NEC

User's Manual

Low-Voltage Starter Kit for Motor Control

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Notes for CMOS Devices

1. **VOLTAGE APPLICATION WAVEFORM AT INPUT PIN**
   Waveform distortion due to input noise or a reflected wave may cause malfunction. If the input of the CMOS device stays in the area between VIL (MAX) and VIH (MIN) due to noise, etc., the device may malfunction. Take care to prevent chattering noise from entering the device when the input level is fixed, and also in the transition period when the input level passes through the area between VIL (MAX) and VIH (MIN).

2. **HANDLING OF UNUSED INPUT PINS**
   Unconnected CMOS device inputs can result in malfunction. If an input pin is unconnected, it is possible that an internal input level may be generated due to noise, etc., causing malfunction. CMOS devices behave differently than Bipolar or NMOS devices. Input levels of CMOS devices must be fixed high or low by using pull-up or pull-down circuitry. Each unused pin should be connected to VDD or GND via a resistor if there is a possibility that it will be an output pin. All handling related to unused pins must be judged separately for each device and according to related specifications governing the device.

3. **PRECAUTION AGAINST ESD**
   A strong electric field, when exposed to a MOS device, can cause destruction of the gate oxide and ultimately degrade the device operation. Steps must be taken to stop generation of static electricity as much as possible, and to quickly dissipate it should it occur. Environmental control must be adequate. When it is dry, a humidifier should be used. It is recommended to avoid using insulators that easily build up static electricity. Semiconductor devices must be stored and transported in an anti-static container, static shielding bag or conductive material. All test and measurement tools including work benches and floors should be grounded. The operator should be grounded using a wrist strap. Semiconductor devices must not be touched with bare hands. Similar precautions need to be taken for PW boards with mounted semiconductor devices.

4. **STATUS BEFORE INITIALIZATION**
   Power-on does not necessarily define the initial status of a MOS device. Immediately after the power source is turned ON, devices with reset functions have not yet been initialized. Hence, power-on does not guarantee output pin levels, I/O settings or contents of registers. A device is not initialized until the reset signal is received. A reset operation must be executed immediately after power-on for devices with reset functions.

5. **POWER ON/OFF SEQUENCE**
   In the case of a device that uses different power supplies for the internal operation and external interface, as a rule, switch on the external power supply after switching on the internal power supply. When switching the power supply off, as a rule, switch off the external power supply and then the internal power supply. Use of the reverse power on/off sequences may result in the application of an overvoltage to the internal elements of the device, causing malfunction and degradation of internal elements due to the passage of an abnormal current. The correct power on/off sequence must be

judged separately for each device and according to related specifications governing the device.

6. **INPUT OF SIGNAL DURING POWER OFF STATE**
Do not input signals or an I/O pull-up power supply while the device is not powered. The current injection that results from input of such a signal or I/O pull-up power supply may cause malfunction and the abnormal current that passes in the device at this time may cause degradation of internal elements. Input of signals during the power off state must be judged separately for each device and according to related specifications governing the device.

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Preface

Readers This manual is intended for users who want to understand the functions of the low voltage starter kit for motor control.

Purpose This manual presents the hardware manual of the low voltage starter kit for motor control.

Organization This system specification describes the following sections:

- Kit Contents
- Hardware Setup
- Standalone Operation
- Drive and Motor Protection
- Software Setup
- Using the IAR C Compiler and Source Code Debugger
- Download and Debug the Code
- GUI Operation

Legend Symbols and notation are used as follows:

- Weight in data notation: Left is high order column, right is low order column
- Active low notation: $\overline{xxx}$ (pin or signal name is over-scored) or /xxx (slash before signal name)
- Memory map address: High order at high stage and low order at low stage

Note Additional remark or tip

Caution Item deserving extra attention

Numeric Notation

- Binary: xxxx or xxxB
- Decimal: xxxx
- Hexadecimal: xxxxH or 0x xxxx

Prefixes representing powers of 2 (address space, memory capacity):

- K (kilo): 210 = 1024
- M (mega): 220 = 10242 = 1,048,576
- G (giga): 230 = 10243 = 1,073,741,824

Table of Contents

Chapter 1 Introduction

The low-voltage starter kit for motor control (MC-LVKIT-714) is a complete 3-phase motor control evaluation system for NEC Electronics' microcontroller application-specific standard products (ASSP's) for motor control.

The kit contains all necessary hardware and software to quickly set up and run a low-voltage brushless DC motor (BLDCM).

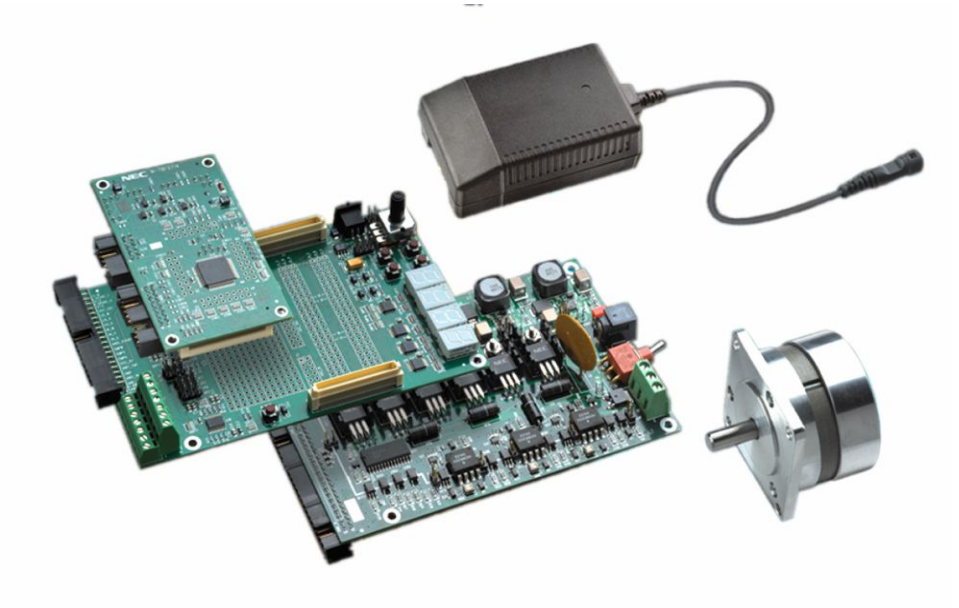

Figure 1-1 Motor Control Starter Kit

Chapter 2 Kit Contents

- MC-78F0714 microcontroller board containing the μPD78F0714 ASSP microcontroller
- MC-I/O interface board. Connects the microcontroller board to the power module
- Low-voltage power module (MC-PWR-LV) containing the inverter MOSFET
- BLDC motor
  - Pitman N2311 12V motor or
  - Ametek 150093-50 24V motor
- FW7362/15 DC power supply
- 20 MHz oscillator (For use with an On Chip Debug Unit)

For information about the electrical characteristics and hardware functions of the μPD78F0714 microcontroller, refer to **μPD78F0714 User's Manual** (U16928EJ1V0UD00).

For the instruction descriptions, refer to the **78K0 Series Instruction User's Manual** (U12326E)

Chapter 3 Hardware Setup

The kit can be purchased as one unit with all three boards connected as shown below: Replacement board can be ordered separately.

Figure 3-1 MC-LV-KIT-714 Kit Configuration

To attach the motor, connect the phase U, V and W terminals to the J3 connector block on the MC-PWR-LV power board and the Hall sensor terminals to the J5 connector block on the MC-IO control board.

Table 3-1 Motor Connections

Motor Terminals			I/O Board (MC-IO)	Power Board (MV-PWR-LV)
Connection	**Pitman**	**Ametek**		
Phase U	Beige	Black	—	J3 - 1
Phase V	Red	White	—	J3 - 2
Phase W	Orange	Red	—	J3 - 3
Hall sensor 1	Grey	Blue	J5 - 13	—
Hall sensor 2	Blue	Green	J5 - 14	—
Hall sensor 3	White	Yellow	J5 - 7	—
Hall sensor 5VDC	Purple	Purple	J5 - 6	—
Hall sensor GND	Black	Orange	J5 - 5	—

Motor terminal connections are shown in *Figure 3-2* and *Figure 3-3* .

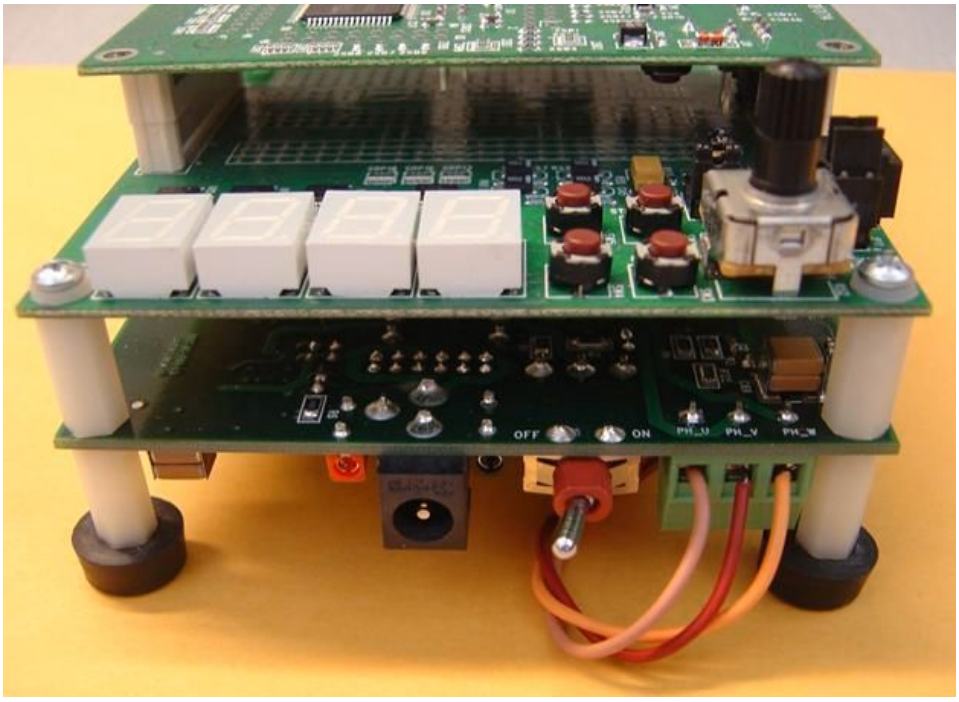

Figure 3-2 Motor Phase Connections

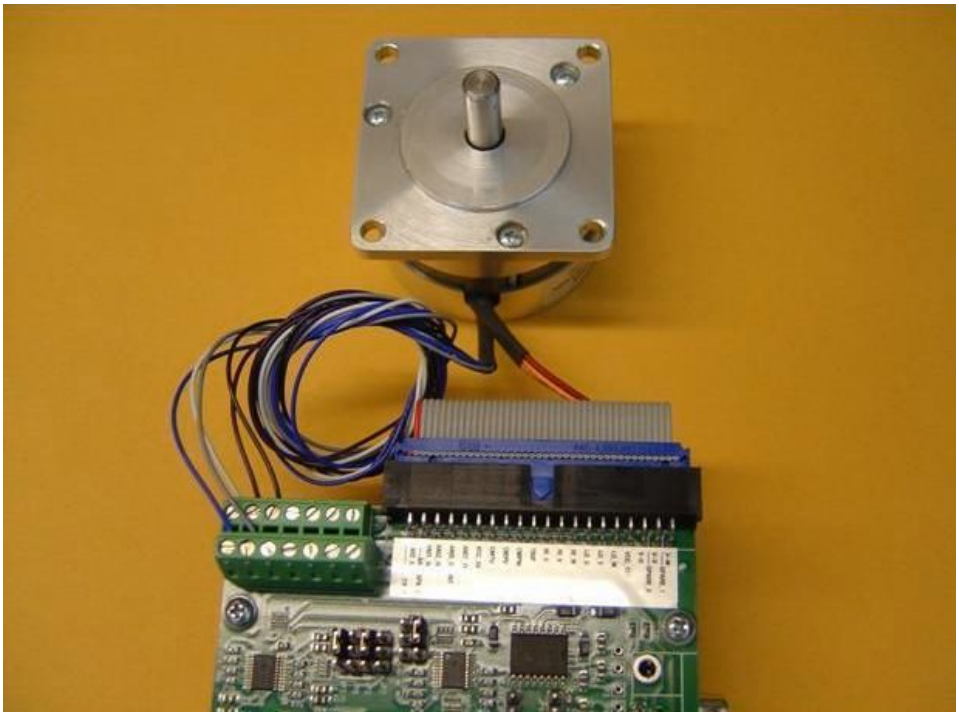

Figure 3-3 Hall Sensor Connections

Figure 3-2 and *Figure 3-3* - Pitman Motor shown for reference.
See *Table 3-1* for equivalent Ametek motor connections.

Chapter 4 Standalone Operation

For Stand alone use (i.e. without the GUI), please check that the following jumpers and links are as defined below

Microcontroller Board

- 2JP5 Pins 2 - 7 Shorted , Pins 3 - 5 shorted
- 2JP1 Pins1 - 2 shorted
- 2JP6 Pins 1 - 2 shorted
- 2JP8 Pins 2 - 3 shorted
- 2JP9 Pins 2 - 3 shorted
- 2JP10 Pins 2 - 3 shorted
- 2SB24 shorted

I/O Board

- JP1 Pins 2 - 3 shorted
- JP2 Pins 2 - 3 shorted
- JP3 Pins 2 - 3 shorted
- JP11 Pins 1 - 2 and 3 - 4 shorted
- JP5 Pins 1 - 2 and 3 - 4 shorted

Low Voltage Power Board

- SB24 Open
- SB25 Shorted
- JP2 Shorted

Example software to run the motor is pre-programmed into the microcontroller's flash memory. After the motor is connected, the program is ready to run the motor as soon as the 15VDC power supply is plugged into J6 of the MC-IO board and power switch SW1 on the MC-PWR-LV power module is turned ON.

When the kit is powered up or reset, the LED displays "**SELF**", indicating that the kit is in standalone mode and you can use the pushbuttons and potentiometer on the MC-IO board to control the motor.

Figure 4-1 Stand Alone Operation

Three seconds after power up, the LED displays the current (start-up) set speed.

Figure 4-2 Initial Speed Display

Note Ametek motor starting speed is 500 RPM

After power up in standalone mode, the motor can be operated as follows:

1. Press the **START/STOP** button to run the motor.
2. Turn the potentiometer clockwise to increase the speed of the motor or counter clockwise to decrease the speed of the motor.
3. The LED will display the actual motor speed calculated from the Hall sensor interrupts. The display can be toggled between actual and demanded speed by use of the **MODE** button
4. Press the **FORWARD** or **REVERSE** button to change the rotation direction.
5. Press **START/STOP** to stop the motor.

Caution If the potentiometer position is set to higher speeds, and the motor rotation is suddenly reversed, an error condition may occur due to a timeout or over-current detection and the motor will stop operating. To reboot, press the **RESET** switch on the MC-IO board, adjust the potentiometer to a lower speed and restart.

To control the motor from the Graphical Interface (GUI) from your PC, please refer to "*section 6*" .

