MINI-MAX/51-C2

Single Board Computer

Quick Start Guide

Date: 14 August, 2008
Document Revision: 1.01

BiPOM Electronics

16301 Blue Ridge Road, Missouri City , Texas 77489
Telephone: 1-713-283-9970. Fax: 1-281-416-2806
E-mail: info@bipom.com
**Web: www.bipom.com**

Package Contents

MINI-MAX/51-C2 Micro-controller Board
NULL Modem Serial cable
6VDC Power Supply

1 Hardware Setup

1. Place the MINI-MAX/51-C2 Microcontroller board on a clean, non-conductive surface.

2. Connect the provided 6VDC power supply plug to the power jack on the MINI-MAX/51-C2. Do not connect the power supply to the outlet yet.

CAUTION: Do not use a power supply other than one that is supplied or approved by BiPOM Electronics. Use of another power supply voids the warranty and may permanently DAMAGE the board or the computer to which the board is connected !!!

4. Connect the MINI-MAX/51-C2 to an available serial port on the PC using the supplied serial cable as shown below.

5. Connect the 6VDC power supply to a suitable wall outlet.
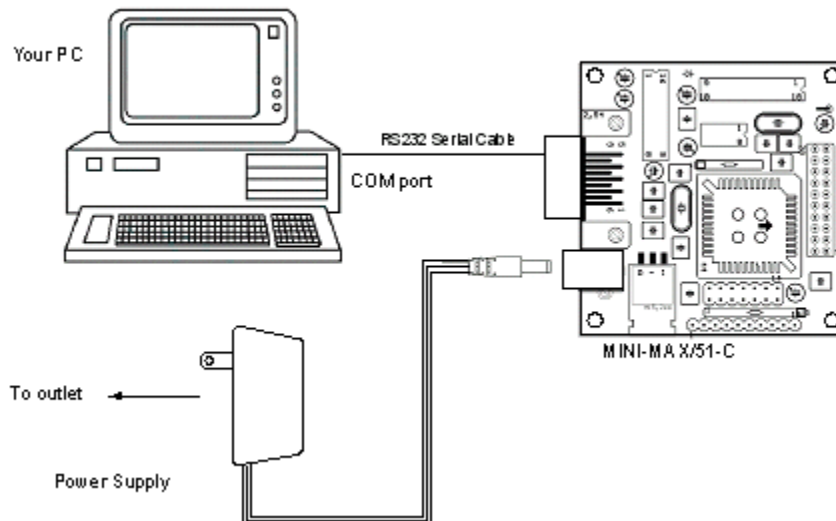
2 Software Installation

MINI-MAX/51-C2 supports various programming languages such as Assembly, C or BASIC.

Virtually any programming package that supports the 8051 microcontroller can be used. Additionally, BiPOM offers the following popular packages:

l   Micro C 8051 Development System C Compiler
l   SDCC C Compiler
l   BASCOM-51 BASIC Compiler

All these packages are built around Micro-IDE, BiPOM's popular Integrated Development System for Microcontroller development.

2.1 Micro C
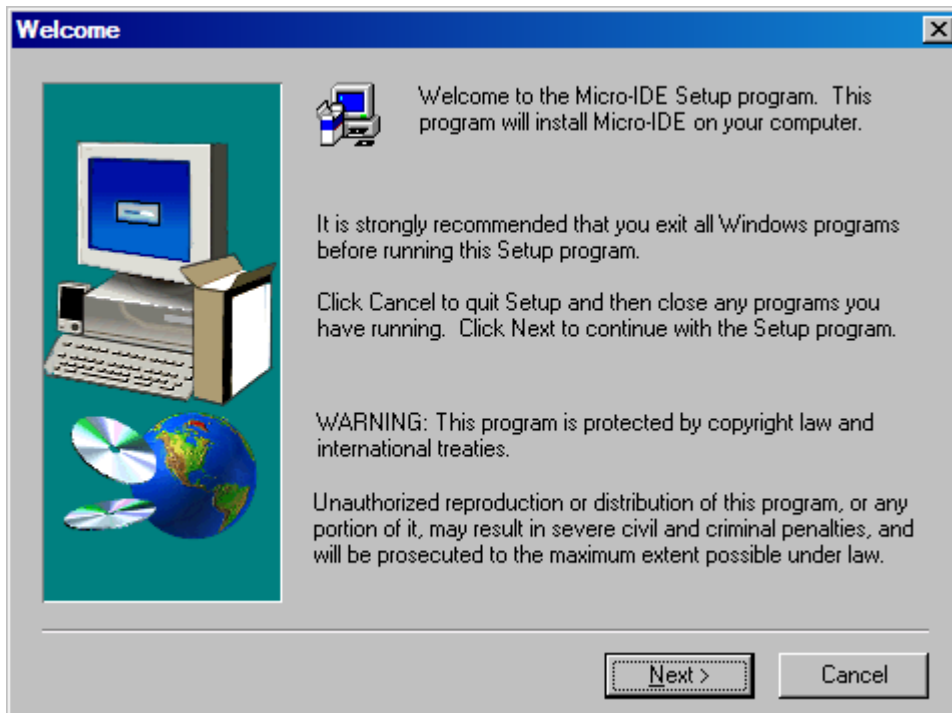
Skip this section if you will not be using Micro C.

2.1.1 Installing Micro C 8051 Development System (Micro-IDE with Micro C Compiler)

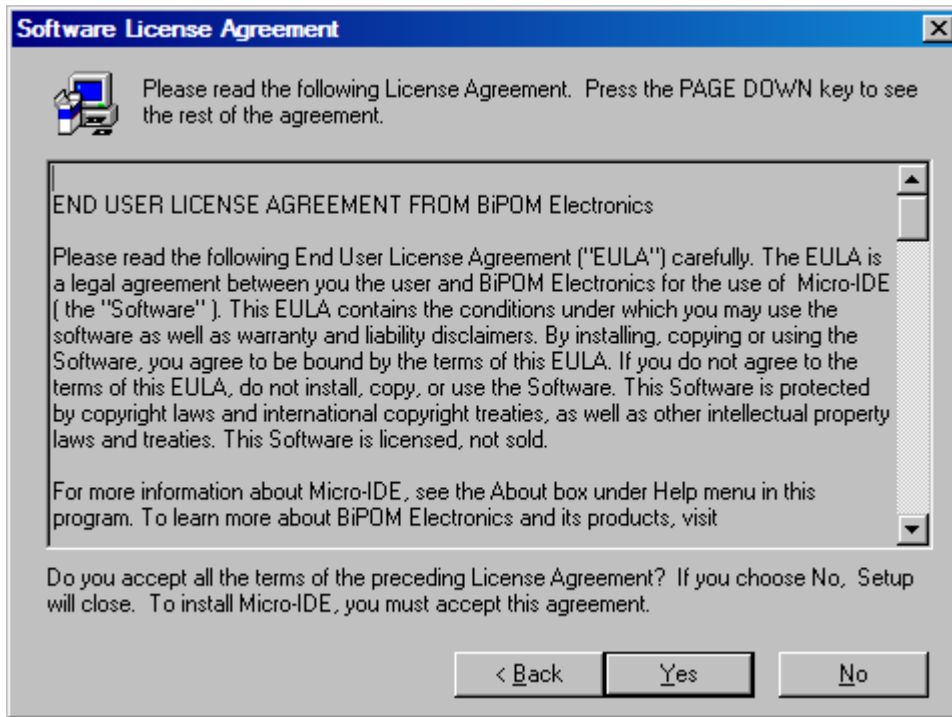Download Micro C 8051 Development System from:

http://www.bipom.com/8051dev.php

Open the zip file 8051dev.zip and install by running setup.exe.
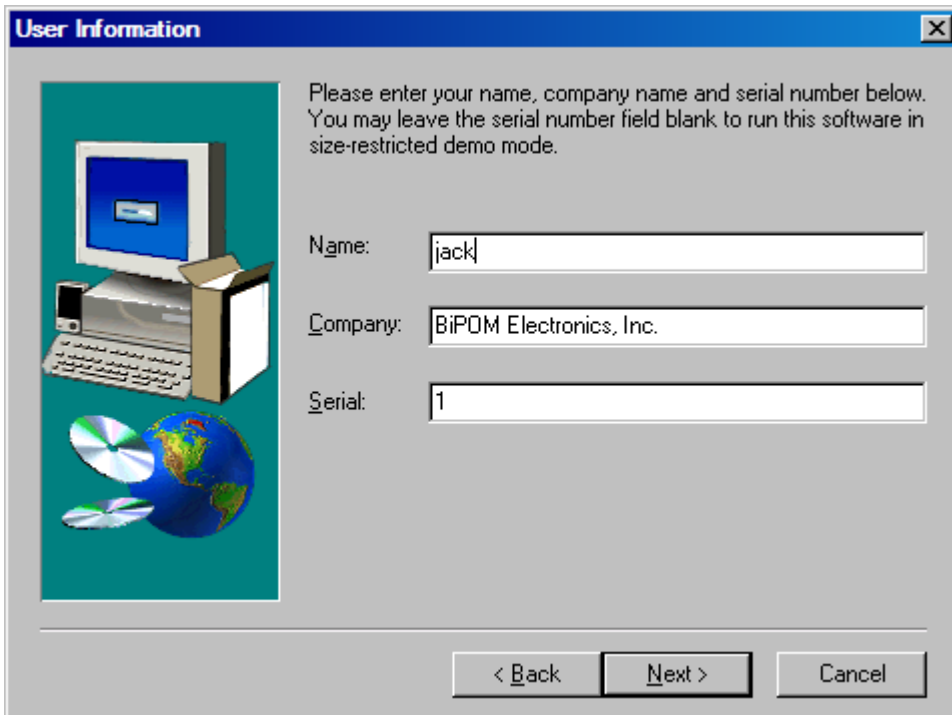
A Welcome screen will appear:

Click on Next. End User Agreement will appear:

Please read the agreement and click Yes if you wish to continue with installation. Click Yes twice, once for Micro-IDE License and once for Micro C License.

