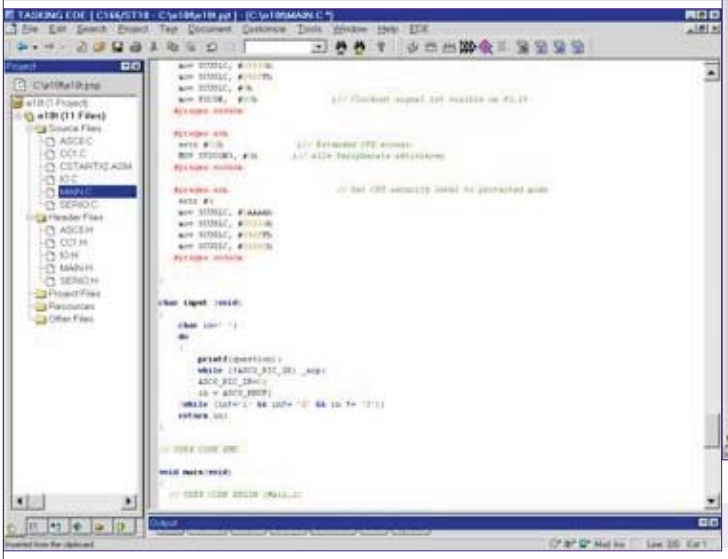
```
do
{
printf(question);
while (!ASC0_RIC_IR) _nop;
ASC0_RIC_IR=0;
in = ASC0_RBUF;
}while (in!='1' && in!= '2' && in != '3');
return in;
}
```

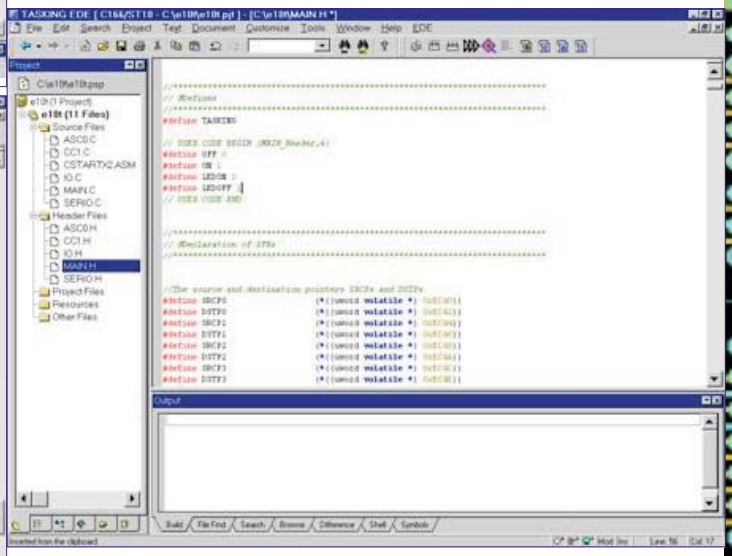




double click Main.h and insert the following Defines:

```
#define OFF 0
#define ON 1
#define LEDON 0
#define LEDOFF 1
```