Chapter 5 Drive and Motor Protection

The starter kit and the motor are protected against unexpected events such as overload, motor stall and malfunction of the Hall sensors. If such faults are detected, the motor stops rotating and the fault conditions are displayed on the seven-segment LED. For details on the protection functions implemented in hardware, consult the user's manual for MC-PWR-LV low-voltage power module. The sample code software also has built-in fault detection algorithms as an extra measure of protection. Consult the software manual for details.

In standalone (SELF) mode, the LED displays the following fault conditions:

- Motor over-current: "O – C – "
- Motor stall fault: "– – – –"
- Hall sensor fault: "H A L L"

In the Graphical Interface mode (PC), the LED displays "PC" all the time and the GUI will displays all fault conditions. Refer to "*section 6*" for more information.

Chapter 6 GUI Operation

To operate the motor from the PC GUI, the Hex file for the motor control software including the GUI interface, will need to be programmed into the Flash memory of the 78F0714 microcontroller. The complete IAR embedded Workbench project can be downloaded from the Motor Control starter kit web site.

To program the "*hex*" file (*BLDC_714_GUI.hex*) into the microcontroller please refer to "*section 7*" .

Once the Graphical Interface program has been programmed ensure that the jumpers on the microcontroller board are returned to the settings described in chapter 4 above

It is necessary to locate the following files on to the PC in order to connect to the starter kit. The two programs should always be located together in the same directory

- MotorPanel.exe (GUI Application)
- Motor.inf (set up file)

To operate the PC GUI a “Female-Female” RS232 serial cable (with crossover) is required.
(Not supplied).
Connect the PC serial port to the starter kit J9 DB-9 RS232 connector with an RS232 serial cable.

The pin connection of the RS232 cable needs to be as follows (crossover)

Table 6-1 GUI RS232 Cable Connections

Signal Name	PC Connection	Starter Kit connection
Rx Signal Detect (Not Used)	Pin 1	Pin 1
Rx Data	Pin 2	Pin 3
Tx Data	Pin 3	Pin 2
DTE Ready	Pin 4	Pin 4
Signal Ground	Pin 5	Pin 5
DCE Ready	Pin 6	Pin 6
RTS	Pin 7	Pin 8
CTS	Pin 8	Pin 7
Ring Indicator (Not used)	Pin 9	Pin 9

To launch the communication program Run the "MotorPanel.exe" application program and the following window should open.

1. Select the appropriate COM port on your PC and click OK.

Figure 6-1 PC COM Port Selection

The GUI will launch if the connection is established:

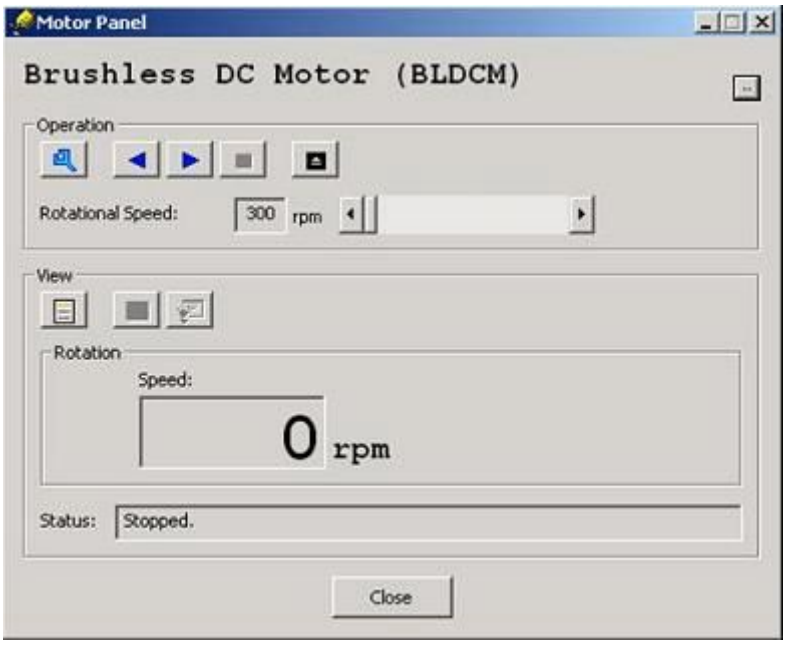

Figure 6-2 BLDC Motor Control GUI

2. To operate the motor, use the controls in the GUI window The user has the same controls as described for the “Stand Alone” mode (Start / Stop, Clockwise / Anti-Clockwise, Speed increase / decrease)
3. It is also possible to change the PID parameters from the GUI interface. (Please note that changes can only be made when the motor is stopped) To change the PID parameters click on the tuning key symbol

Figure 6-3 Launching PID Parameter Window

The tuning window will open allowing the user to change the values of P, I or D constants:

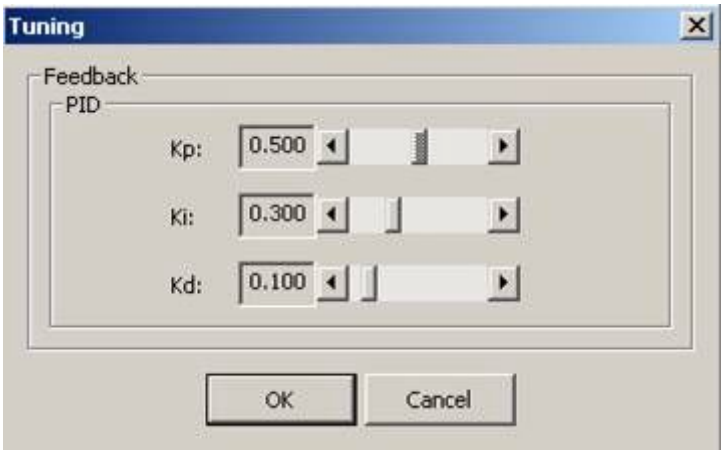

Figure 6-4 PID Parameter Window

The new parameter values will be down loaded to the starter kit into the internal RAM when the motor is restarted again.

To make the changes permanent, the user will have to modify the definitions in the original IAR project files (control.h) and then rebuild the project. This requires a licensed version of either.

IAR Embedded Workbench (Full Version) or IAR Embedded Workbench (Kick Start Version).

The three PID values that require changing are

#define KP_DEF

#define KI_DEF

#define KD_DEF

Set these parameters to the values shown in the Tuning Window of the GUI.

Chapter 7 Programming the Microcontroller

If the user wishes to modify the program in the 78F0714 device on the microcontroller board, a Flash Programmer is required (not included in the Starter Kit).

Two programmers are available

1. PG-FP4 Full Programmer
2. QB Programmer MiniCube 2 - On Chip Debug / Low Cost Programmer

Figure 7-1 PG-FP4 Programmer

Figure 7-2 QB Programmer (MiniCube2)

The Graphical Interface for either of these programmers can be downloaded from the NEC Electronics Development tools web site.

In this guide we have shown only the MiniCube2 (QB Programmer).
The interface for the microcontroller board is the same for both programmers.

Note

1. It is easier to remove the Microcontroller board from the starter kit to program the device. However it is possible to program the device while connected to the I/O board. The set up of the programmer is slightly different although the actual programming of the device is the same. Programming the microcontroller with the board attached to the kit is described in "*section 7.2*" of this user guide.
2. Older programmers such as the PG-FPL can still be used with this device. Please refer to the previous version of this user guide for details on how to use this programmer.

7.1 Progamming with the Microcontroller Board disconnected

- Download the following files
  - The MiniCube2 (QB programmer) Flash Programming Graphical Interface (From the NEC Electronics Tool download web site)
  - The Appropriate IAR Work bench project (with or without the GUI) (From the NEC Electronics Motor Control Starter Kit web site)
  - Uncompress and Install the QB programmer GUI software (Run the "SETUP" application)
- Save and uncompress the IAR Workbench project
  - For Flash programming, no changes to the jumper settings on the Microcontroller board are necessary
- Check that the switches on the QB programmer are set as shown below
  - a) Switch M1 / M2 is set to "M2"
  - b) Switch 3 - T – 5 is set to "5"
- Then attach the QB programmer to connector 2J2 on the microcontroller board using the 16-pin cable

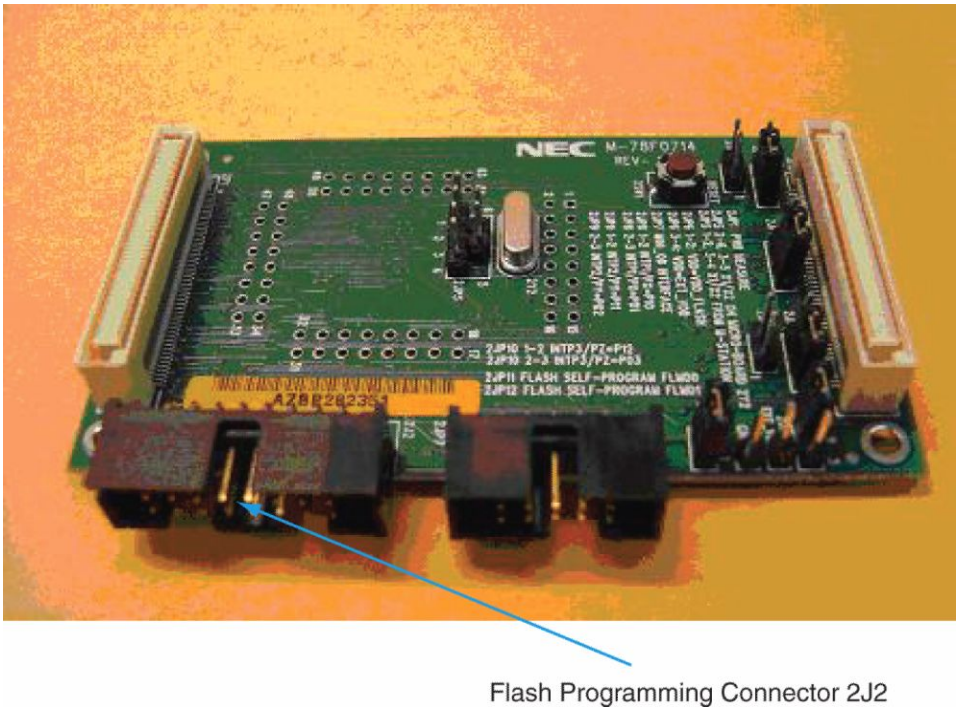

Figure 7-3 Microcontroller Board Flash Connection

- Copy the 78F0714 Flash programming parameter file (78F0714.prm) into the installation directory for the QB programmer program.

  $installation path$\....\PG-FPL\PRM

  (This file is included with the IAR project download)

Once the Microcontroller board is configured and the programmer connected to the PC, open the Flash programming Graphical interface "PG-FPL".

The following Screen should appear. (Note the text may differ after the 1st two lines)

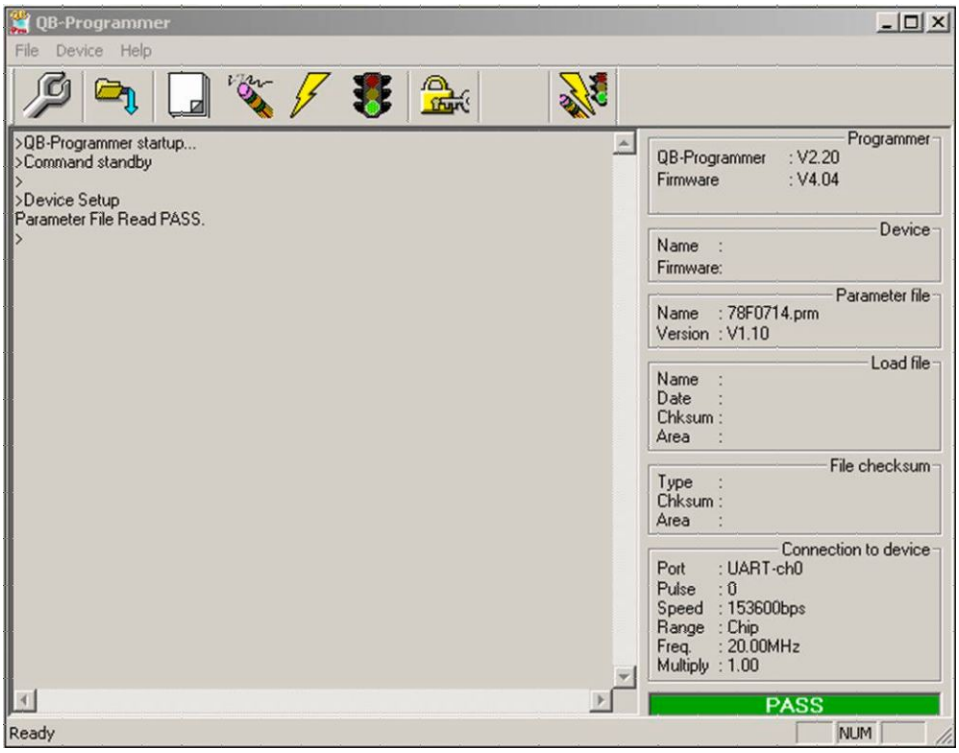

Figure 7-4 MiniCube 2 Programmer GUI (QB Programmer)

Next the device needs to be set up from the menu follow the following sequence:

Device =>Setup…

Or press the "**Spanner**" symbol in the ICON taskbar

The following screen should appear:

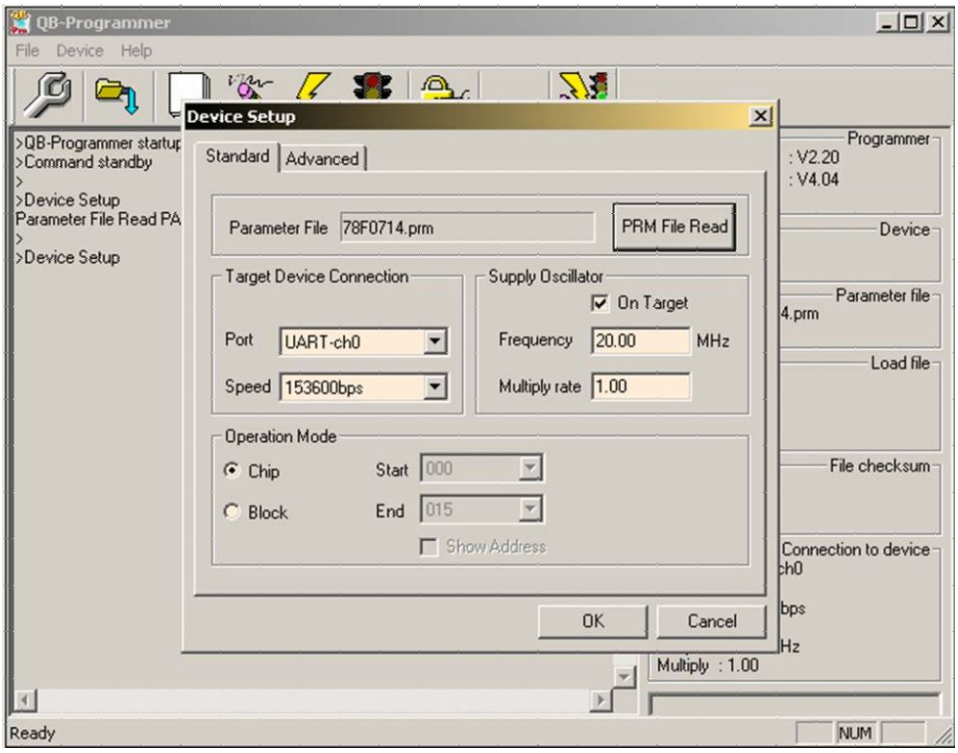

Figure 7-5 Device Setup

Set the details for the COM port, Speed etc as shown above.