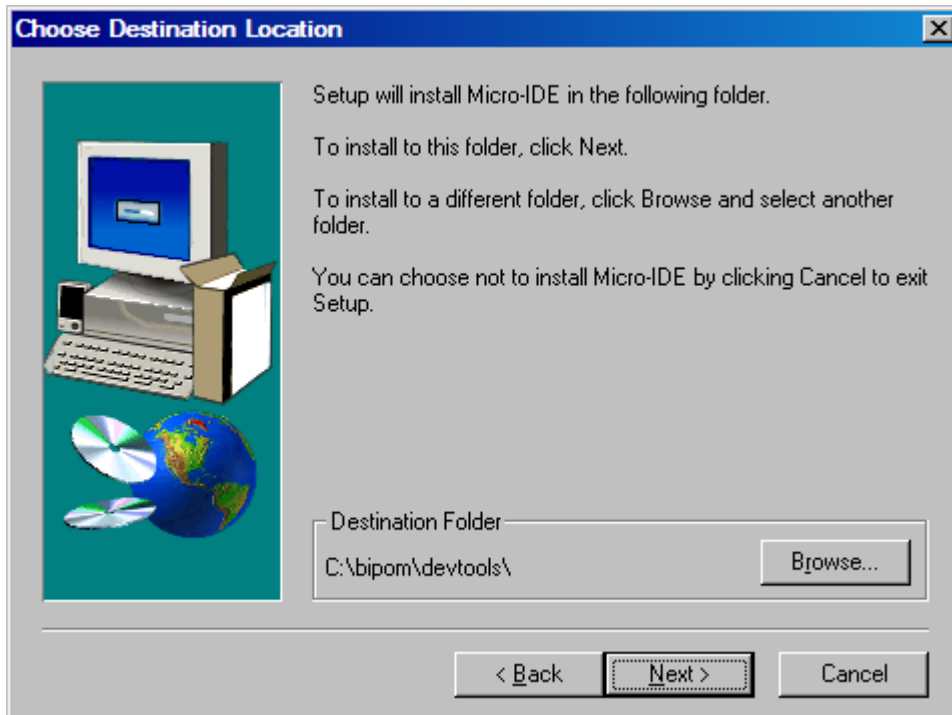Enter your name, company (if applicable) and serial number:

If you have already purchased license for Micro C 8051 Development System, please enter your Serial Number in the Serial field. Otherwise, you can enter a serial number of 1 to run the Micro C 8051 Development System in demo mode with reduced functionality.

Click Next. If you have entered a serial number of 1, you will be asked to confirm if you want to run in demo mode:
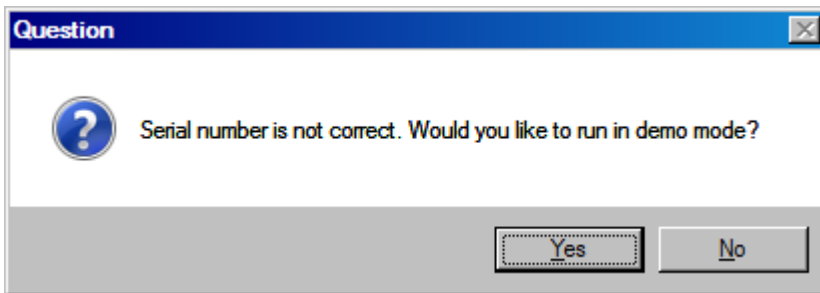

Click Yes.

Select the disk location where the software will be installed. Using the default location of c:\bipom\devtools is recommended:

Choose Destination Location

Setup will install Micro-IDE in the following folder.

To install to this folder, click Next.

To install to a different folder, click Browse and select another folder.

You can choose not to install Micro-IDE by clicking Cancel to exit Setup.

Destination Folder

C:\bipom\devtools\

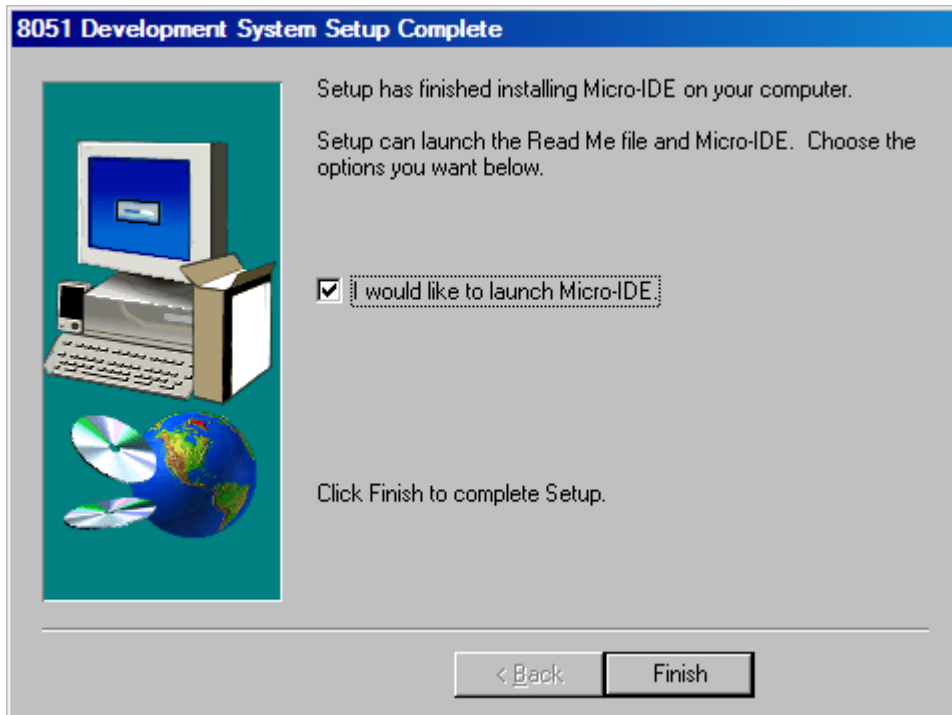Browse...

< Back   Next >   Cancel

Click Next. Select the Program Folder where the icons for Micro-IDE will be installed. Default selection is **Micro-IDE** folder.
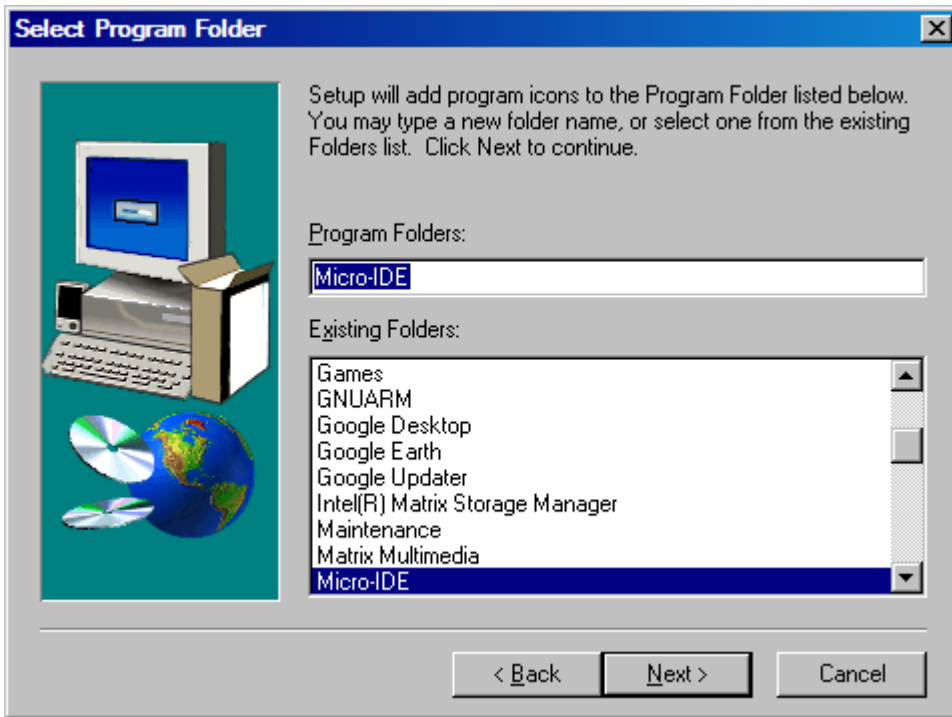
Click Next. Micro-IDE will be installed and you will see the progress:
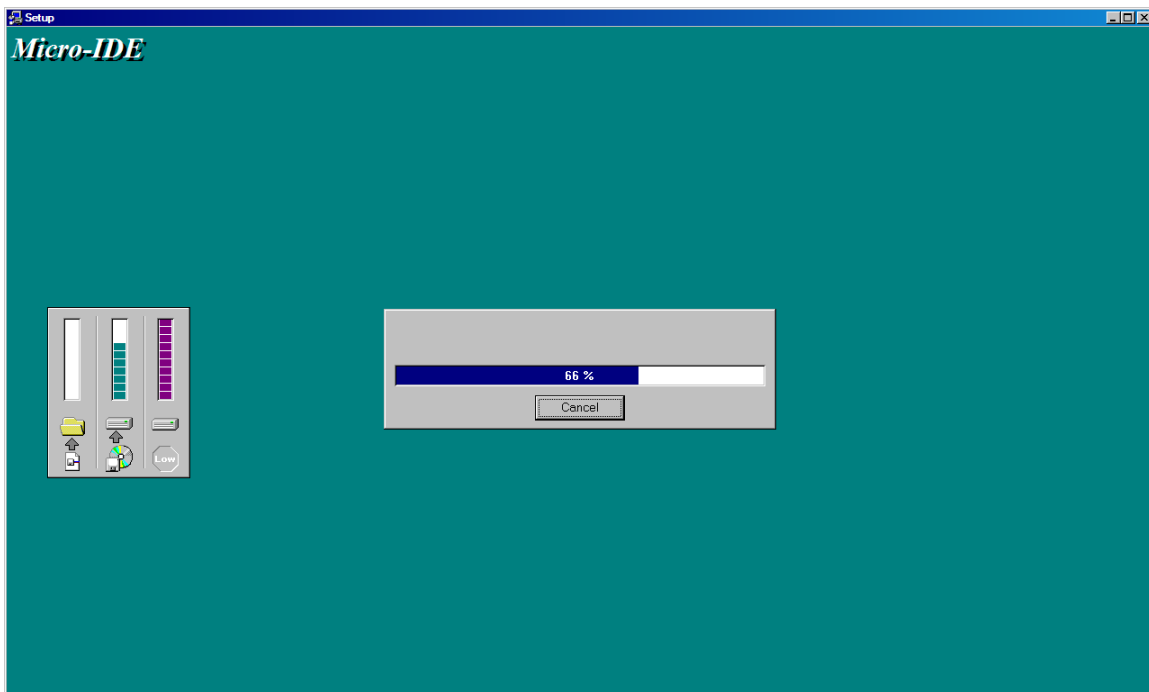
**When the installation is complete, you will be given an option to start Micro-IDE now:**

Click Finish and Micro-IDE will start.