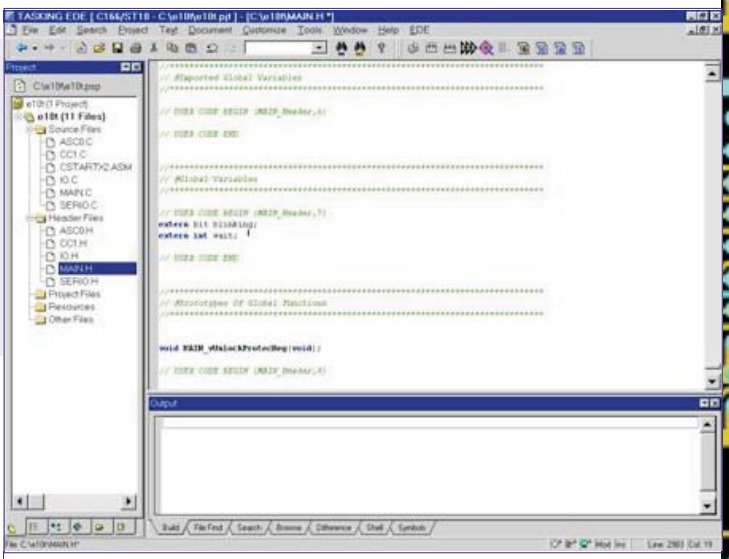


insert Global Variables

```
extern bit blinking;
extern int wait;
```

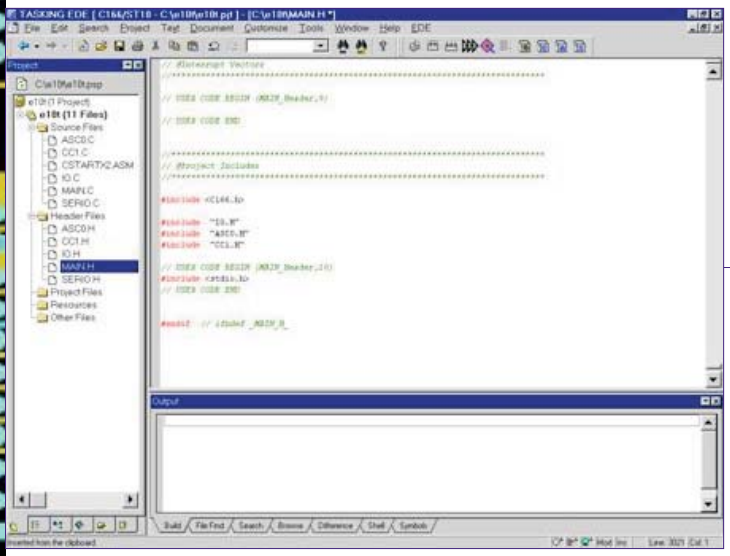
insert the following code in the main function

```
Configure_PLL ();
Configure_SYSCON3 ();
while(wait);
while (1)
{
  printf(menu);
  select=input();
  switch (select)
  {
  case '1': blinking=OFF; P9_P4=LEDON, printf(message1); break;
  case '2': blinking=OFF; P9_P4=LEDOFF, printf(message2); break;
  case '3': blinking=ON, printf(message3); break;
  }
}
```



insert Includes (for printf())

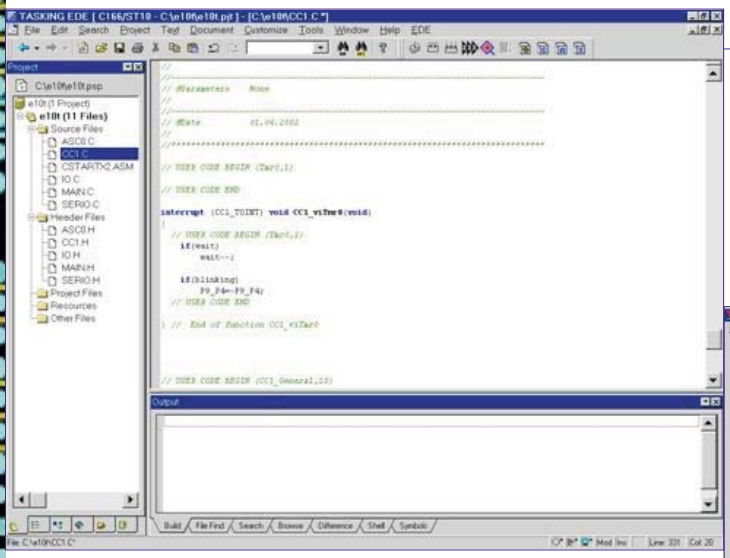
```
#include <stdio.h>
```



double click CC1.C

insert code for T0 interrupt service routine

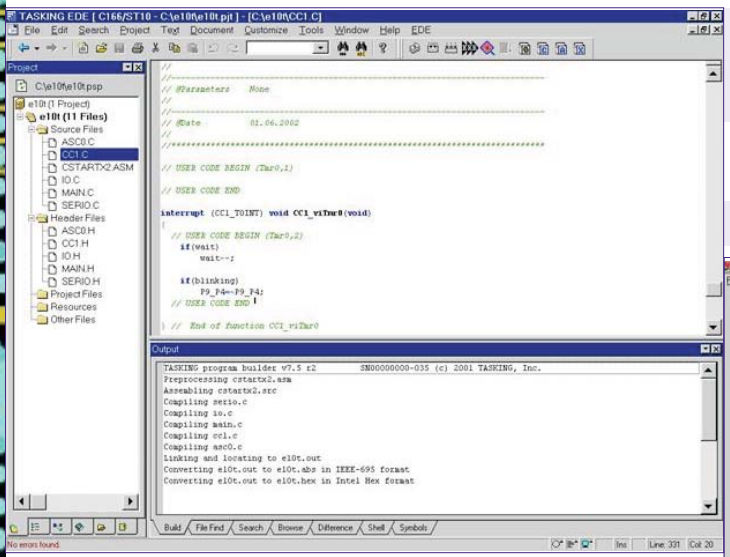
```
if(wait)
wait--;
if(blinking)
P9_P4=~P9_P4;
```



5. Step: Generate your application program – generate the hex file for Memtool

Project

Rebuild



Now you can close your project and Tasking EDE:

Project

Project Space

Close

File

Exit

Now you can program the hex output file e10t.HEX with Memtool in the OnChipFlash (Program Memory) of the XC164CS microcontroller.