Note Enter your COM port number as this will vary.

Next press the "**PRM File Read**" button and the following screen should appear. Select the 78F0714.prm file and press the "**Open**" button

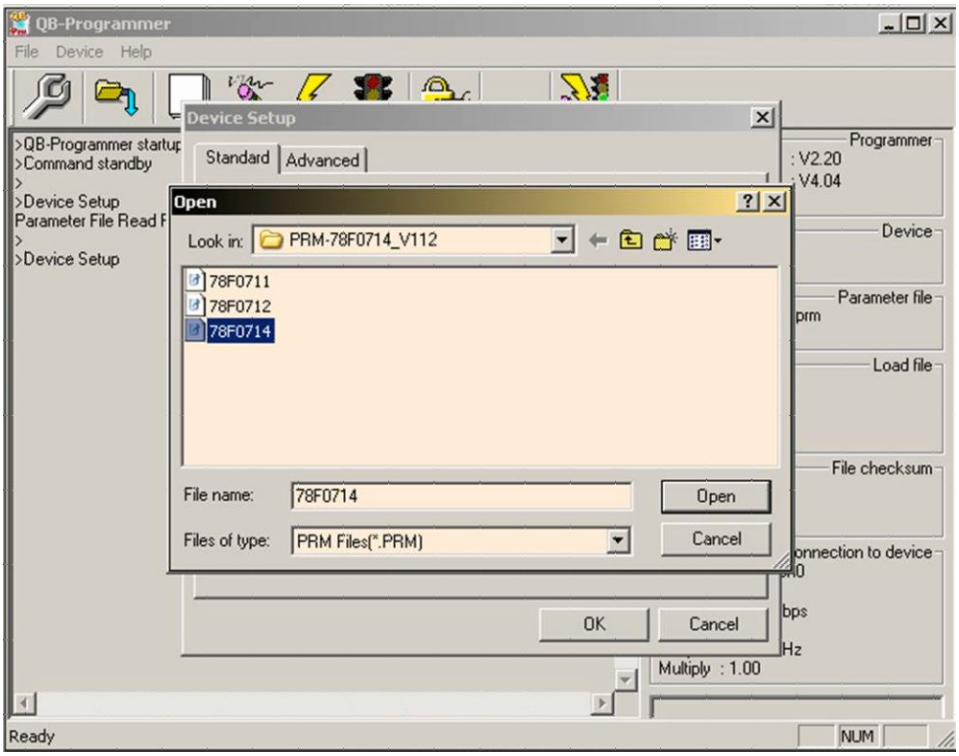

Figure 7-6 Parameter File Read

Then press the “"**OK**" button to return to the main menu system

The text in the main screen should read

> Device Setup
Parameter File Read Pass
>

Next press the select the "HEX" file to be programmed from the Menu

File => Load
Or press the "Load File" symbol in the ICON taskbar

The following screen should open

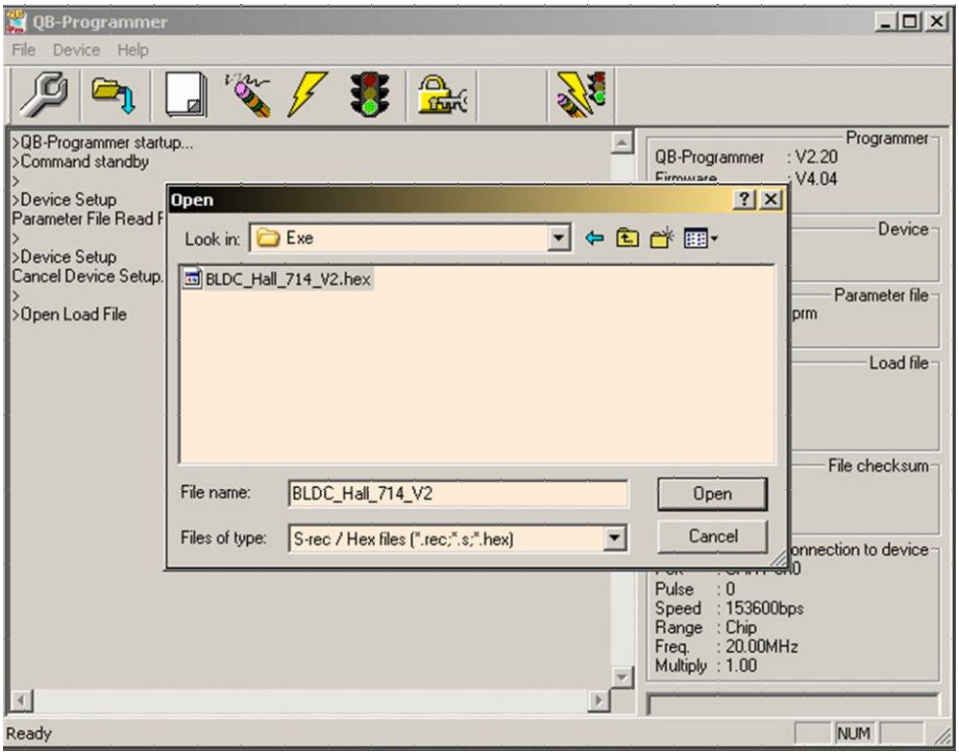

Figure 7-7 Hex File Selection

Locate the file as shown in the window from the downloaded IAR project.

The file will be located as follows

$saved directory$\BLDC_Hall_714_GUI\Debug\Exe

Select the file (BLDC_714_GUI.hex) and press the "**OPEN**" button

This will close the "**LOAD**" file window. The following should be displayed on the main screen

> Open Load File
Success read Load file

The Flash programming setup is now complete.

Now press the "**AUTOPROCEDURE**" button to start the programming sequence

The following sequence should be seen

>AutoProcedure(Epv)
Blank check Block 000: Not blank, Erase need.

```
Erasing...
Erase Chip : PASS
Program Chip:
10%
20%
30%
40%
50%
60%
70%
80%
90%
100%
PASS
Verify Chip:
10%
20%
30%
40%
50%
60%
70%
80%
90%
100%
PASS
AutoProcedure(Epv) PASS
>
```

Note The "Verify Chip operation is enabled by setting the "Read Verify after Program" option in the "Advanced" Tab of the "Device Setup" Window.
The 78F0714 device has now been reprogrammed with the example program using the graphical interface. To re program the "stand Alone" again follow the same procedure as above, but download the "SK BLDC_HALL_714" IAR project instead.
The file to be programmed is "SK BLDC_HALL_714.hex"

7.2 Progamming with the Microcontroller Board connected

The only difference from the procedure defined above, is that the QB programmer switches need to be set as shown below

a) Switch M1 / M2 is set to “M2” (78K0)
b) Switch 3 - T – 5 is set to “T” (Target Power Supply)

Connect the QB programmer as described previously and ensure that once the setup is completed the 15V DC power supply is connected to the starter kit and switched on.

Chapter 8 Using the IAR Embedded Workbench

As already explained the example software for use with the starter kit comprises two versions

- Sensored BLDC control without the Graphical Interface (GUI)
- Sensored BLDC control with the Graphical interface (GUI)

As described above the kit is supplied pre programmed for use in “Stand Alone” mode.
(This is without the GUI)

The complete example project program for the IAR 78K0 Embedded Workbench development tool environment can be downloaded from the motor control web site as detailed in starter kit package (i.e. where this manual was downloaded).

The software is supplied in source format and can be modified as required.

The following sections describe IAR 78K0 embedded Workbench development tool environment, how to install it on your computer, and how to rebuild and download executable code to the microcontroller’s flash memory.

Before proceeding with the tools installation, however, refer to all of the documentation for the starter kit, On Chip Debugger tool and the IAR Embedded Workbench.
(Please note that a 16Kbyte code limited version is included with the On Chip Debug unit and can be used to run the example software.)

Please note that a Flash Programmer, On Chip debugging tool or IAR Embedded workbench are not included in this package. These items are available from your local NEC Electronics Distributor or contact your local NEC Electronics sales office.

8.1 Software Installation

1. If a version of the IAR tool is not already installed, then install the IAR embedded Workbench tool as per the instructions provided by IAR.
2. Ensure that if not already that the example software has been downloaded from the NEC starter kit web site and "unzipped" into an suitable location.

The example software can operate on any revision of either the IAR Kick Start or IAR Full versions. However it may be necessary to define your own project and workspace. This is described later in this chapter.

8.2 MC-LVKIT-714 Setup for On-chip Debugging

To set up the MC-LVKIT-714 starter kit for debugging, follow the steps below.

1. Disconnect the M-78F0714 micro board by separating it from the MC-IO board.
2. Remove jumpers 2JP5 2-5, JP5 3-6 and 2JP7 1-2
3. Ensure that link 2SB24 is open

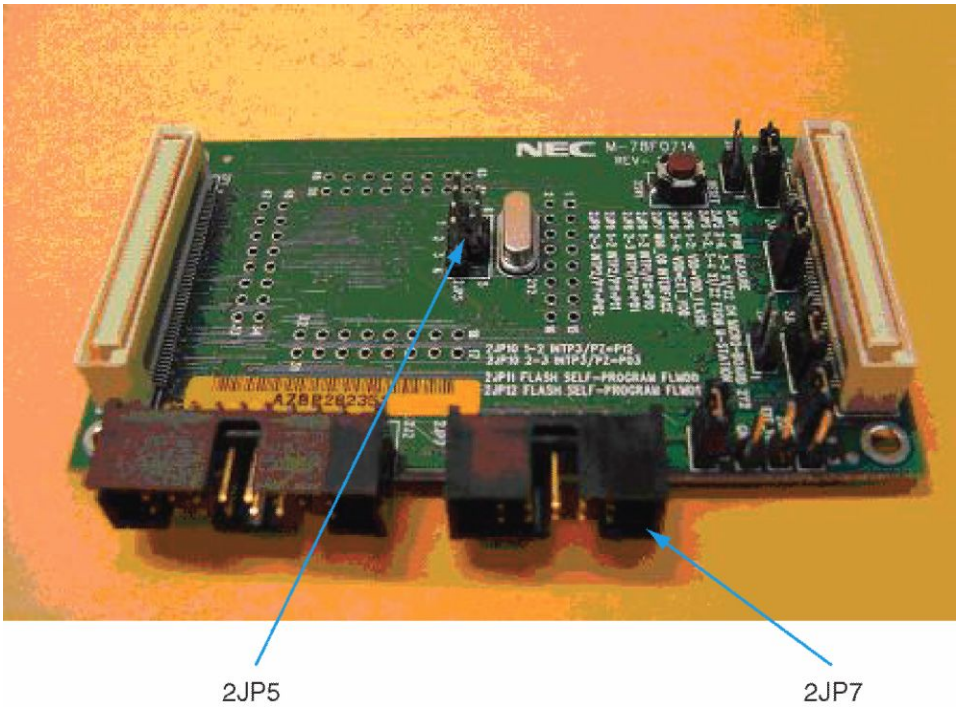

Figure 8-1 Microcontroller Board OCD Configuration

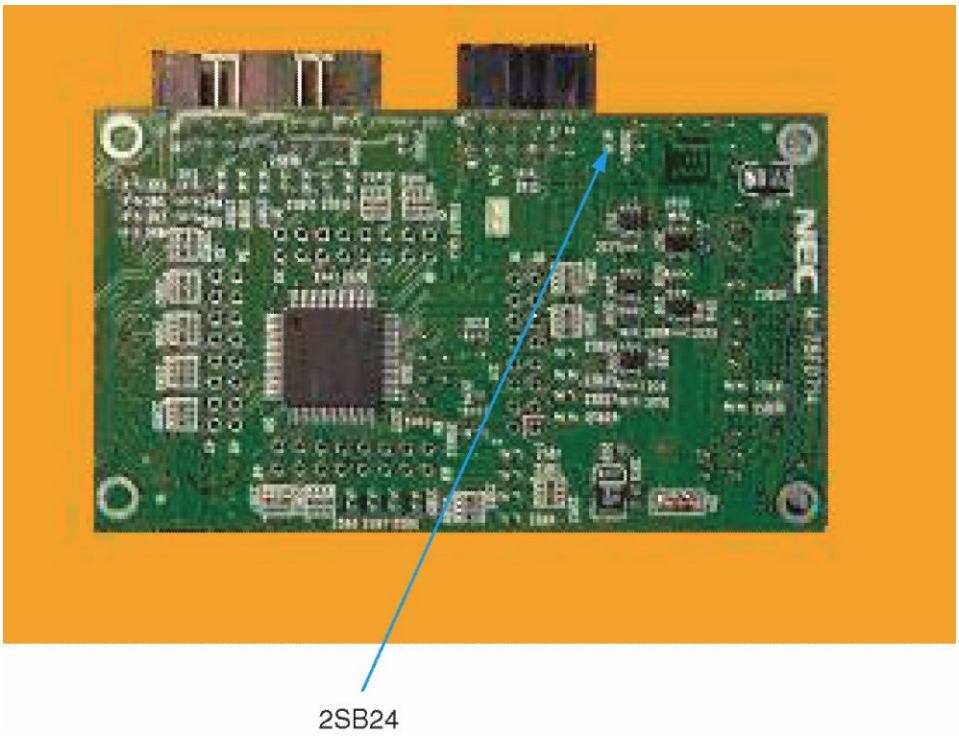

Figure 8-2 Microcontroller Board OCD Configuration

4. Reconnect the M-78F0714 board to MC-IO board
5. Attach the on-chip debugging emulator's target connector to 2JP7 on the M-78F0714 and the USB cable to your computer as shown below.

Figure 8-3 OCD Debugger Unit Connection

The MC-78F0714 must be operated at 20 MHz. This requires the use of the external 20 MHz oscillator supplied with the kit, which needs to be mounted in the socket inside the OCD unit.
Please refer to the on-chip debugger user's manual for information about how to attach the external oscillator.