## 2.1.2 Downloading Example Programs

After installing the software, you can build programs and download programs to the board. Follow the steps below:

1. Make sure the board is powered and connected to the PC as described in the section **Installing the Hardware**.

2. Run Micro-IDE from Windows Start menu. When Micro-IDE is started, the Project selection window appears:
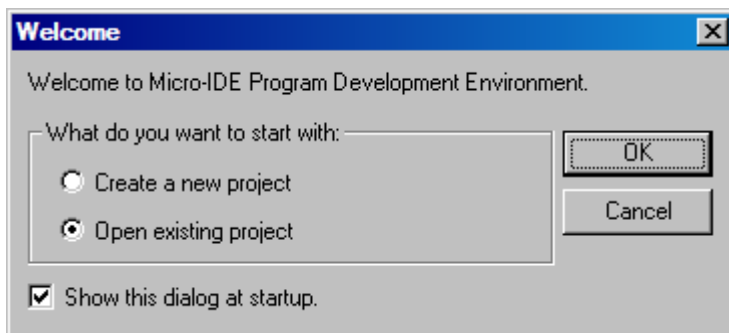

Click OK to select an existing example project.

Micro-IDE is distributed with several example programs that illustrate how to program the 8051 micro-controller. Example projects are located under the Examples folder under the folder where you installed Micro-IDE. Select Project, Open Project and change to Examples folder if you are not already there:
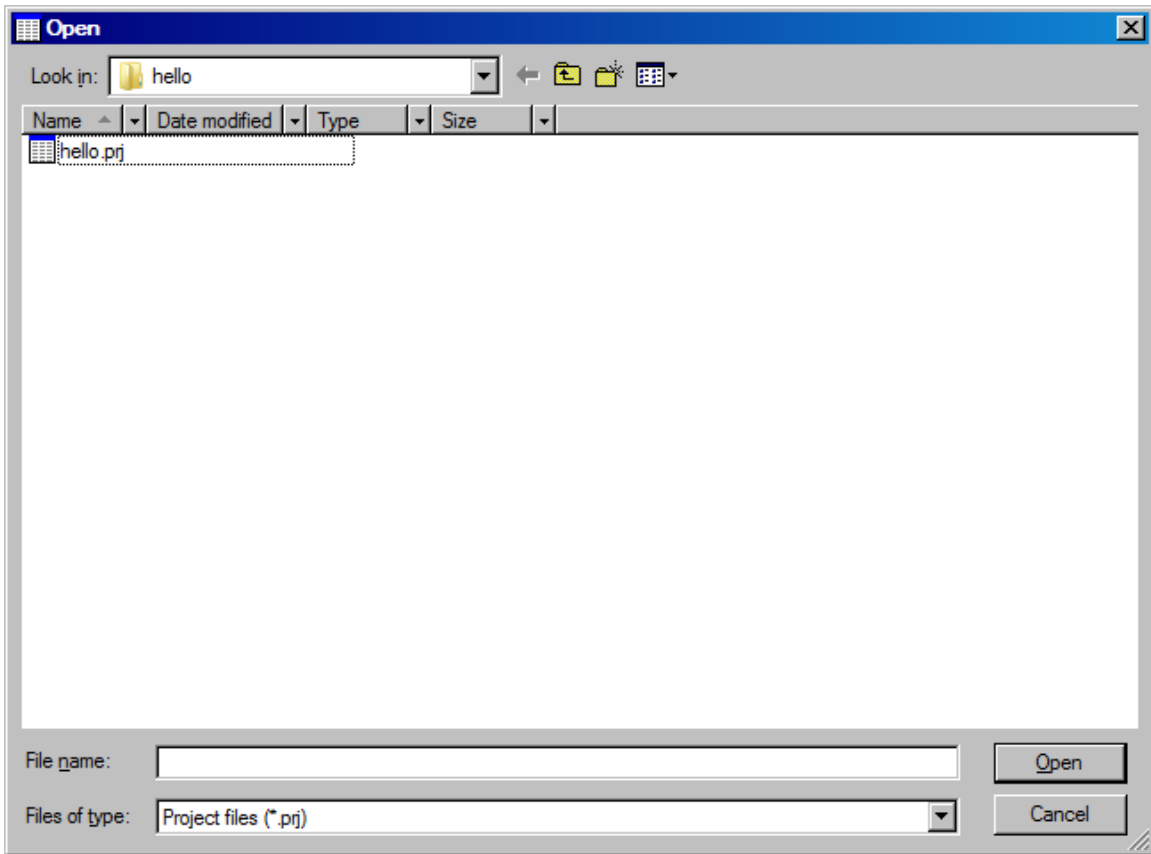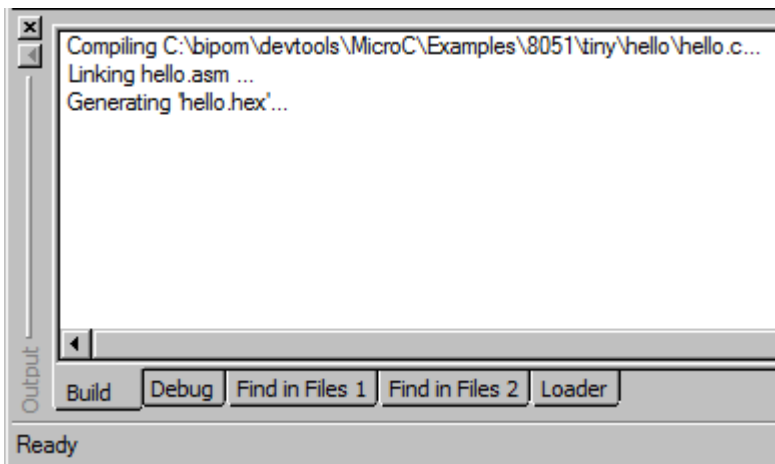
3. Open the example project Hello.prj from

C:\bipom\devtools\MicroC\Examples\8051\tiny\hello
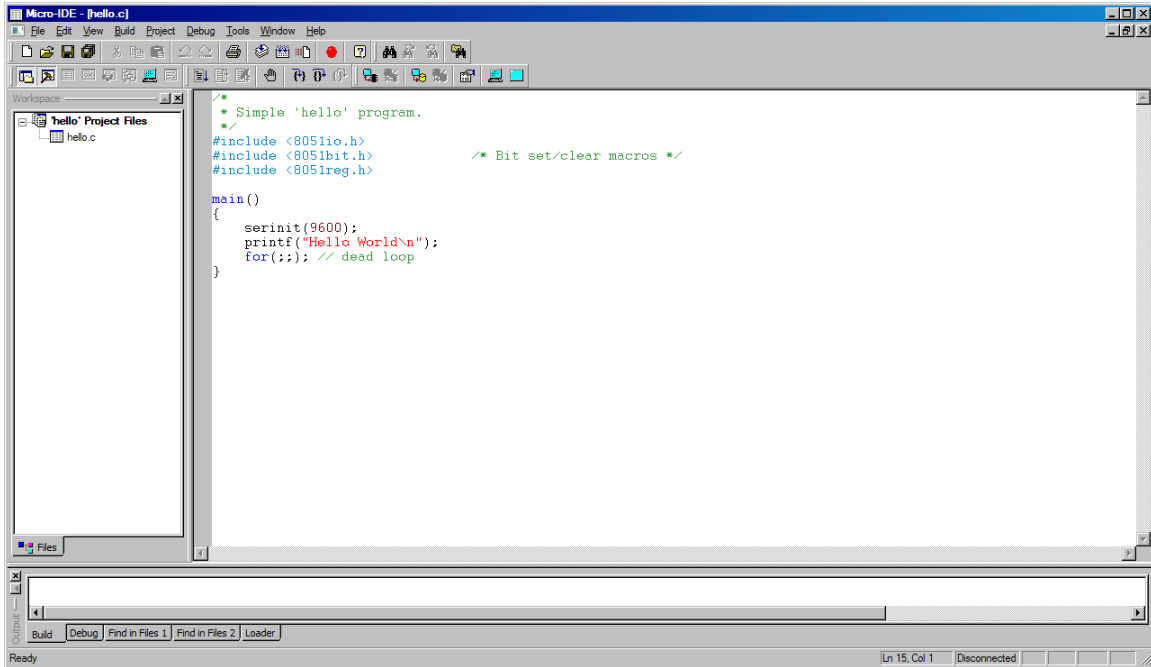
4. Click the Build button on the main toolbar. This will   build the Hello project:

Build button

If the project builds successfully, you should see a message indicating no errors on the Output Window:


```
Compiling C:\bipom\devtools\MicroC\Examples\8051\tiny\hello\hello.c...
Linking hello.asm ...
Generating 'hello.hex'...
```

5. Download the executable (hello.hex) file to the board by selecting Download under Build menu:

Download button

If the MINI-MAX/51-C2 board is powered and connected properly to the PC, a progress dialog will appear:
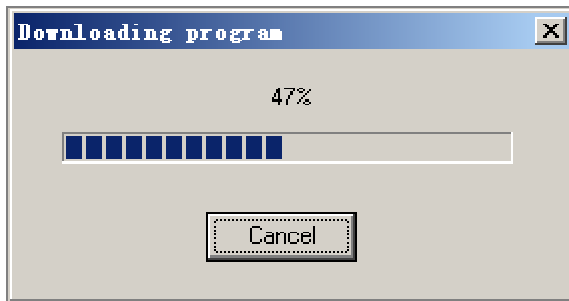
The progress dialog will disappear following a successful download. Details of the download are shown on the Output Window:
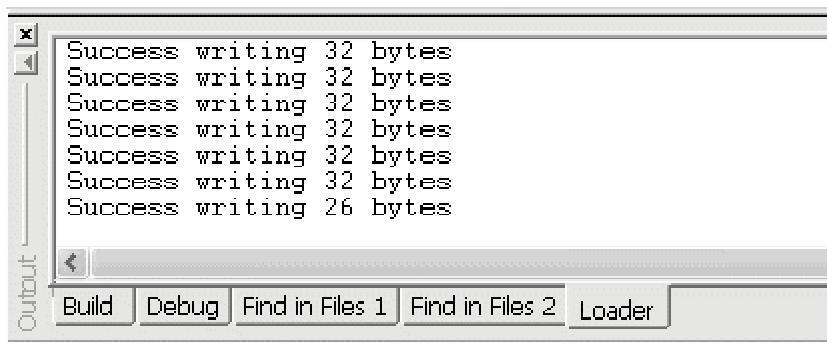
When the download is finished, the progress indicator disappears. This means that the board has received the program successfully. After the program has been successful downloaded, it can be started using the Mode button on the main Toolbar:

Mode button

Mode button puts the board into **Run** or **Program** mode. In Run mode, the microcontroller is executing the program in its memory. In Program mode, the microcontroller is in Reset state so no programs are running. In Program mode, microcontroller's flash memory can be changed and a new program can be downloaded.