VI.) MEMTOOL Installation

The following procedure will install/prepare Memtool for the programming of the XC16 family:

1. Execute file infineon_memtool_3_2_5.exe and choose Destination Location (default directory) C:\Programme\Memtool .
2. Start Memtool (use the Windows Start Menu)
3. Select under Menu Target\Change

   device XC161CJ-16FF\XC164CS-16FF STEP AA or

   device XC161CJ-16FF\XC164CS-16FF STEP AB.

   Your system is now ready to program the OnChipFlash of the XC16 family.

VII.) Using MEMTOOL

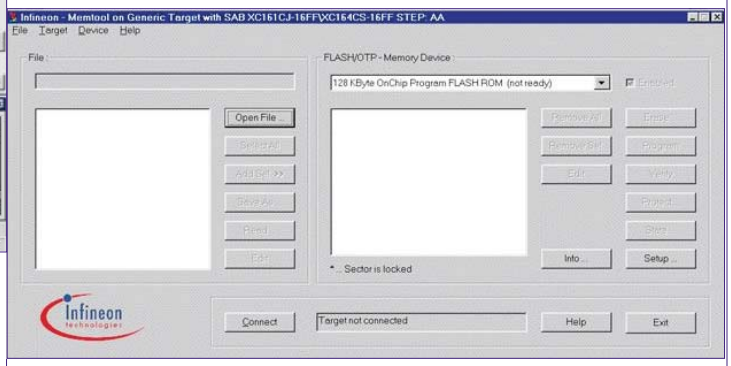
Program e10k.h86 (KEIL) or e10t.hex (TASKING) into the OnChipFlash in the XC164:

Start MEMTOOL

Assign Power to your target board

Set Dip Switch S106 to Standard Boot (bootstrap loader)

Press Reset Key



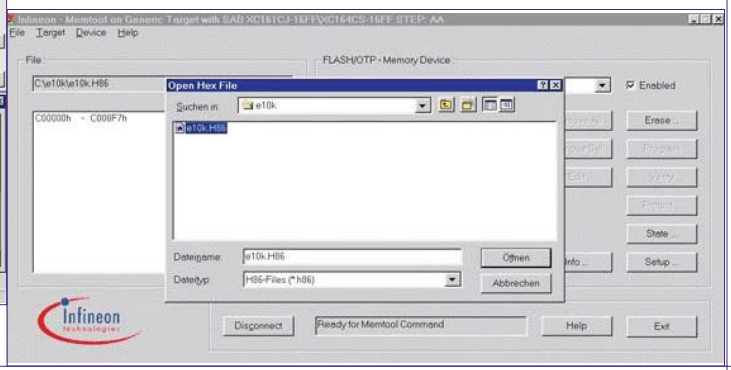
Erase the ONChipFlash

```
Connect
Erase
Select All
Start
Exit
```

Load HEX File

for KEIL Compiler

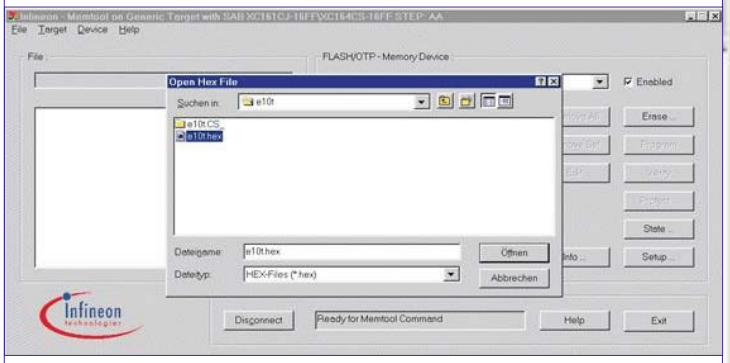
```
Open File
Dateityp (File type): H86-Files (*.h86)
```



```
Select C:\e10k.h86
Öffnen (Open)
```

for TASKING Compiler

```
Open File
Dateityp (File type): HEX-Files (*.hex)
Select C:\e10t.hex
Öffnen (Open)
```



Program selected hex-file into the OnChipFlash:

```
Select All
Add Sel >>
Program
Exit
```

Exit MEMTOOL

```
Disconnect
Exit
```

Set Dip Switch S106 to Standard Boot internal start

Press Reset Key

Your application is running!