8.3 IAR Embedded Workbench Start-up

1. Open the IAR workbench. The following Screen should be opened: (Note the exact display may vary depending on if this is a new installation)

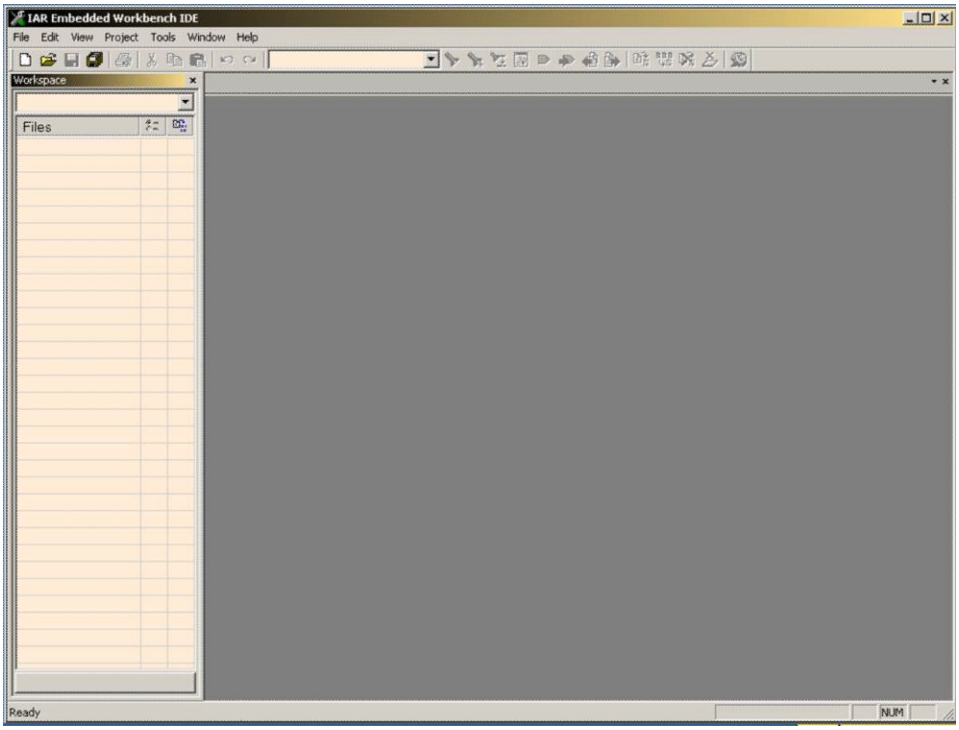

Figure 8-4 IAR Workbench Opening Screen

2. Next open the IAR Workspace by following the sequence and locating and then selecting the appropriate workspace file as shown below:

   File -> Open -> Workspace -> BLDC LVSK 714

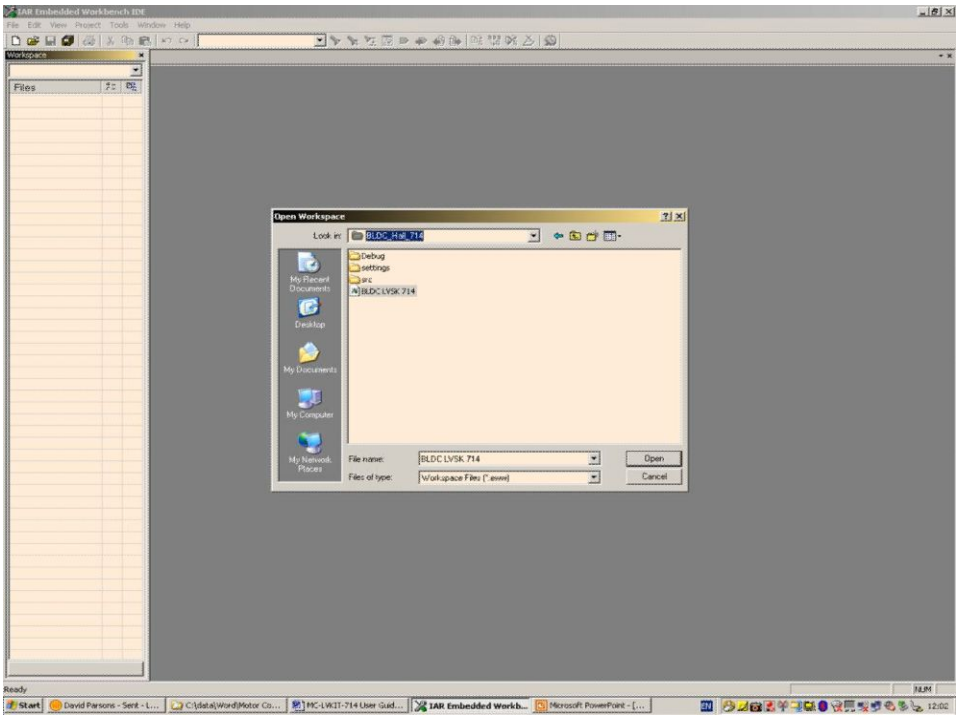

Figure 8-5 IAR Workbench Project Selection

Once the Workspace open the display should look something close to that as shown in *Figure 8-6* .

This shows the workspace where the project is located and has opened either the BLDC non GUI or BLDC GUI project. The display shows the following project files

- Left Hand side window – Project File (Source. Header, Map etc)
- Bottom Build Debug messages when the project is re built or the debugger is active
- The main centre display shows any open files in a tabbed form. The file can be viewed by selecting the relevant Tab in the wind

Any of the files shown can be opened by double clicking on the file in the "Project" (left hand side) window. Debugging windows are described later.

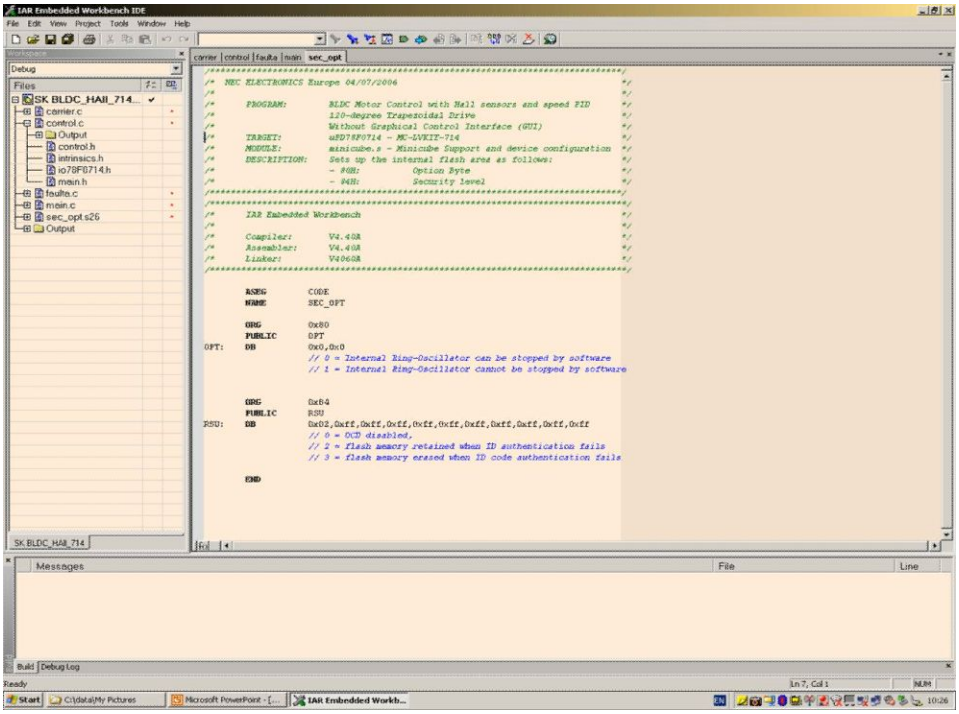

Figure 8-6 Workspace & Project open screen

3. The build options for the project can then be set or changed using the following menus. The build options are entered as shown in *Figure 8-7* below, then ensure all the options are as shown in *Figure 8-8* to *Figure 8-11* below.