The Mode button is Red in Program mode and Green in Run mode. Following a download, the Mode button will be Red. Click the Mode button to change the mode to Run mode. The program **hello.c** that you just downloaded starts executing.

You should now see the message "Hello World" being displayed on the Terminal window.

Congratulations!!! You have built and executed your first program on the MINI-MAX/51.

Click the Mode button once again so it turns Red. The board is in Program mode

### 2.1.3 Writing Your Own Programs

2.1.3.1 Creating Projects

To create your own project, select Project menu and select New Project. This will display the New Project dialog:
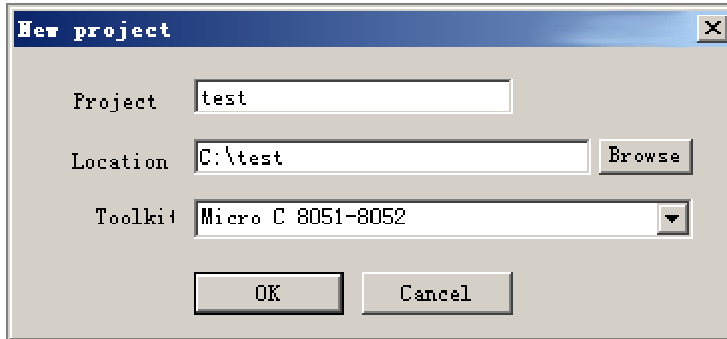
Enter the name of the new project and its location (this examples uses test as the project name and c:\test as the project location). Toolkit is already pre-selected as Micro C 8051-8052. Click OK; the new project with the name of test under c:\test will be created.
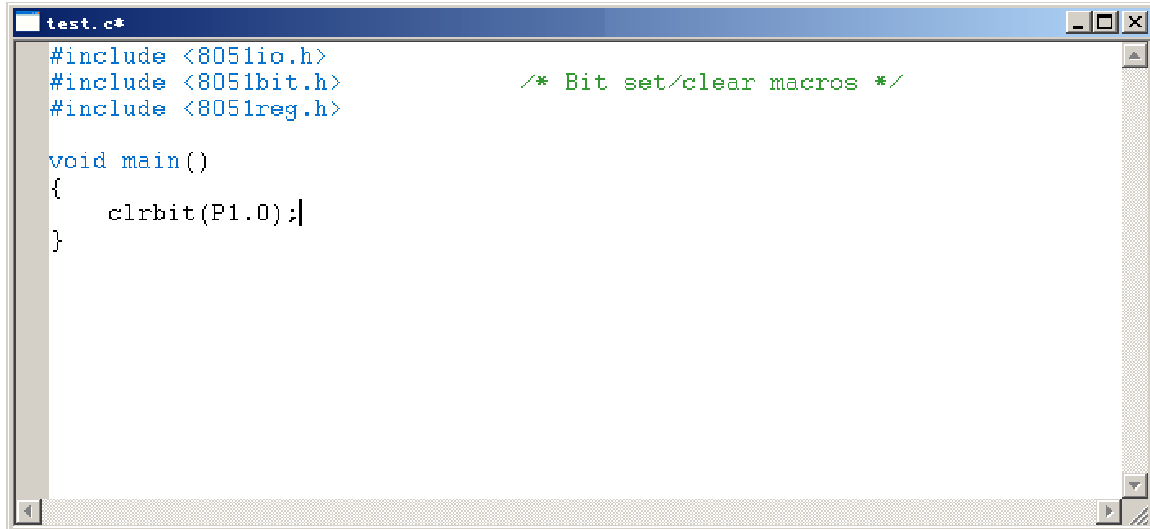
A blank C file (test.c) will be automatically created:
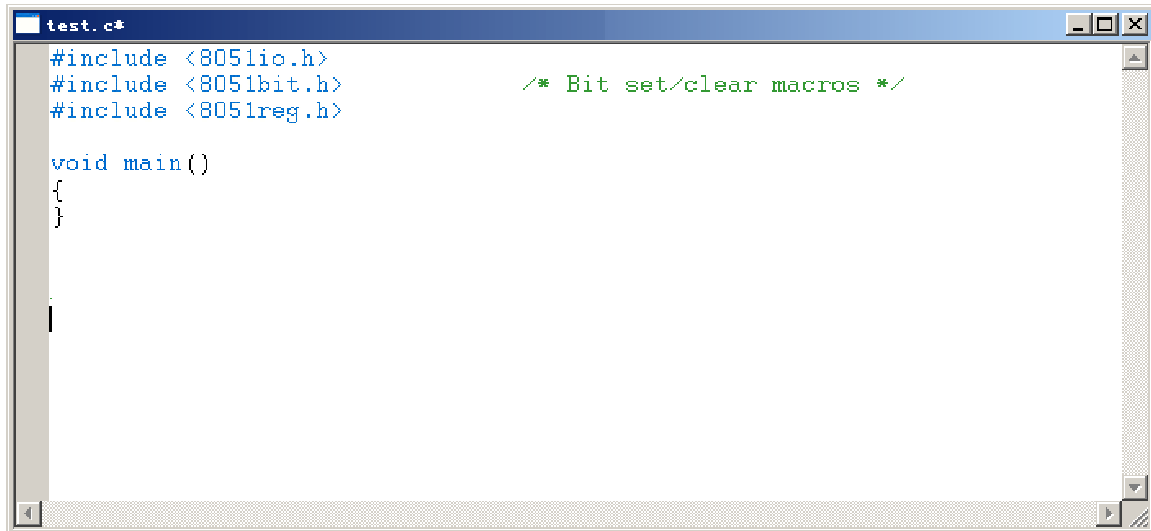
Type the following sentence into the main function:

clrbit(P1.0);

The C program should now look like this:

```
test.c*
#include <8051io.h>
#include <8051bit.h>          /* Bit set/clear macros */
#include <8051reg.h>

void main()
{
    clrbit(P1.0);
}
```

This program changes port pin P1.0 to logic low level. P1.0 is connected to the Green LED on the Training Board (TB-1) so this program will turn on the Green LED if TB-1 is installed. Build the program by clicking the Build button. If the program builds successfully, you will see the following messages on the Output Window:

Compiling c:\test\test.c…
linking test.asm …
Generating 'test.hex' …

2.1.3.2   Downloading the program

Download the program to the board by clicking the Download button on the main toolbar.
Run the program by clicking the Mode button on the main toolbar. You will see the Green LED on TB-1 turning on if TB-1 is connected.

2.2 SDCC

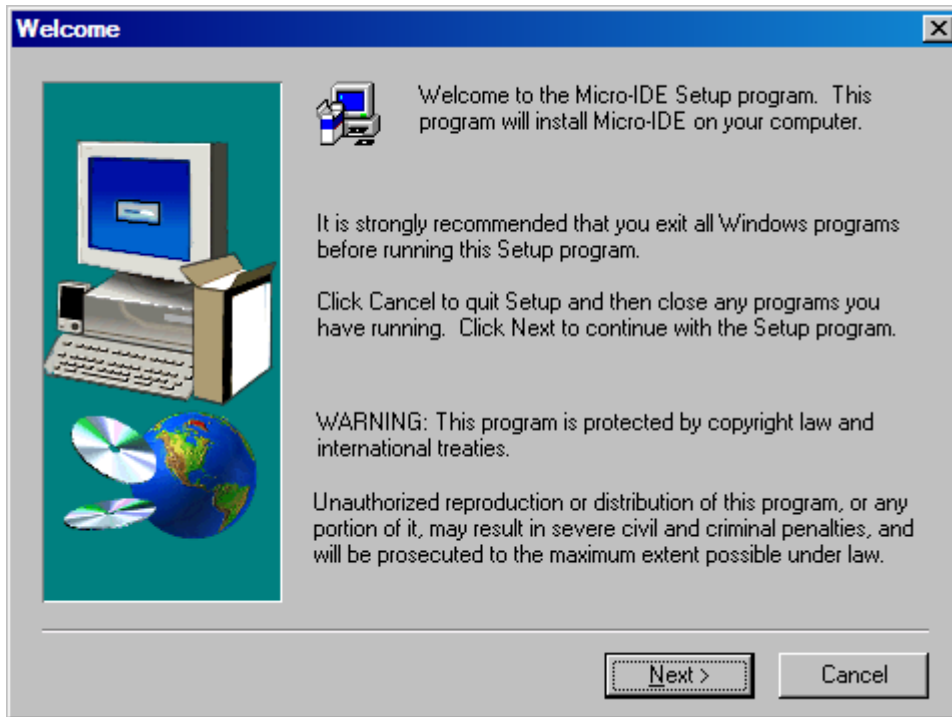*Skip this section if you will not be using SDCC.*

2.2.1 Installing SDCC 8051 Development System (Micro-IDE with SDCC C Compiler)

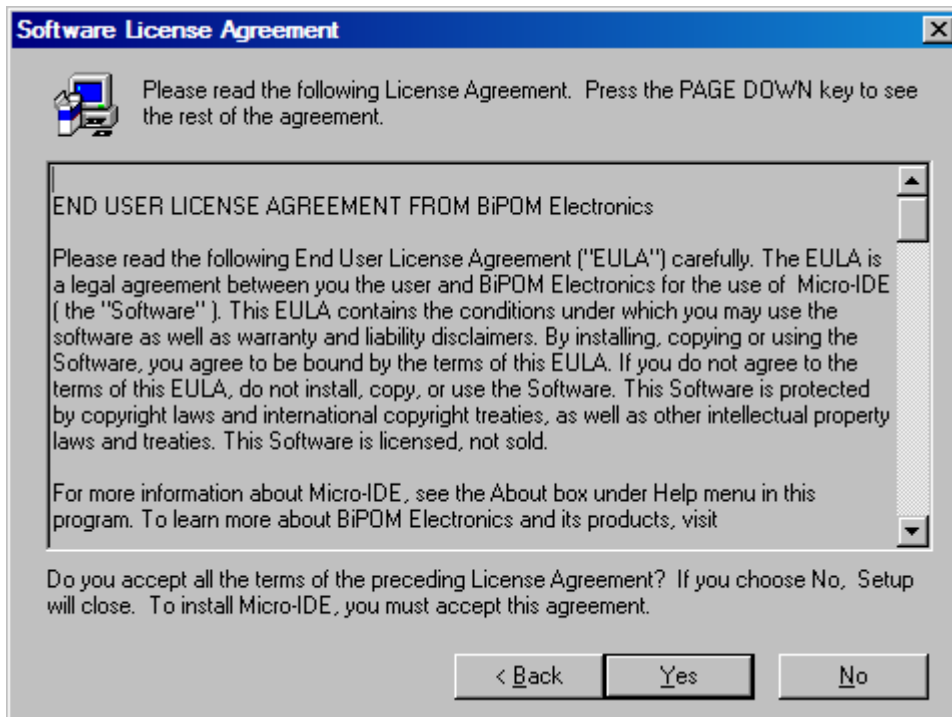Download SDCC 8051 Development System from:

http://www.bipom.com/sdcc.php

Open the zip file sdcc.zip and install it by running setup.exe.
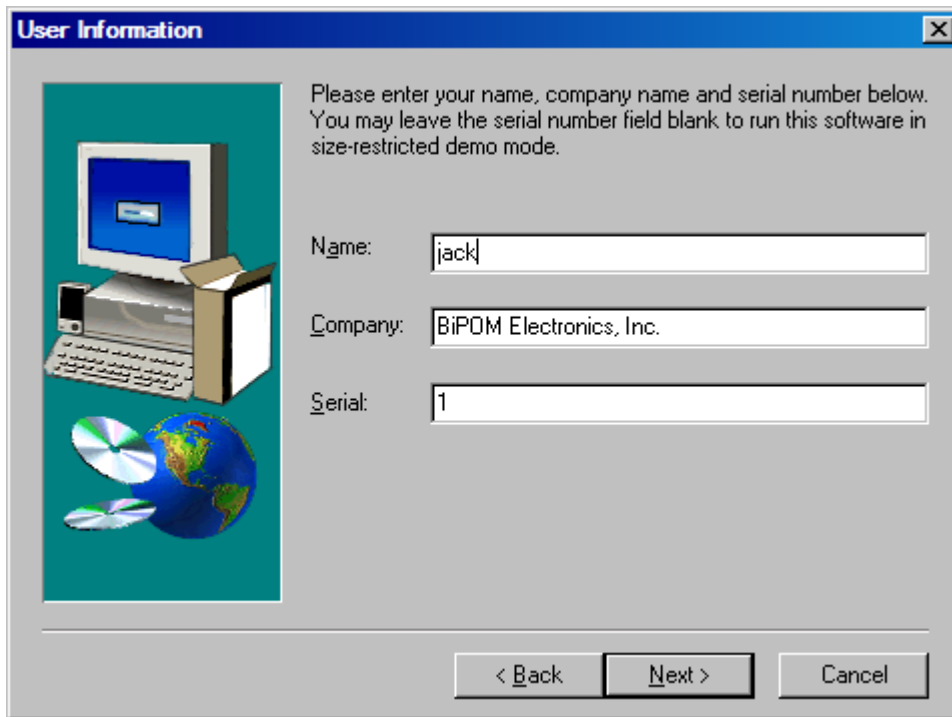
A Welcome screen will appear:
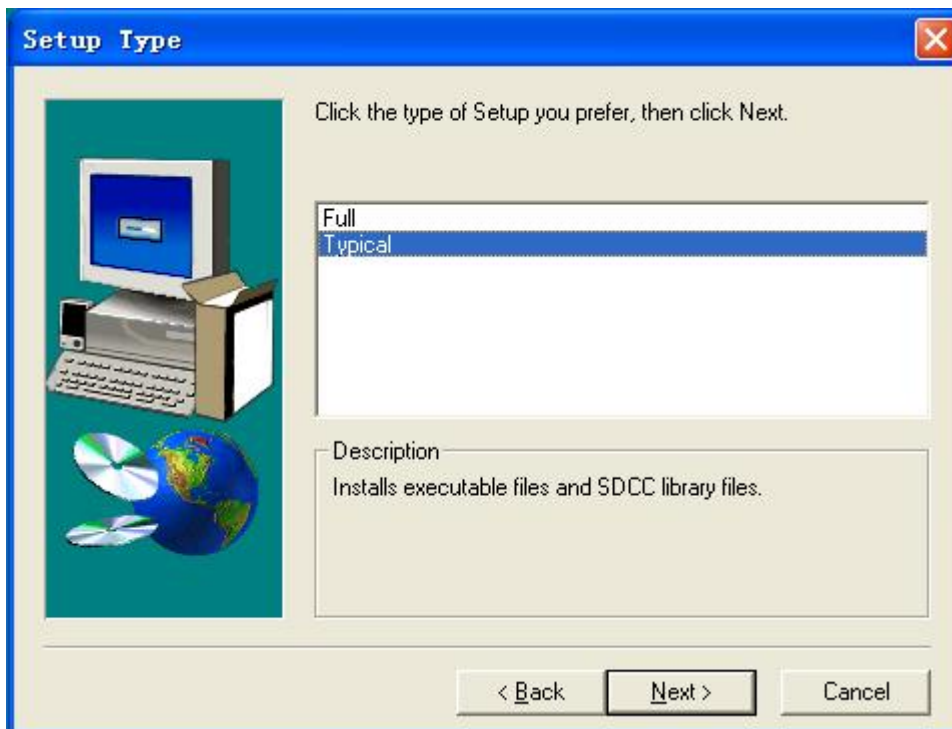

Click on Next. The End User Agreement will appear:

Please read the agreement and click Yes if you wish to continue with installation.

Enter your name, company (if applicable):

SDCC is a freeware, so you can enter any Serial Number in the Serial field, or keep the default one. Click on Next. Setup Type selection window will appear:


You can select Typical setup to install SDCC executable files and SDCC library files, or select Full setup if you need install source files for SDCC library.
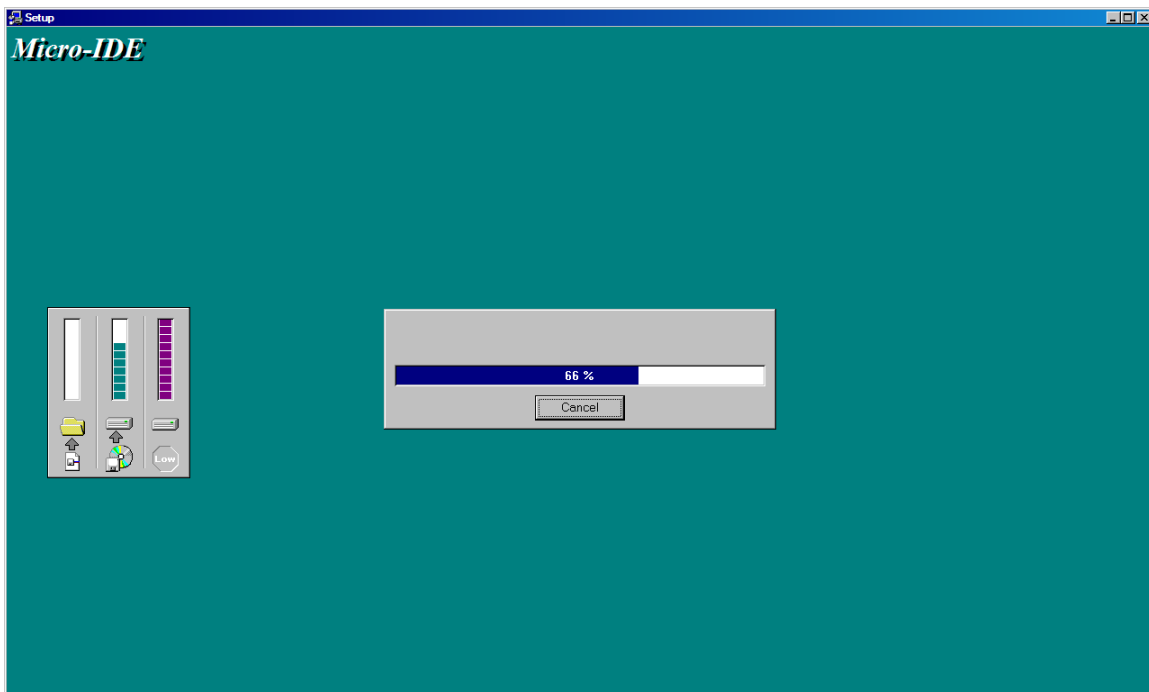
Click on Next. Select the disk location where the software will be installed. Using the default location of c:\bipom\devtools is recommended:
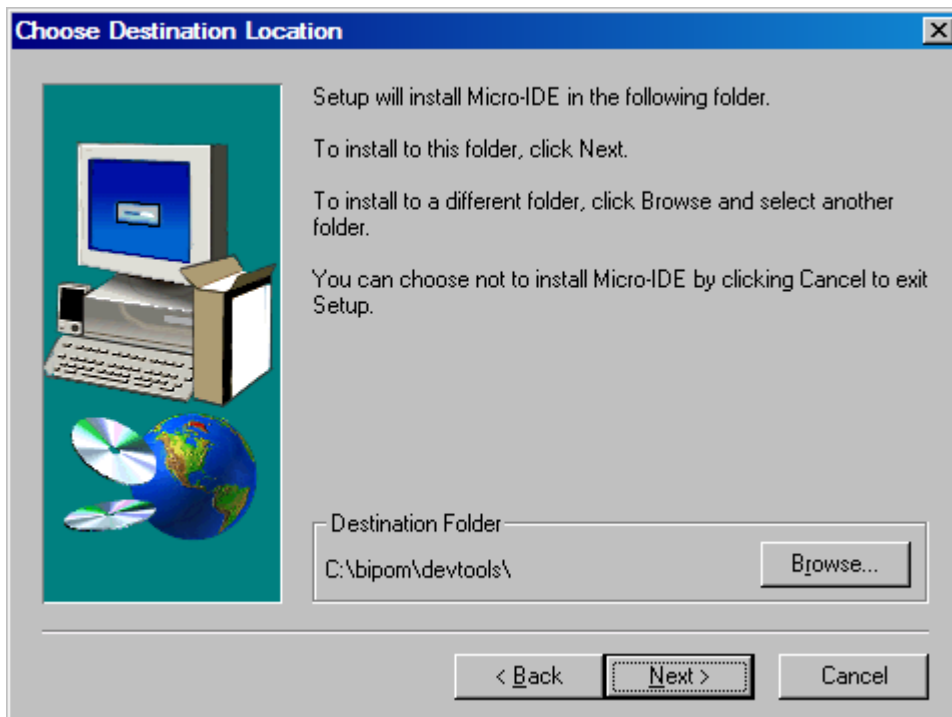
Click Next. Select the Program Folder where the icons for Micro-IDE will be installed. Default selection is **Micro-IDE** folder.
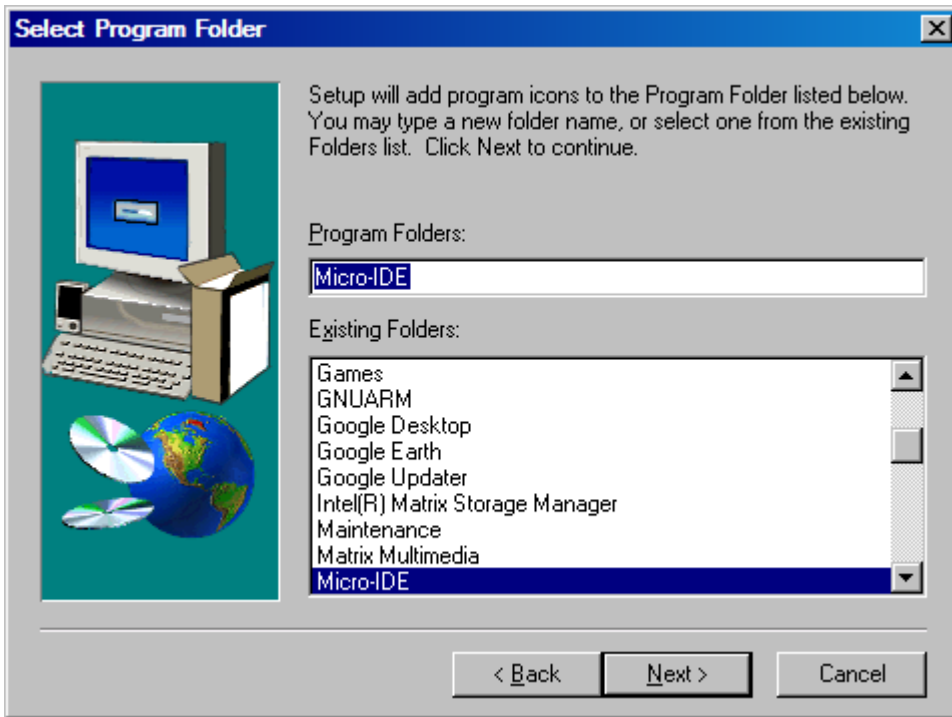
Click Next. Micro-IDE will be installed and you will see the progress:

When the installation is complete, you will be given an option to start Micro-IDE now:
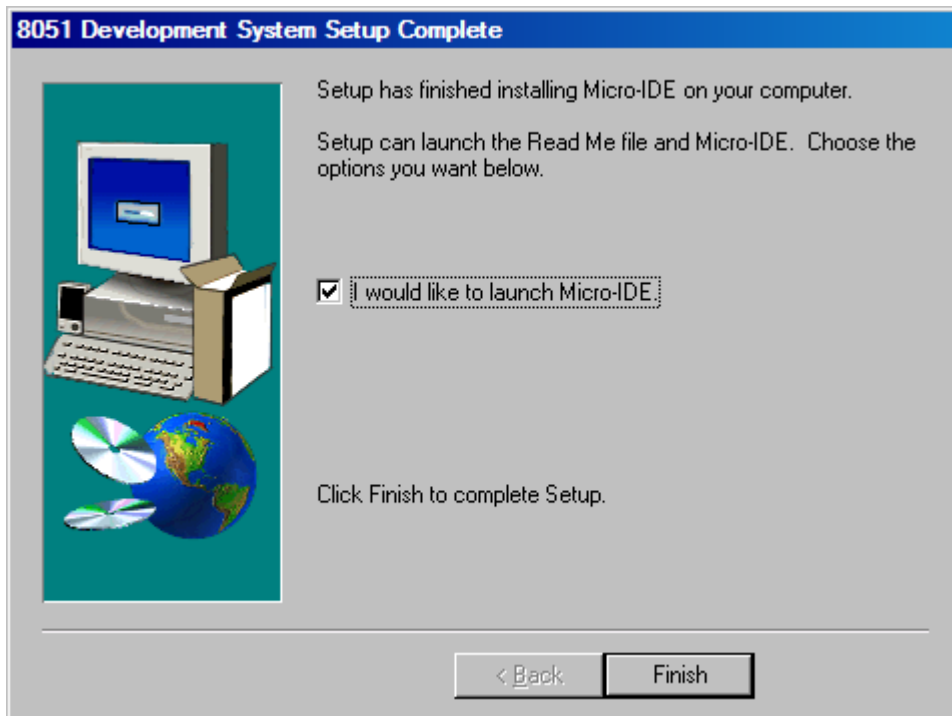
Click Finish and Micro-IDE will start.

2.2.2 Downloading SDCC Example Programs

Follow the steps below to check if you can build and download SDCC C programs to the board:

1. Make sure the board is powered and connected to the PC as described in the section **Installing The Hardware**.

2. Run Micro-IDE from the Windows Start. When Micro-IDE is started, the Project selection window appears:
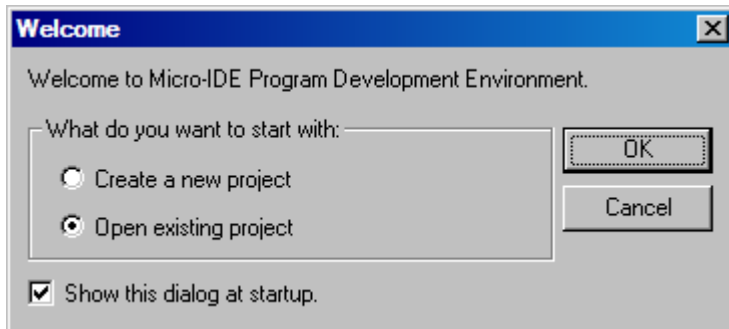
Click OK to select an existing example project.
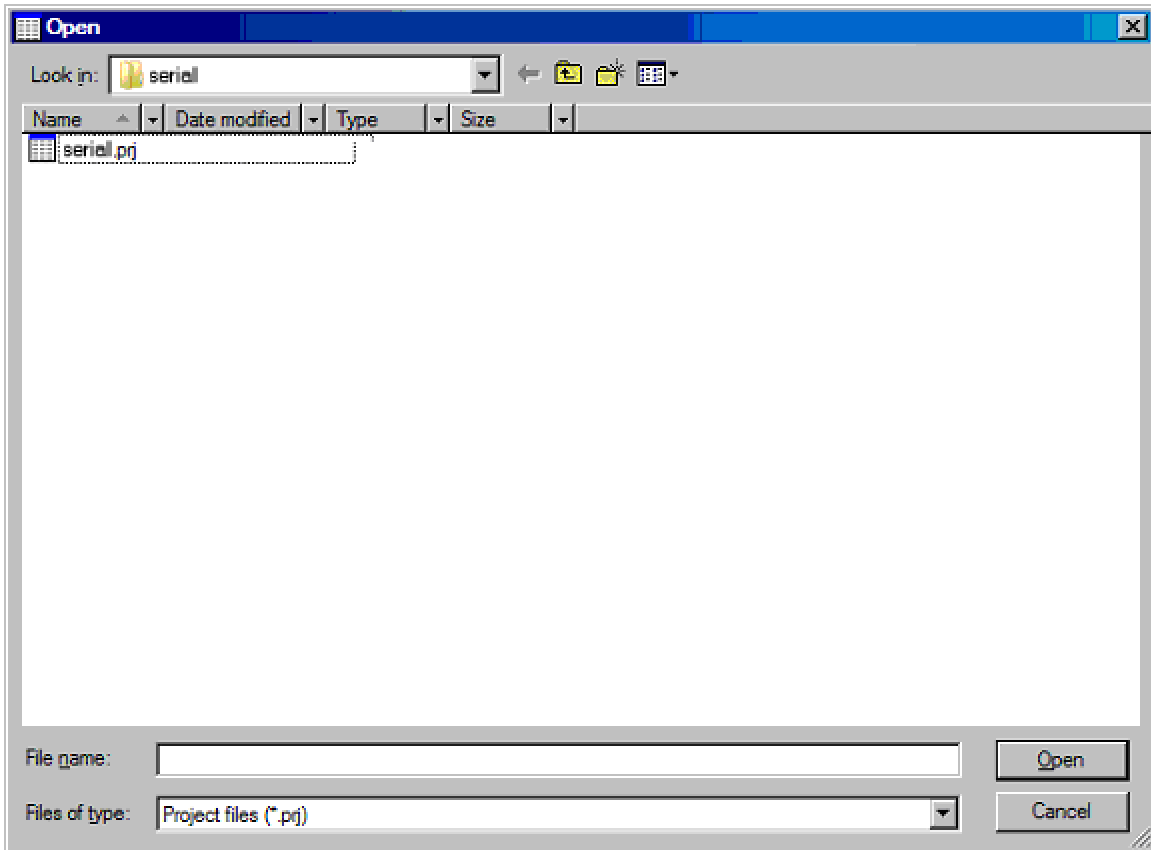
3. Open the example project serial.prj from

C:\ bipom\devtools\SDCC\examples\serial\serial.prj
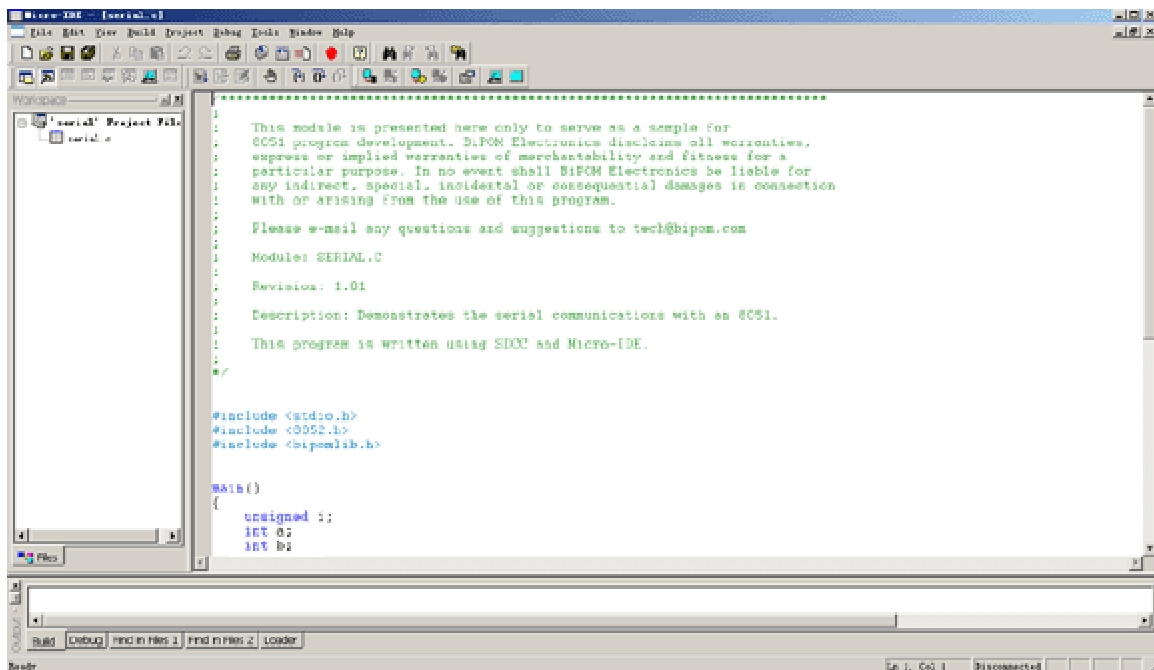
4. Click the Build button on the main toolbar. This will build the serial project:

Build button

If the project builds successfully, you should see a message indicating no errors on the Output Window:

```
Compiling C:\bipom\devtools\SDCC\examples\serial\serial.c...
Linking serial.rel ...
-k C:\bipom\devtools\sdcc\bin\..\lib\large
-l mcs51
-l libsdcc
-l libint
-l liblong
-l libfloat
serial.rel
```

Build | Debug | Find in Files 1 | Find in Files 2 | Loader

Ready
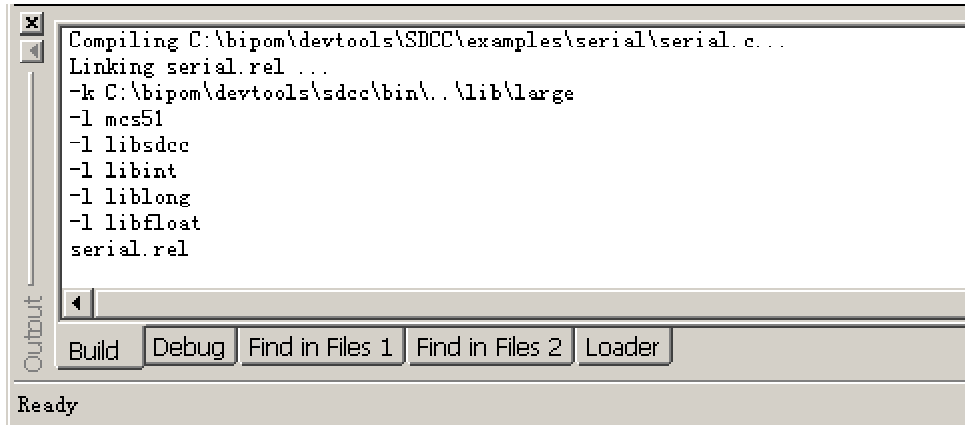
5. Download the file to the MINI-MAX/51-C2 board by selecting Download under Build menu:

Download button

If the board is powered and connected properly to the PC, a progress dialog will appear:
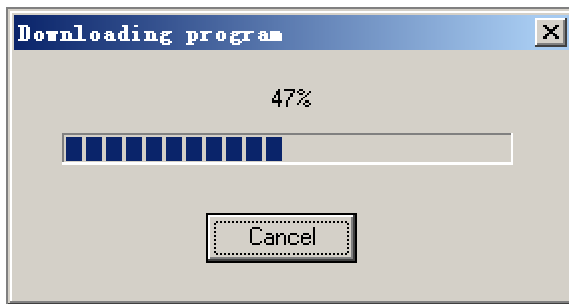
The progress dialog will disappear following a successful download. Details of the download are shown on the Output Window:

When the download is finished, the progress indicator disappears. This means that the board has received the program successfully.

6. After the program has been successful downloaded, it can be started using the Mode button on the main Toolbar:

Mode button

The Mode button is Red in Program mode and Green in Run mode. Following a download, the Mode button will be Red. Click the Mode button to change the mode to Run mode. The program **serial.c** that you just downloaded starts executing.
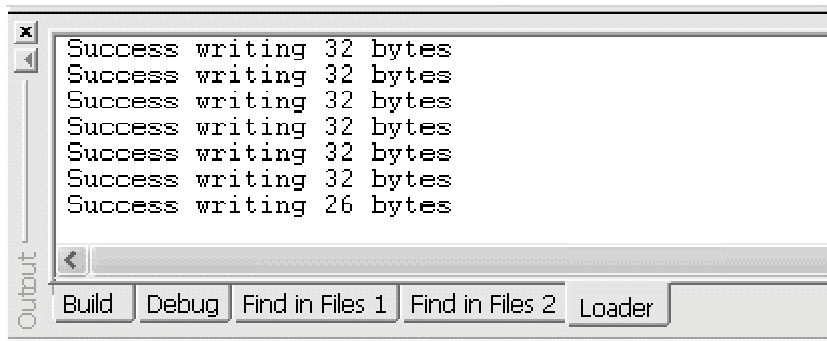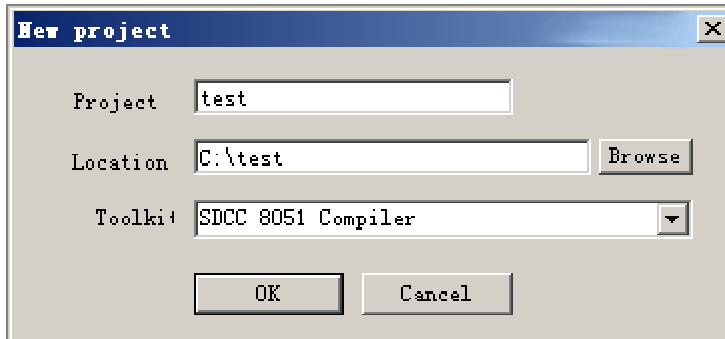
You should now see the message "Press a key to start tests" being displayed on the Terminal window.

Congratulations!!! You have built and executed your first SDCC C program on the MINI-MAX/51-C2.

2.2.3 Writing Your Own SDCC Programs
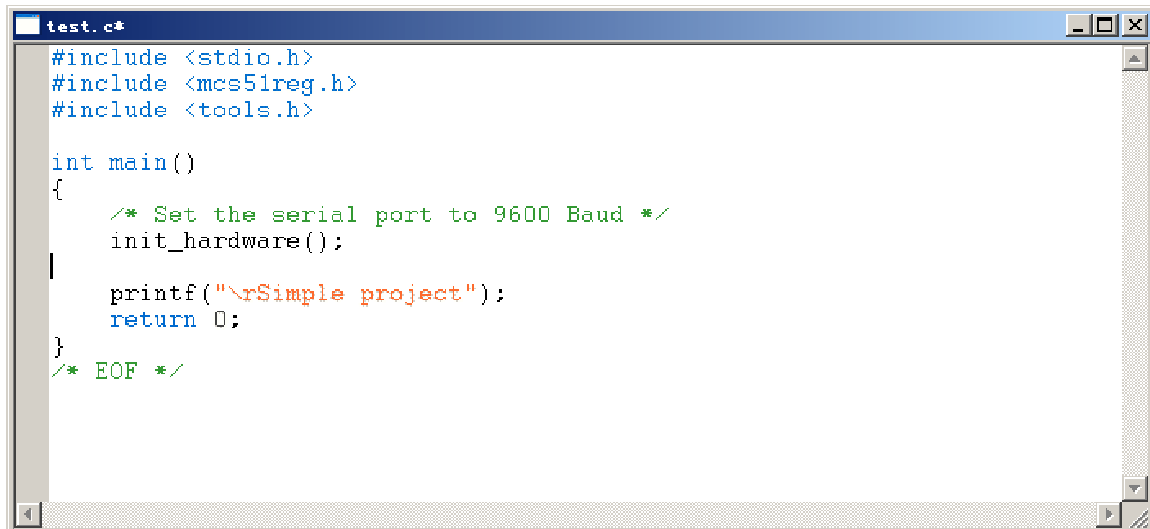
2.2.3.1 Creating Projects

To create your own SDCC project, select Project menu and select New Project. This will display the New Project dialog:

Enter the name of the new project and its location (this examples uses **test** as the project name and **c:\test** as the project location). Select SDCC 8051 Compiler as the Toolkit. Click OK; the new project with the name of test under **c:\test** will be created.

A blank C file (test.c) will be automatically created:

```
#include <stdio.h>
#include <mcs51reg.h>
#include <tools.h>

int main()
{
    /* Set the serial port to 9600 Baud */
    init_hardware();

    printf("\rSimple project");
    return 0;
}
/* EOF */
```

Modify the code to make the program looks like this:

```
test.c*                                                        _ □ ×
#include <stdio.h>
#include <mcs51reg.h>
#include <tools.h>

int main()
{
    P1_0=0;
    return 0;
}
/* EOF */
```
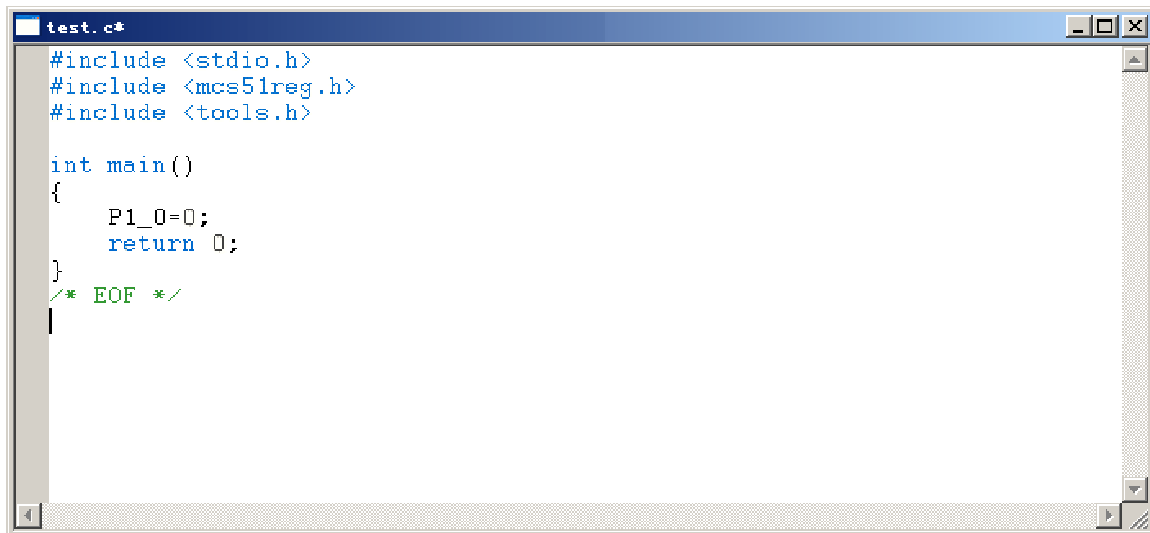
This program changes port pin P1.0 to logic low level. P1.0 is connected to the Green LED on the Training Board (TB-1) so this program will turn on the Green LED if TB-1 is installed. Build the program by clicking the Build button. If the program builds successfully, you will see the following messages on the Output Window:

Compiling c:\test\test.c…
Linking test.rel …
…

2.2.3.2   Downloading the program

Download the program to the board by clicking the Download button on the main toolbar. Run the program by clicking the Mode button on the main toolbar. You will see the Green LED on TB-1 turning on if TB-1 is connected.