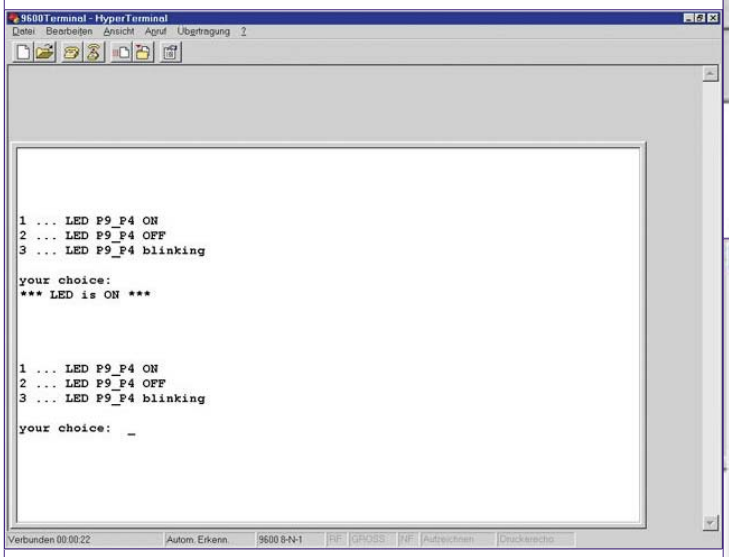
VIII.) You need a Terminal Program; Settings

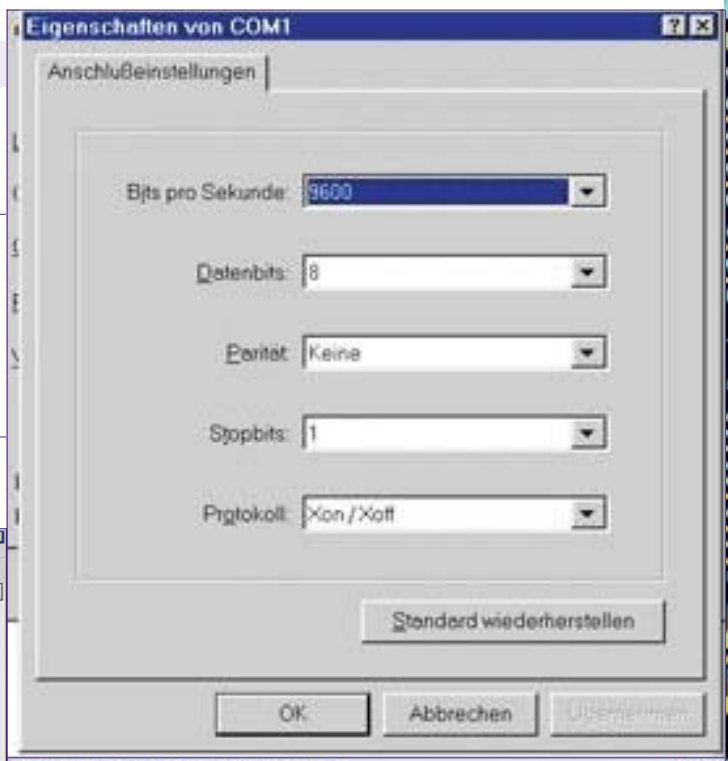
For your programming example you will need a terminal program.

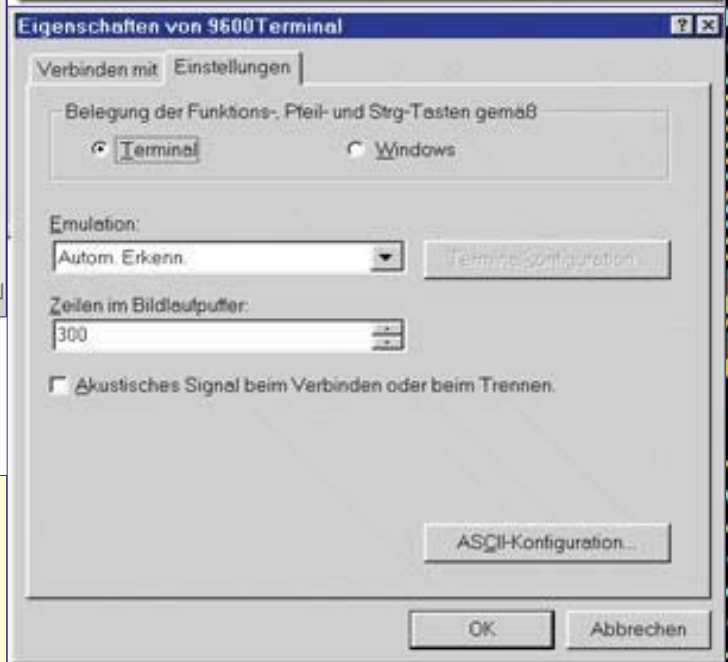
You can use the Windows Utility Hyper Terminal. Please setup the configuration as shown in the following three pictures (9600 Baud, 8 bit Data, no Paritybit, 1 Stopbit, Xon/Xoff Protocol):

IX.) Using a Terminal program

Screenshots of your running application:







Startekit

http://www.spacetools.com/tools4/space/688.htm

Starterkit-Bestellung

http://www.mtm.at/