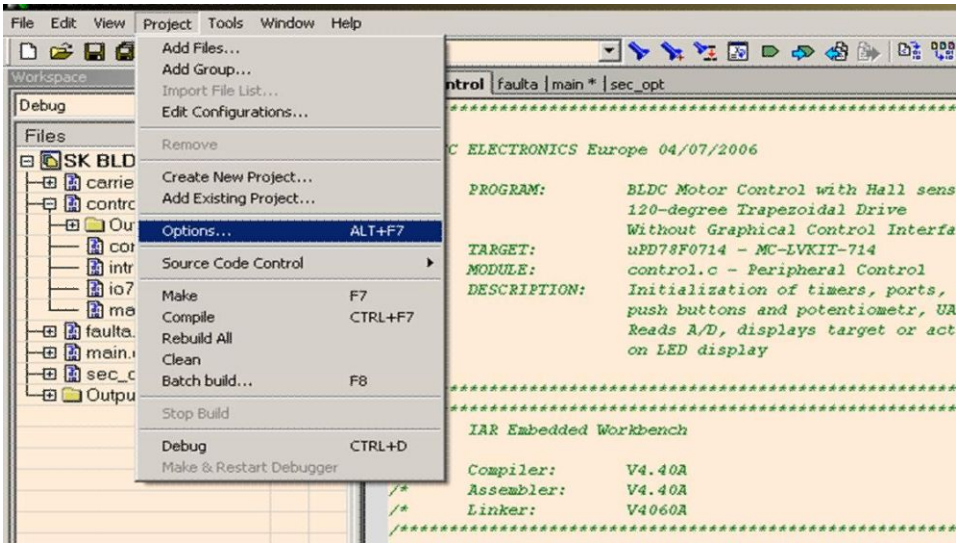

Figure 8-7 Project build options

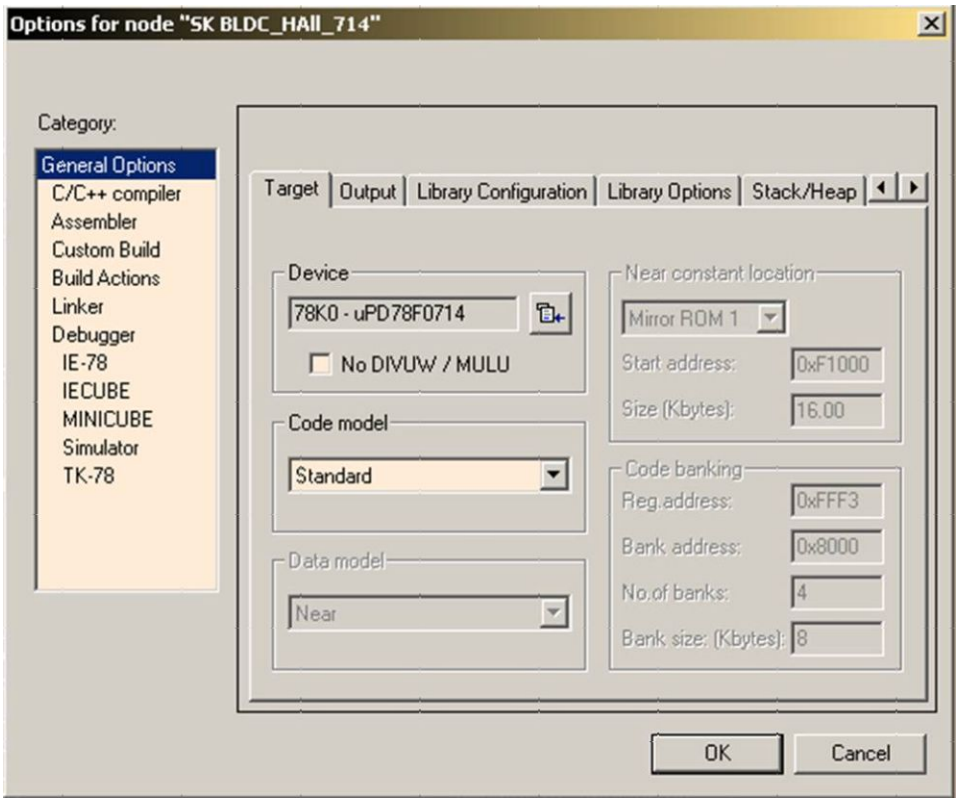

Figure 8-8 General Options – Setting the Target Device

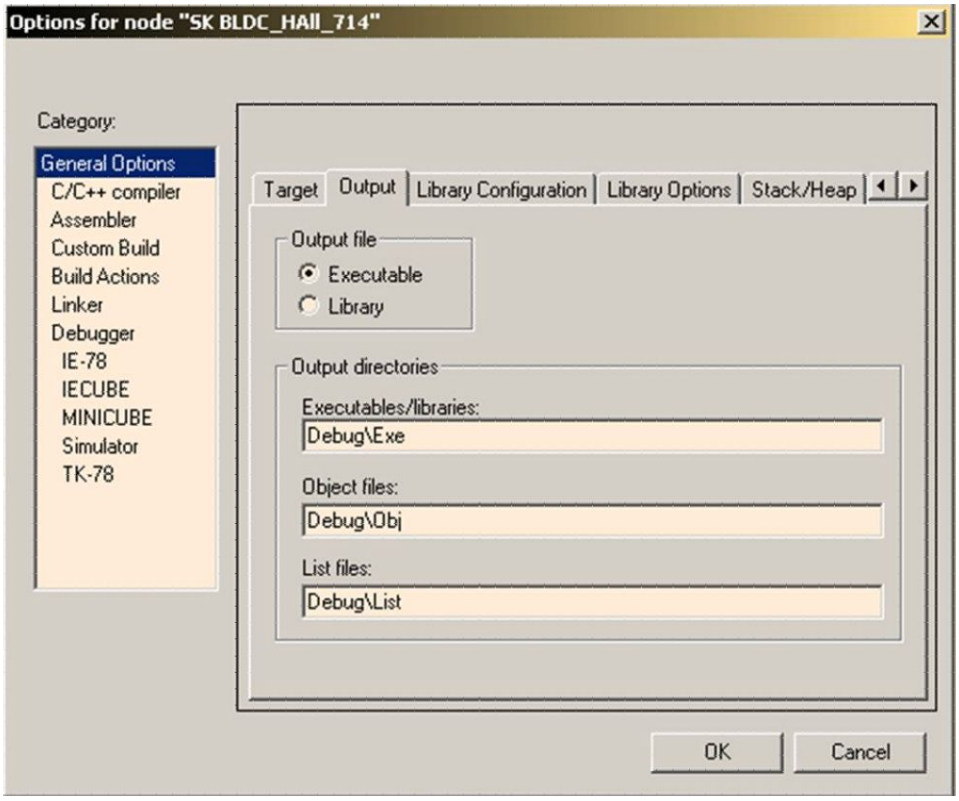

Figure 8-9 General Options – Setting the Output Locations

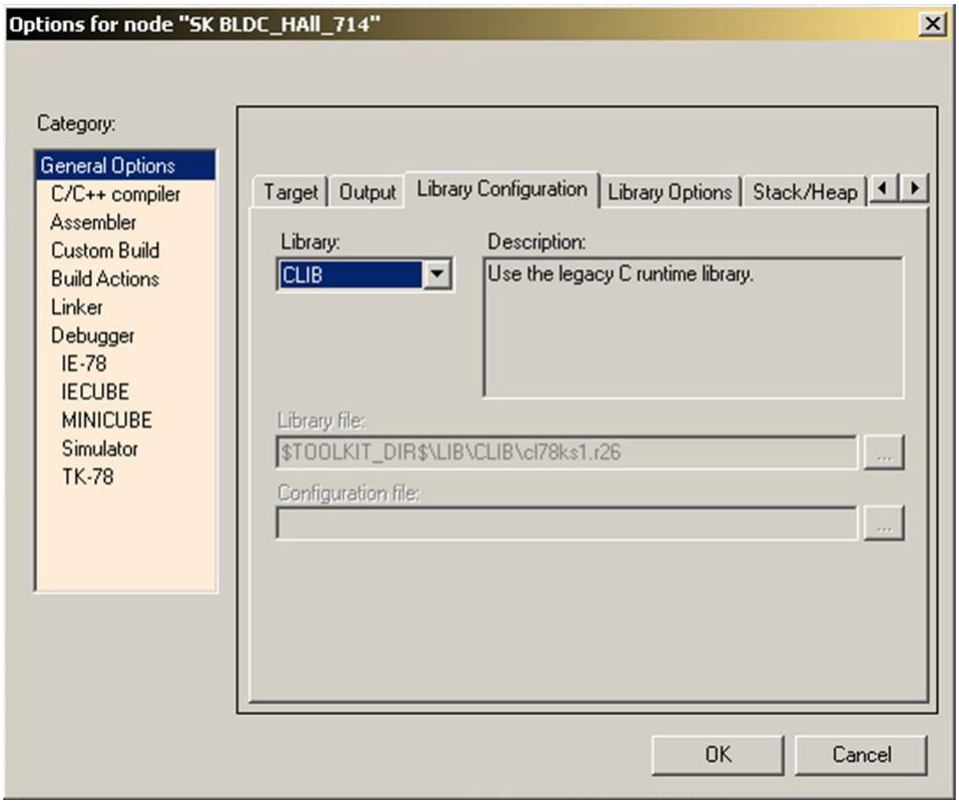

Figure 8-10 General Options – Selecting the C-Library

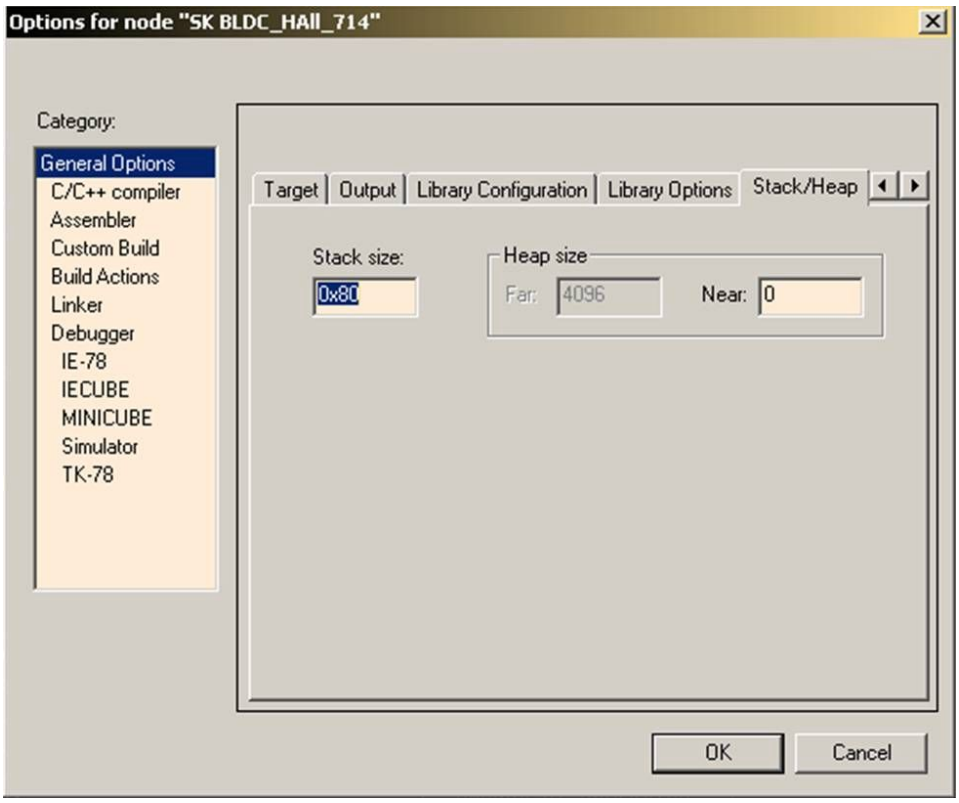

Figure 8-11 General Options – Setting the Stack and Heap

8.4 Compiler Options

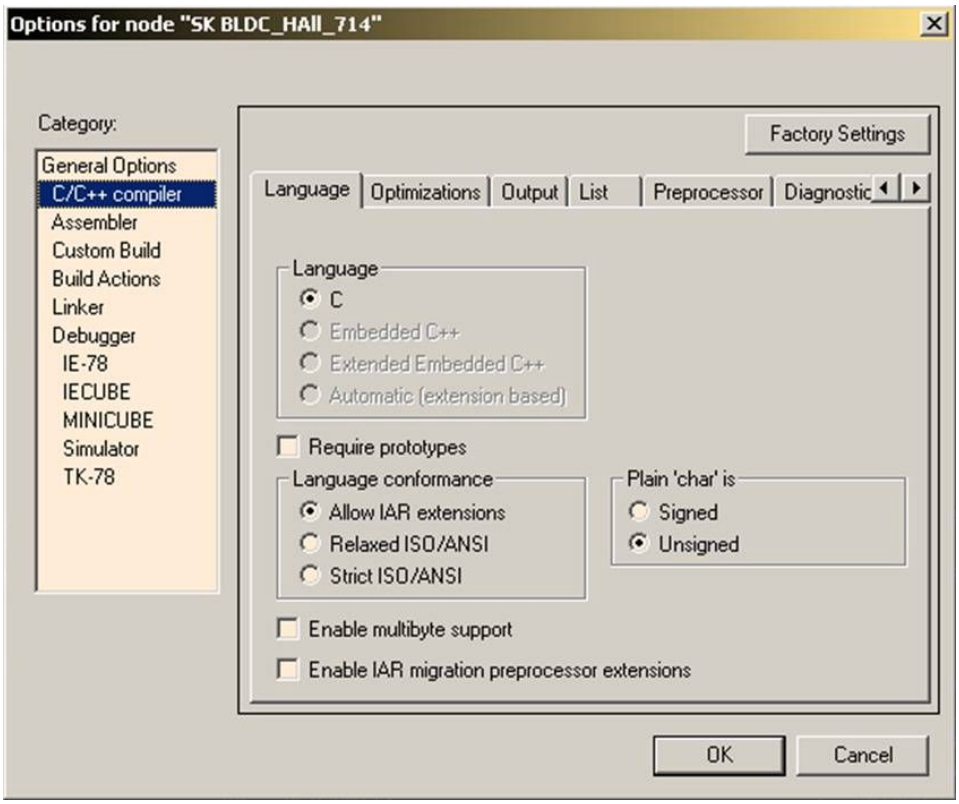

Figure 8-12 Compiler Options – Language Settings

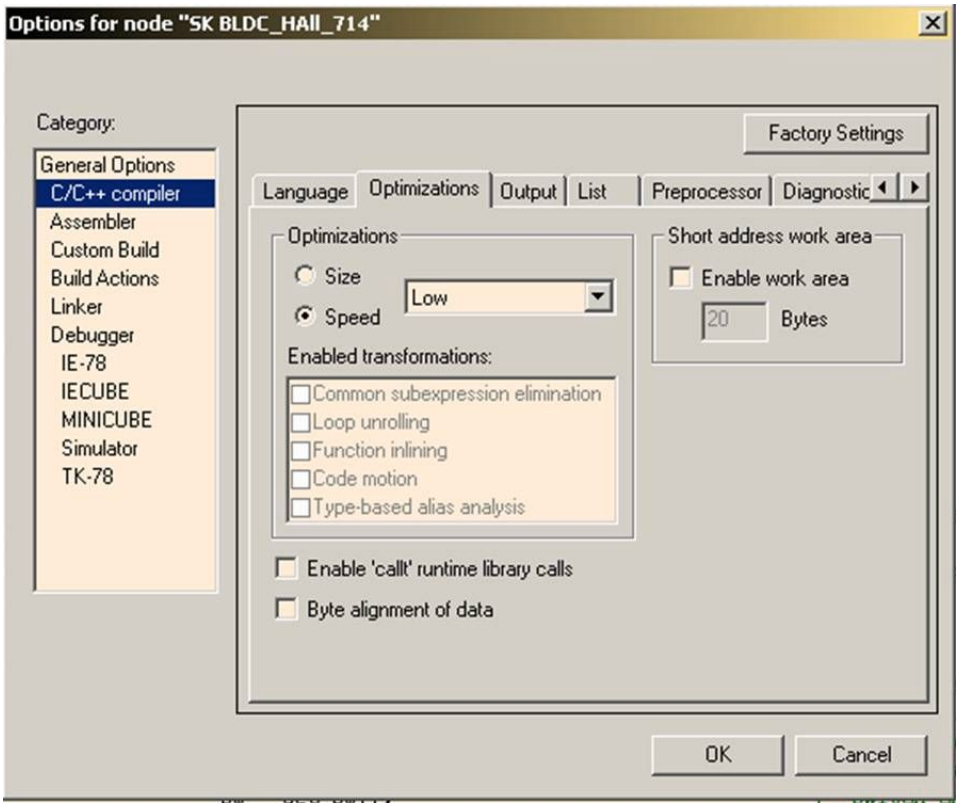

Figure 8-13 Compiler Options – Optimisation

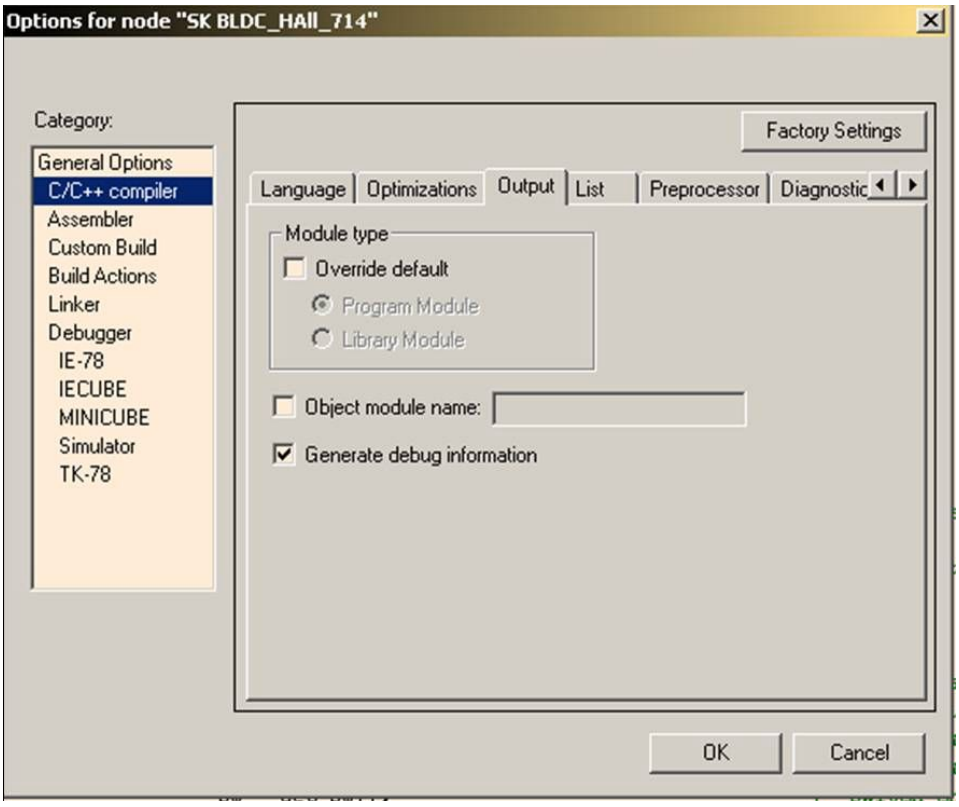

Figure 8-14 Compiler Options – Output Set for Debug

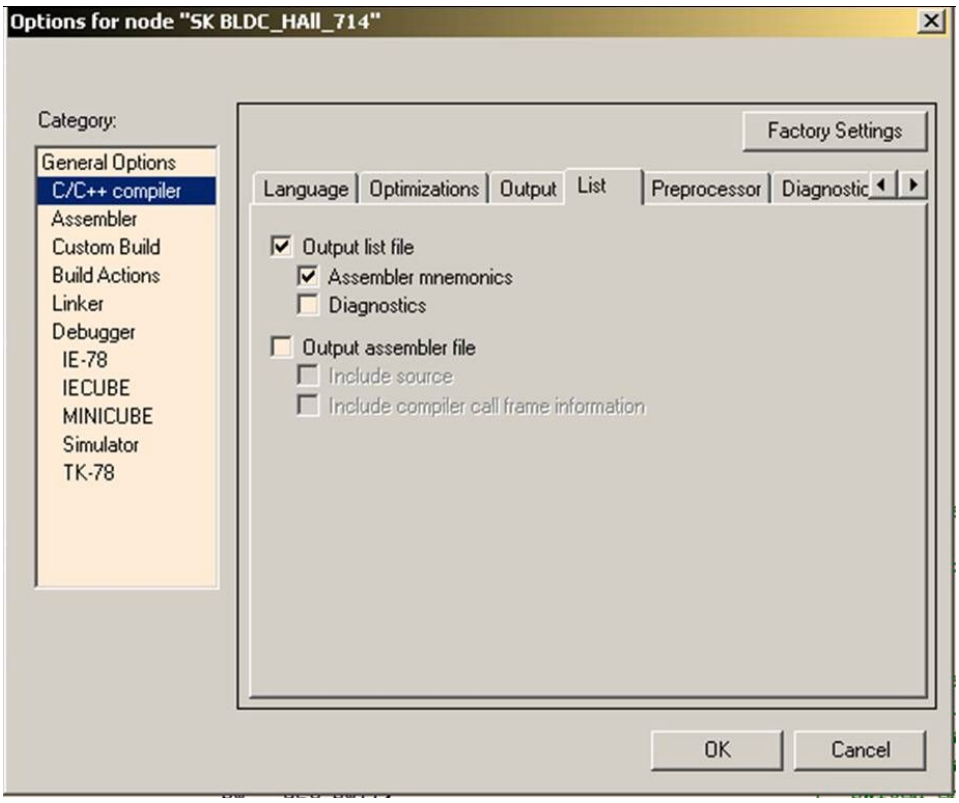

Figure 8-15 Compiler Options – Compiler Listings

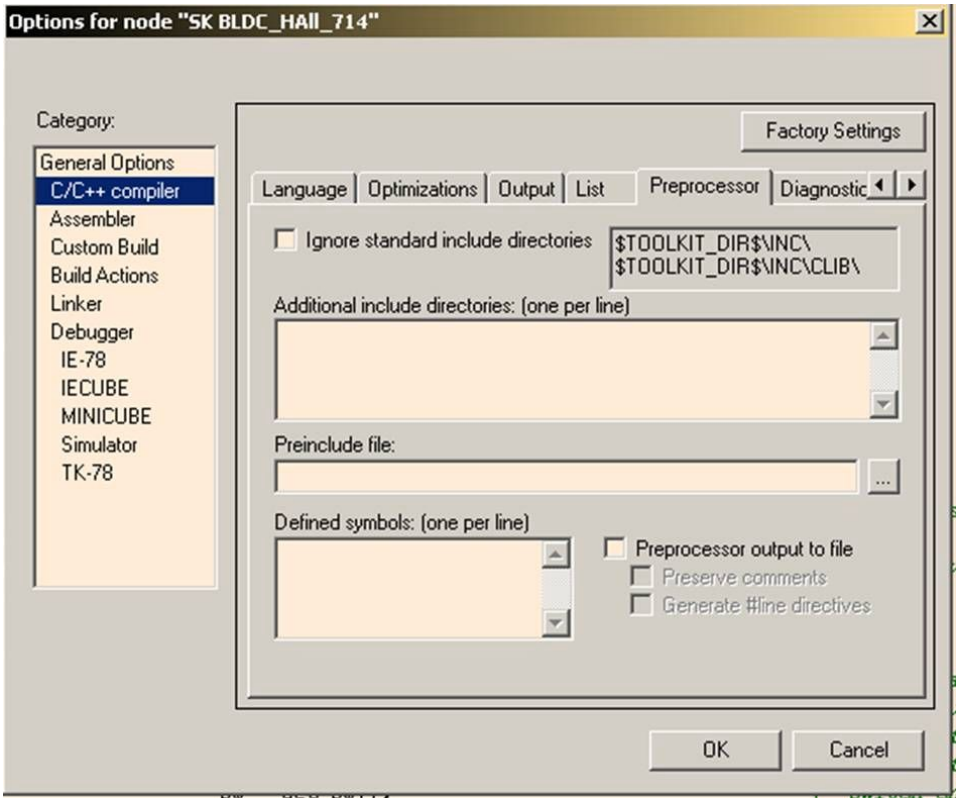

Figure 8-16 Compiler Options – Pre Processor Settings

Note All other Compiler Options settings can be remain as the default settings.

8.5 Assembler Options

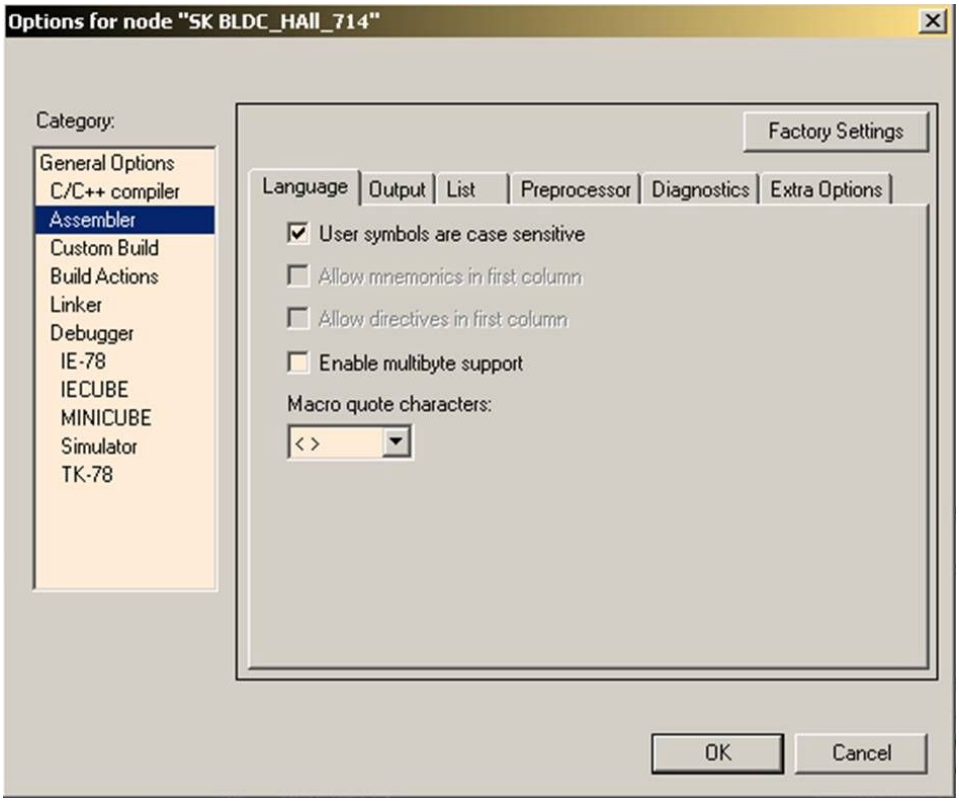

Figure 8-17 Assembler Options – Language Settings

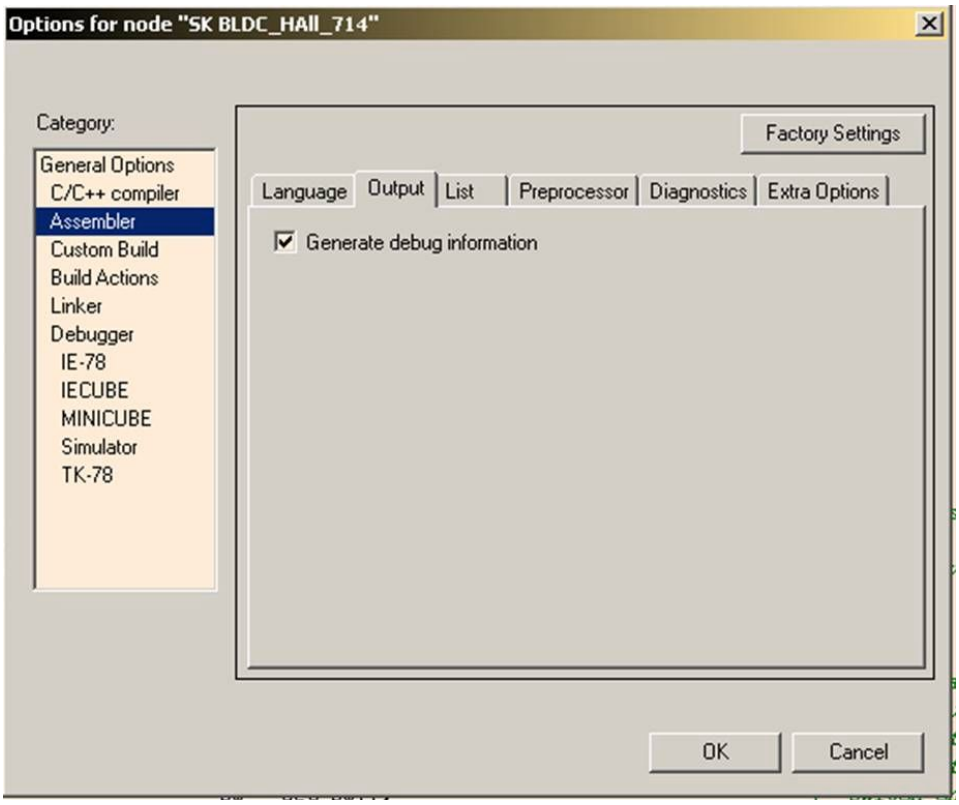

Figure 8-18 Assembler Options – Output set for Debug

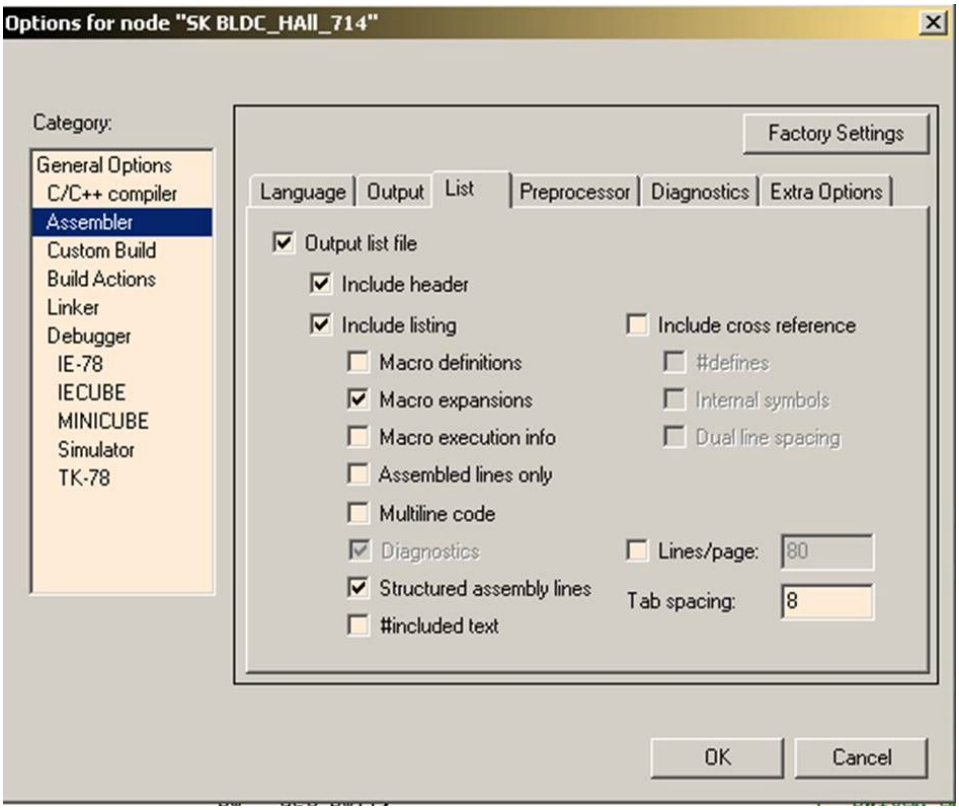

Figure 8-19 Assembler Options – Listings

Note All other Assembler Options can be left as the default setting.

8.6 Linker Options

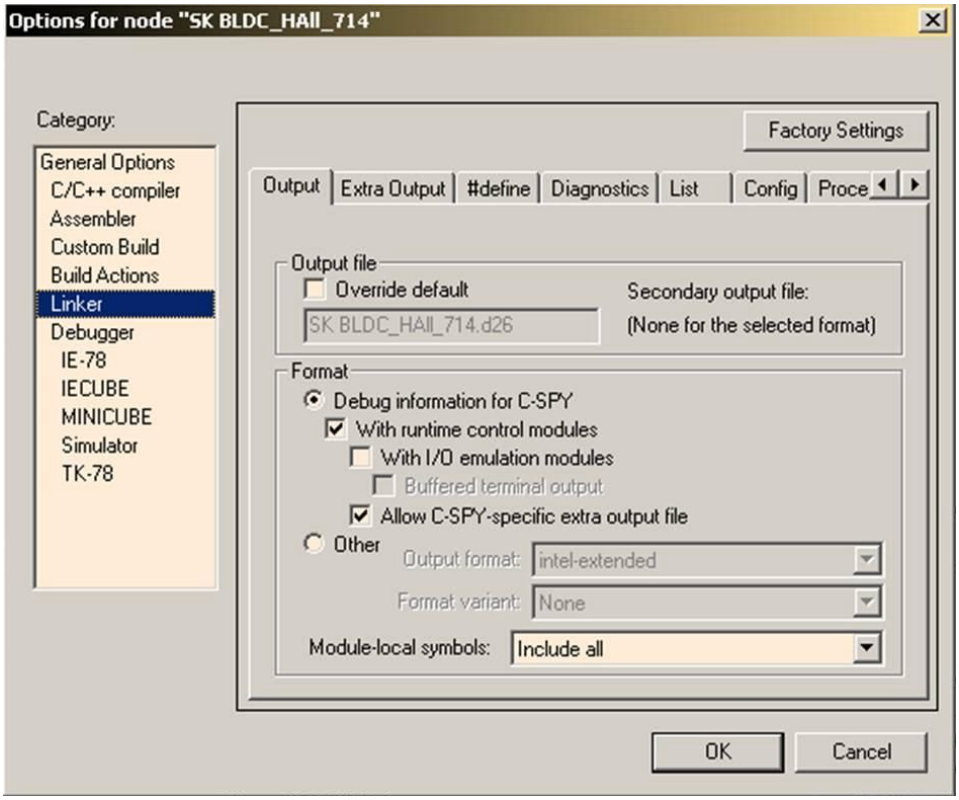

Figure 8-20 Linker Options – Primary File Output

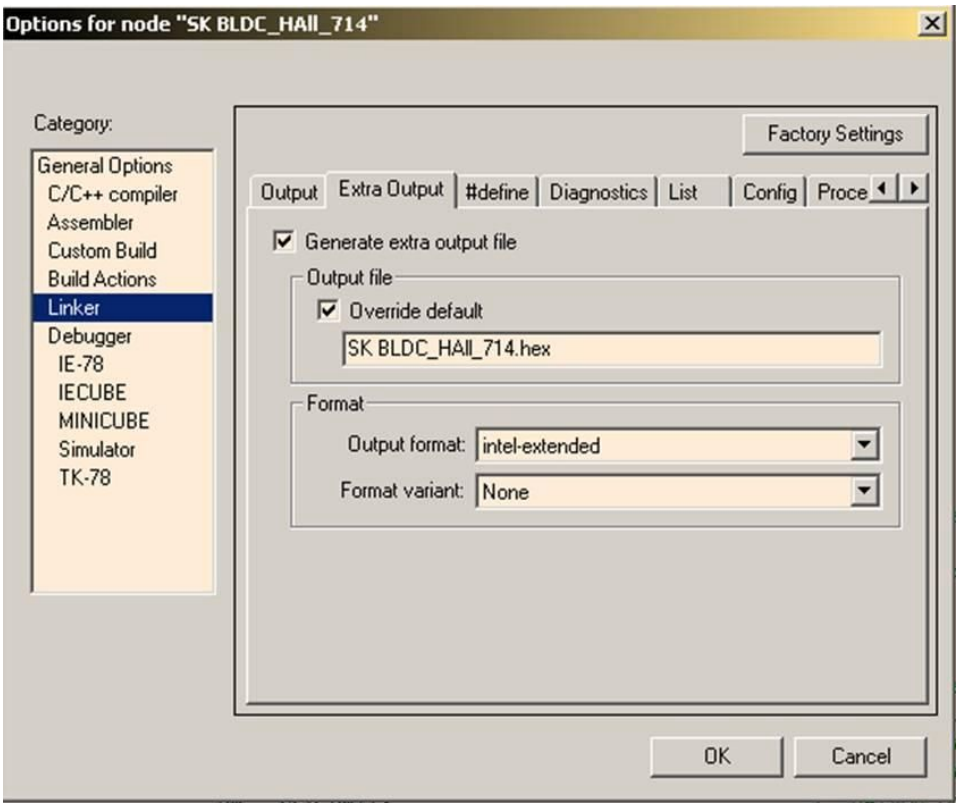

Figure 8-21 Linker Options – Secondary File Output

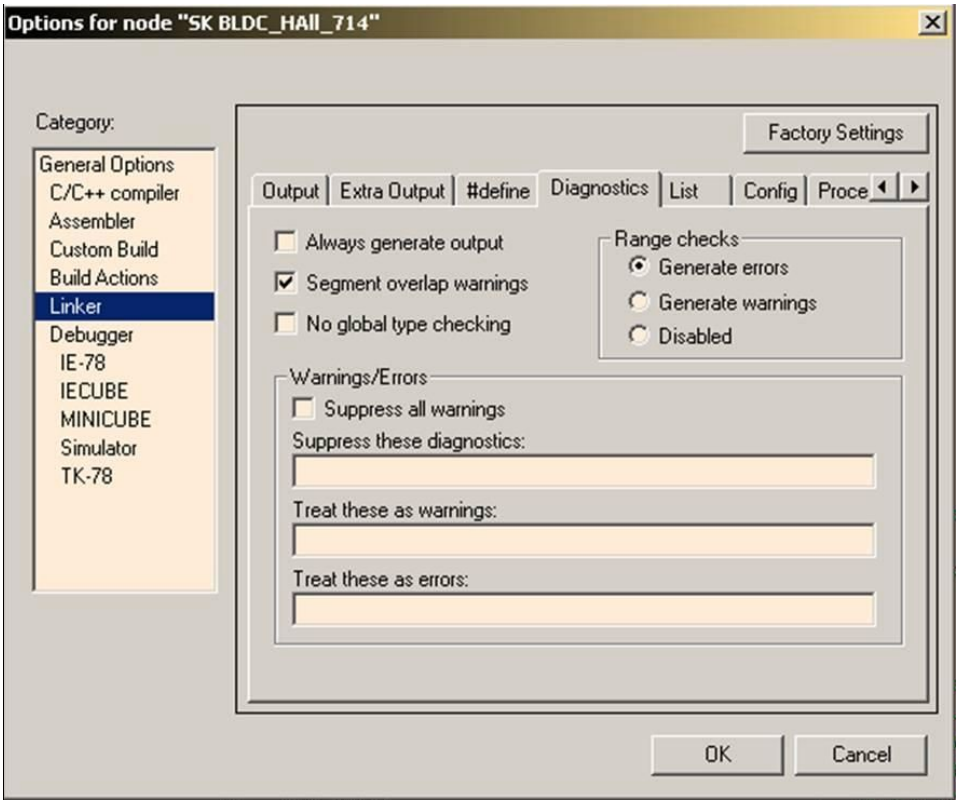

Figure 8-22 Linker Options – Diagnostic settings

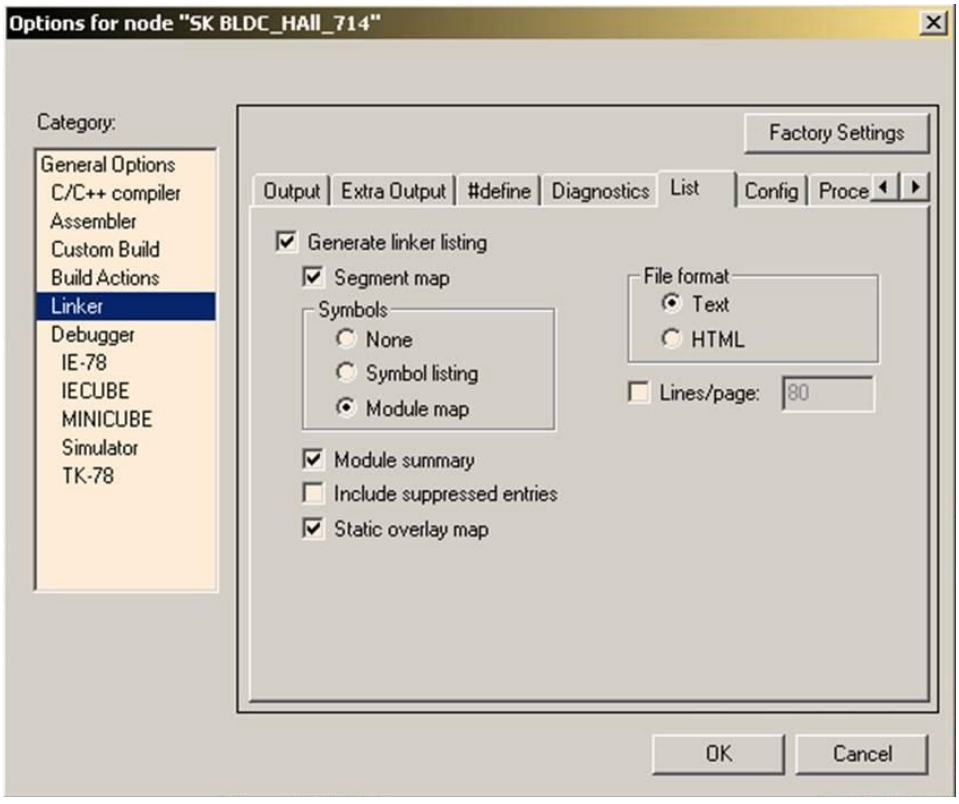

Figure 8-23 Linker Options – Generate MAP File Output

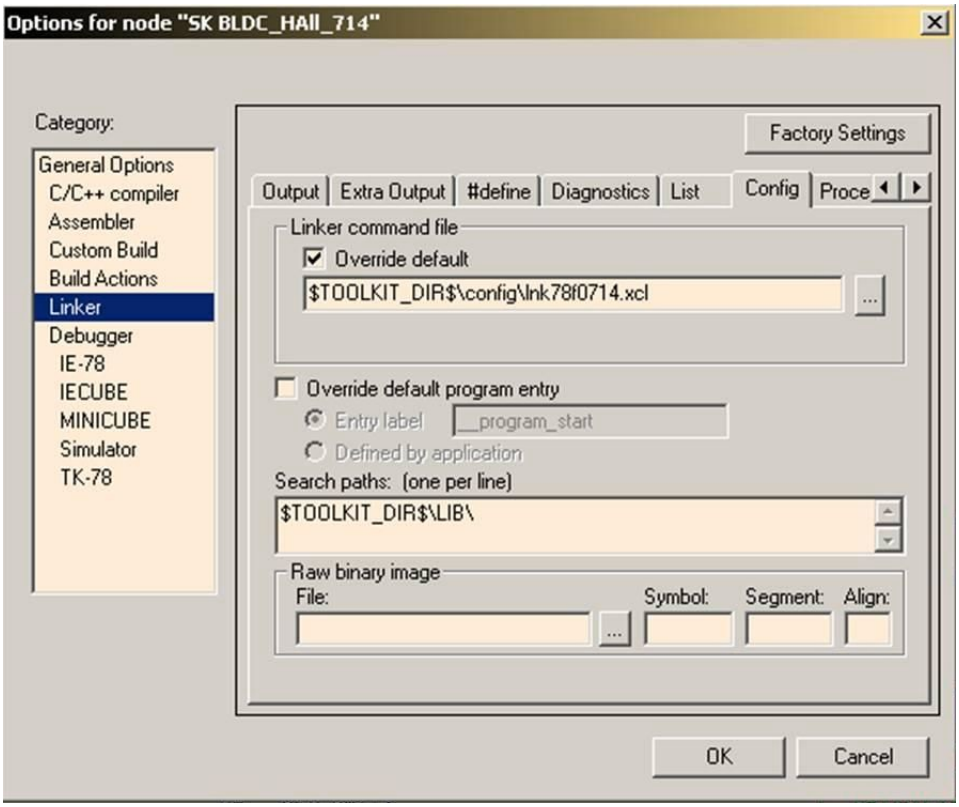

Figure 8-24 Linker Options – Linker Command File Selection

Note The Linker Control File must match the device selected.
The remainder of the Linker setup can be left as the default setting.

8.7 Integrated Debugger Selection

Note The Extra Option section can be ignored.

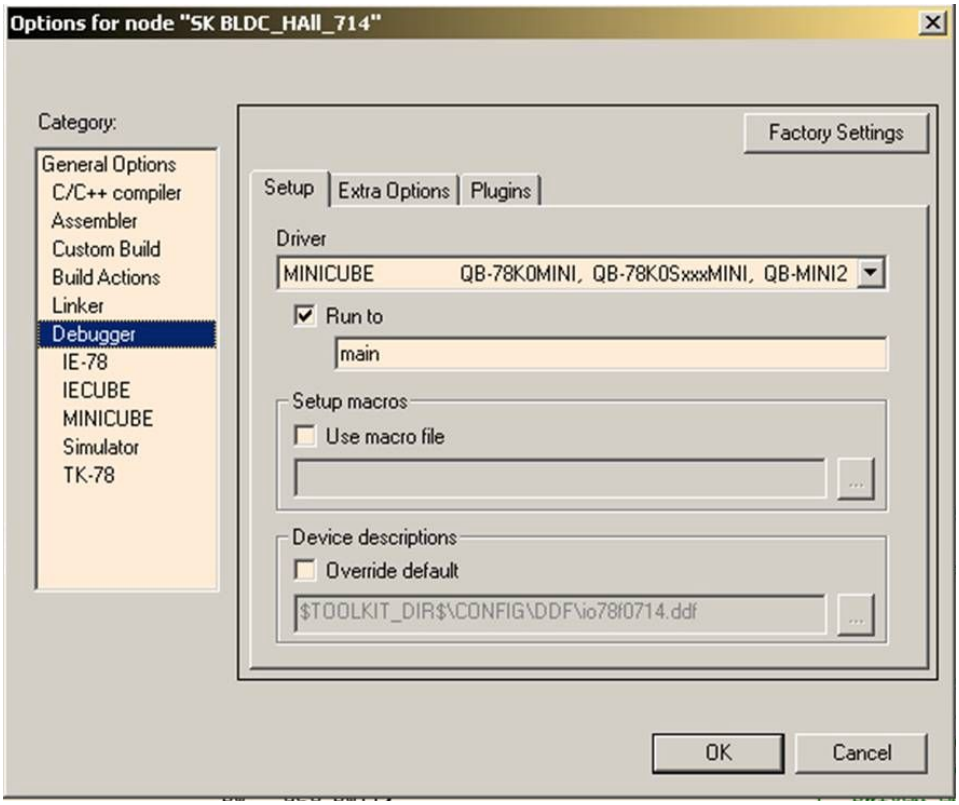

Figure 8-25 Integrated Debugger Selection

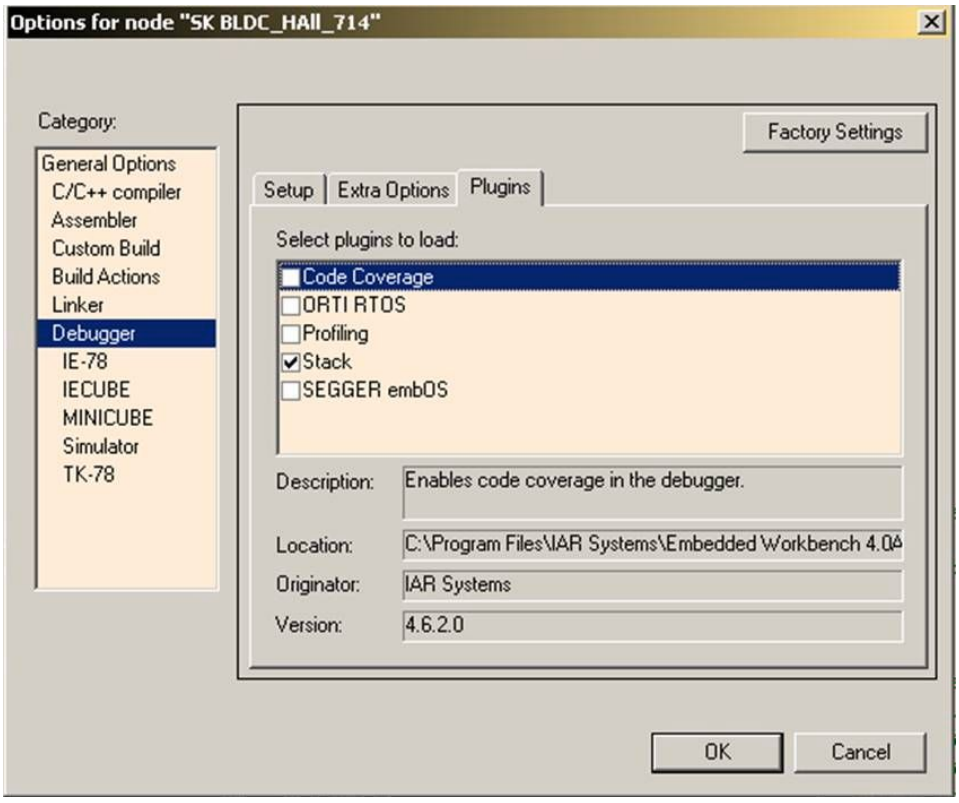

Figure 8-26 Integrated Debugger - Plug-in Selection

8.8 Workspace and Project Setup if the example is not compatible with the installed IAR workbench

- Set a new workspace
  File -> New -> Workspace

- Create a new Project
  Project -> Create New Project -> Select "Empty Project" -> "OK"

  Enter a project name and set the location for the project
  (This can be the same location as the downloaded example software or a new location)

- Add the Source files to the project
  - C Source Files
    Project -> Add Files

    Locate and select all the C source files
    - **Main.c**
    - **Fault.c**
    - **Carrier.c**

      Press "OPEN"

  - Repeat the operation for the Assembler file
    Project -> Add Files

    When the Selection window opens select
    Files of Type -> Assembler Files

    Select the assembler file
    - **SEC_OPT.s26"**
      Press OPEN"

All these file should now appear in the Project Window (Left Hand Side of the IDE), as shown previously.

8.9 Build / Rebuild the Project

To build the project press the “make” icon in the task bar as shown below:

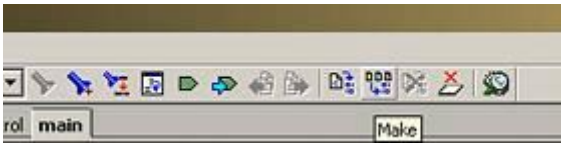

Figure 8-27 Make Button

The build results and any errors or warnings will be displayed in the Messages window at the bottom of the IDE. These should be corrected before moving on to the Debugging section.

8.10 Debugging

Once the project has been built without errors the user can now start the debugging session.

This is done by pressing the "Debug" icon in the task bar.

Figure 8-28 Start the Debug Session

The debugger will connect to the OCD unit and download the code to the Flash memory on the microcontroller board.

Once downloaded the debugging window will open as shown below in *Figure 8-29* .

Note The IAR embedded Workbench provides an integrated debugger, so the debugging window opens as part of the IDE.

If the debugger is run for the first time in a new project the following set up window will open. This is to set the basic function of the debugging hardware (i.e. Mini Cube or IECube etc.).

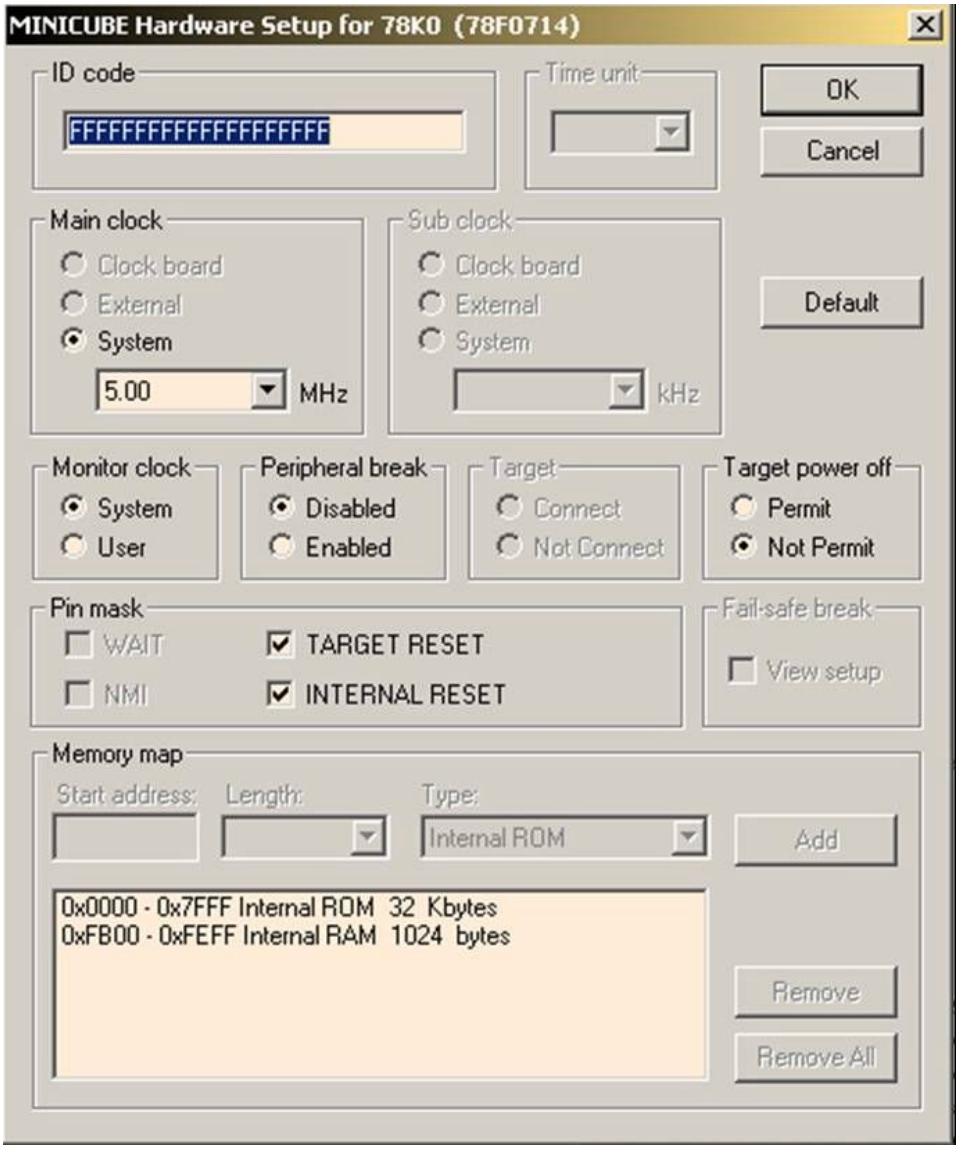

Figure 8-29 Debugging – Initial Hardware Setup

Ensure that the settings are as defined above.

Note If the Main Clock shows the “Clock board” detected, then ensure that this is selected.

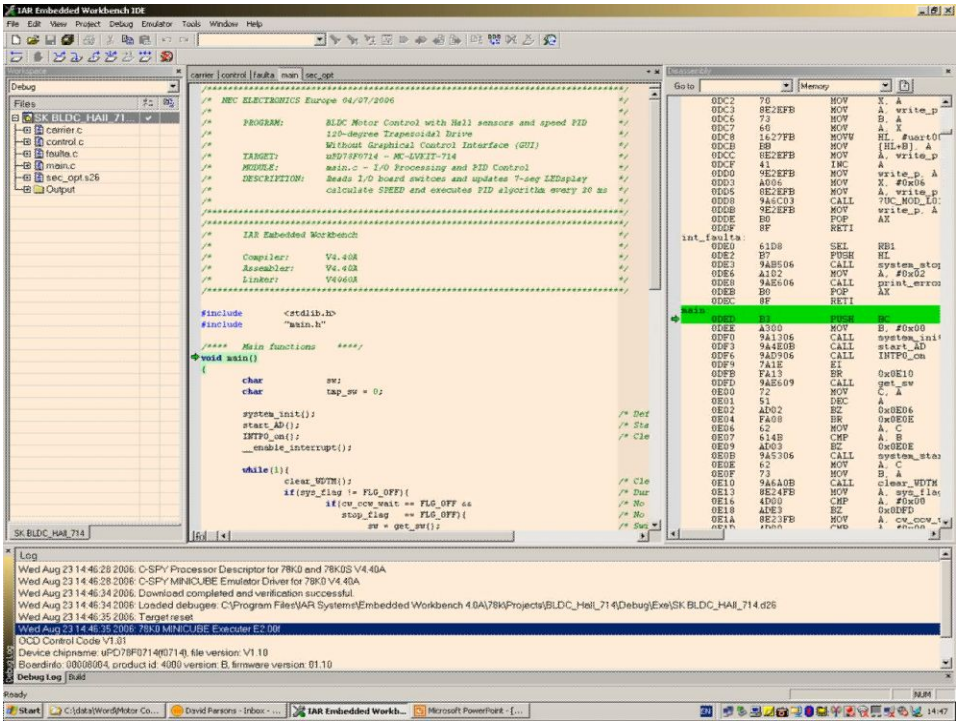

Figure 8-30 Integrated Debugger - Main Window

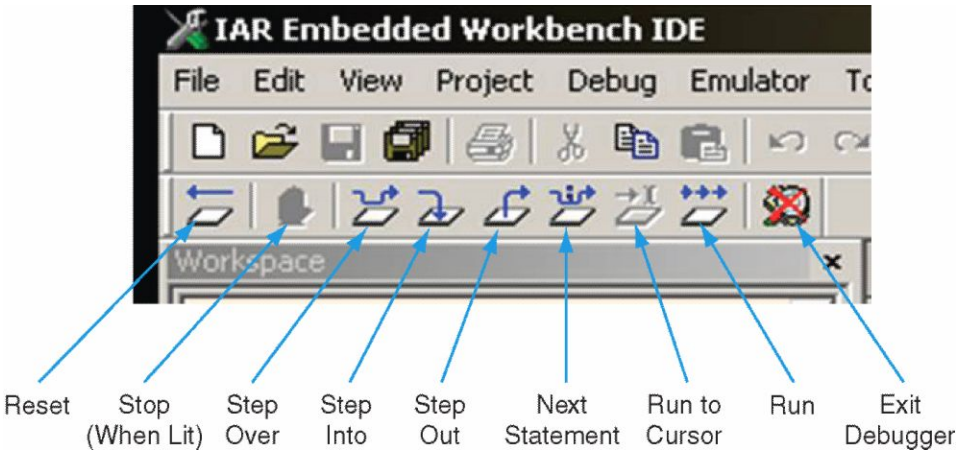

Figure 8-31 Debugger Task Bar Icons

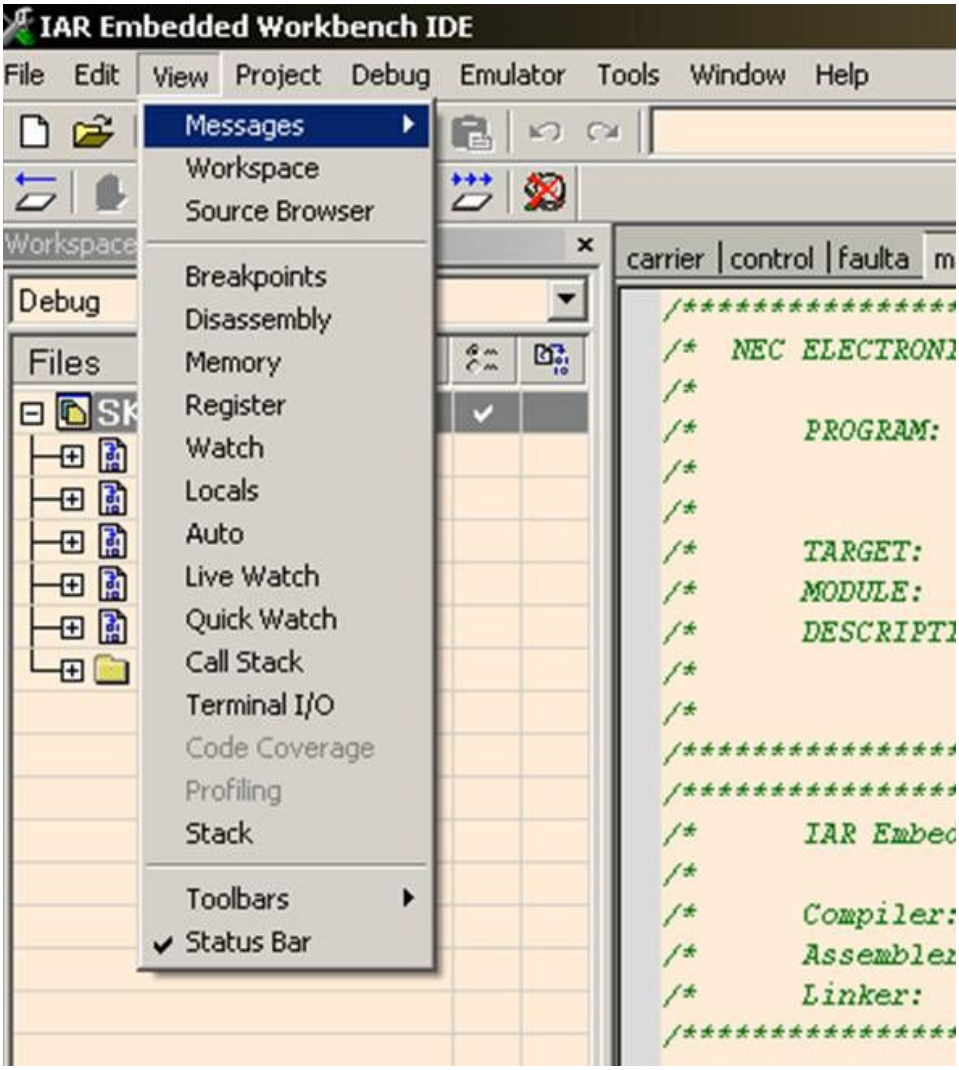

Figure 8-32 Debug Menus

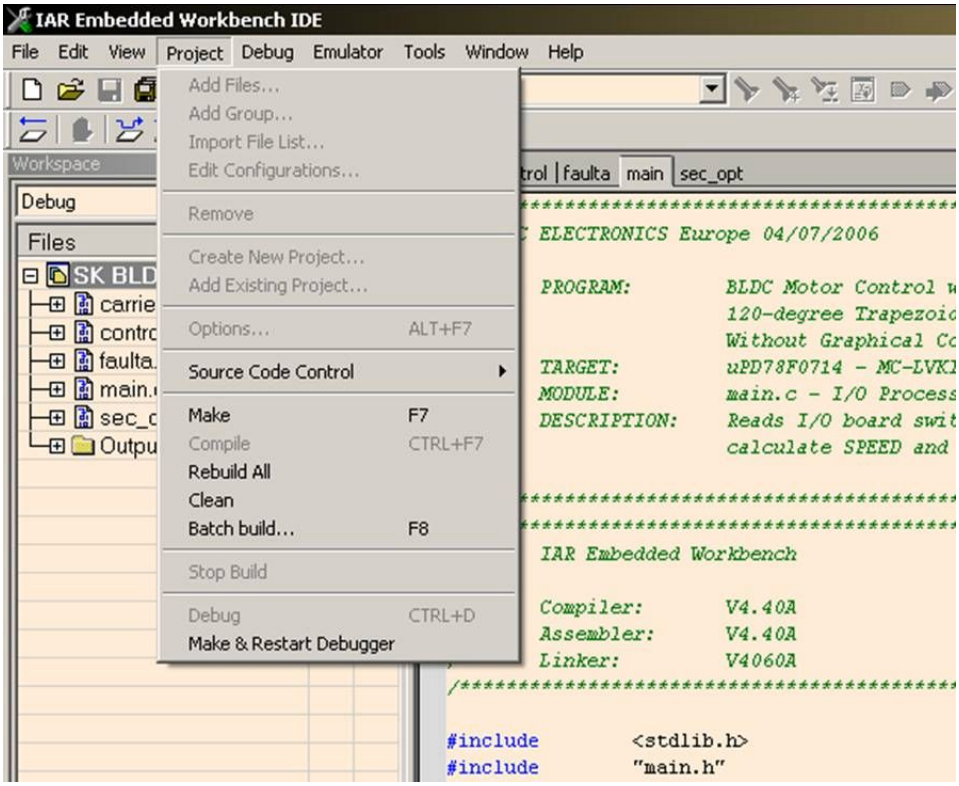

Figure 8-33 Debug Views Windows

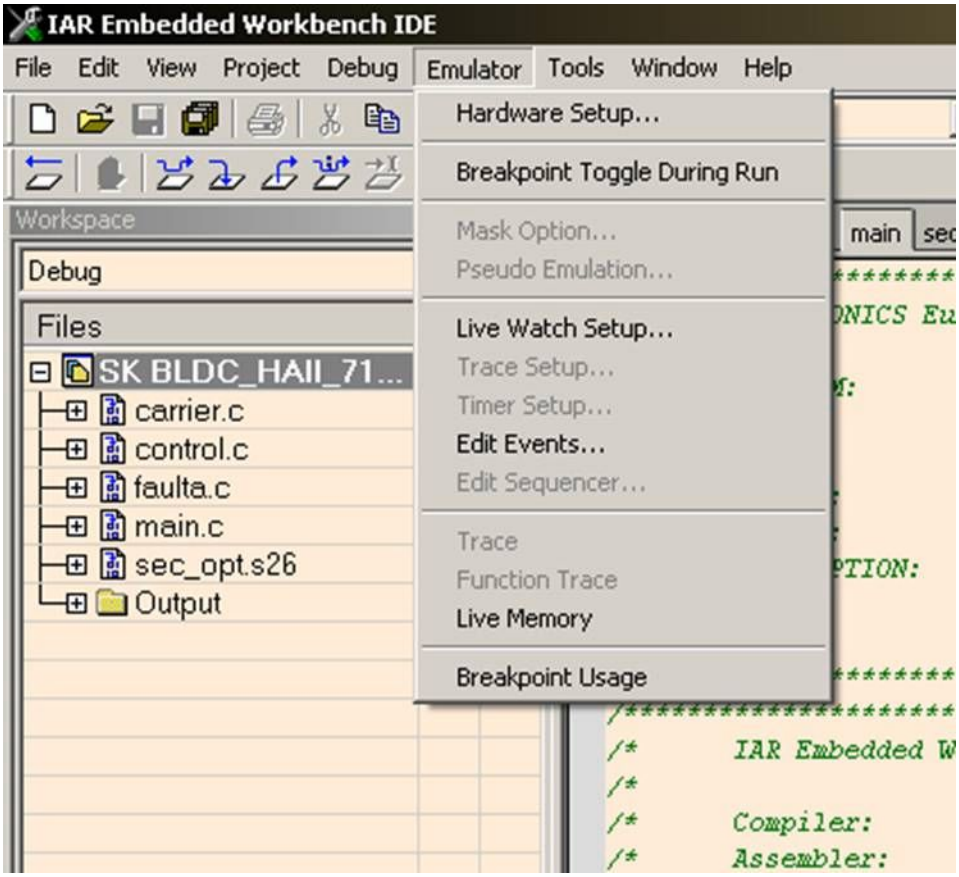

Figure 8-34 Emulator Debug Options

Note The "Live Watch" does not operate in real time on the On Chip Debug Unit.