2.3 BASCOM-51

Skip this section if you will not be using BASCOM-51.

2.3.1 Installing BASCOM-51 (Micro-IDE with BASCOM-51 BASIC Compiler)

Download BASCOM-51 8051 Development System from:

http://www.bipom.com/bascom51_down.php

Open the zip file bascom51.zip and install by running setup.exe.

The installation procedure is just like that of Micro C 8051 Development System.

2.3.2 Downloading BASCOM-51 Example Programs

Follow the steps below to check if you can build and download BASCOM-51 programs to the board:

1. Make sure that the board is powered and connected to the PC as described in the section **Installing the Hardware**.

2. Run Micro-IDE from the Startup menu of the desktop. When Micro-IDE is started, the Project selection window appears:
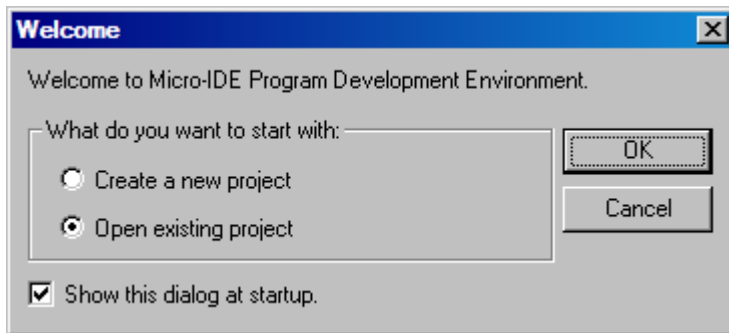
Click OK to select an existing example project.
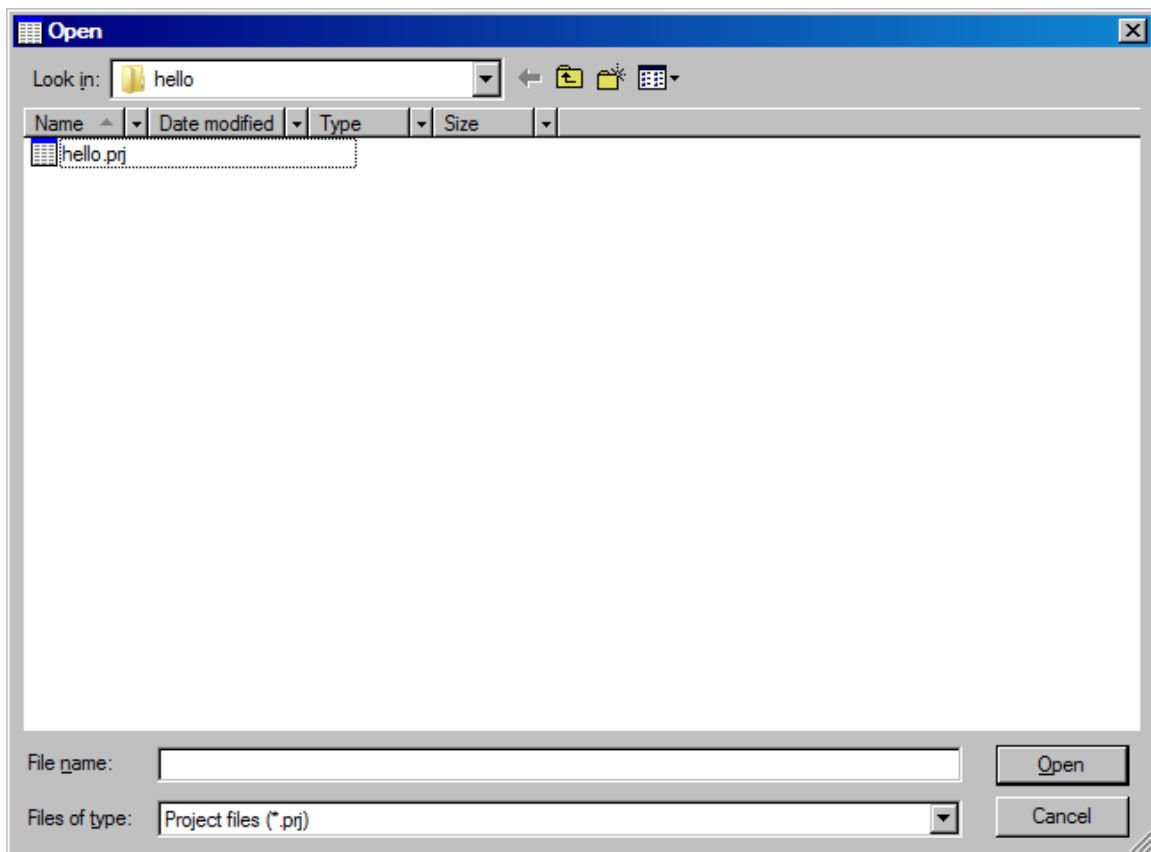
3. Open the example project Hello.prj from

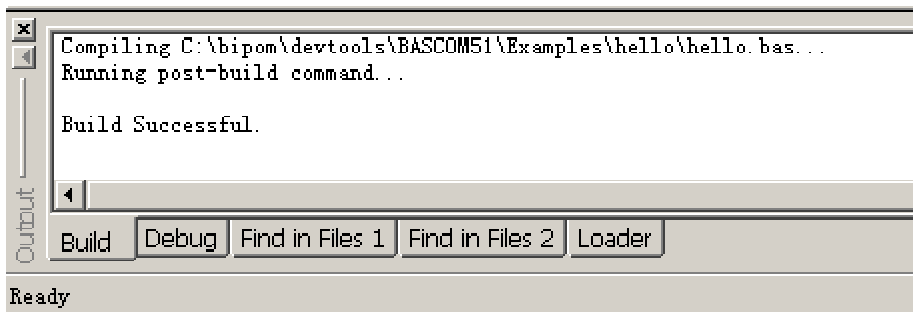**C:\ \bipom\devtools\BASCOM51\Examples\hello**
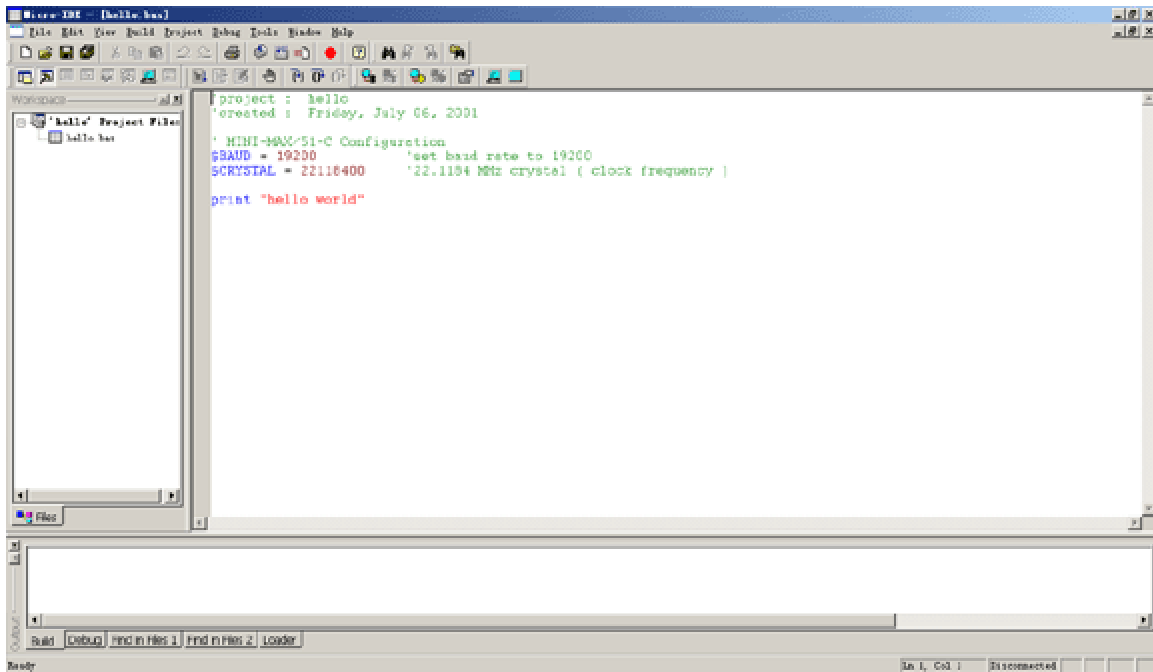
4. Click the Build button on the main toolbar. This will build the Hello project:
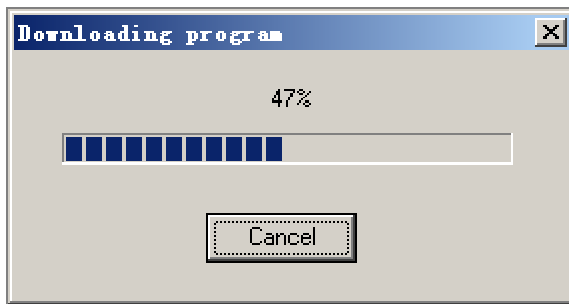

Build button

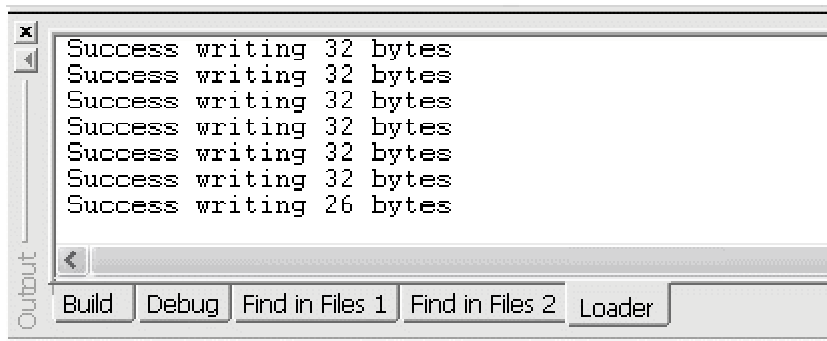If the project builds successfully, you should see a message indicating no errors on the Output Window:

5. Download the file to the board by selecting Download under Build menu:

Download button

If the board is powered and connected properly to the PC, a progress dialog will appear:

The progress dialog will disappear following a successful download. Details of the download are shown on the Output Window:

When the download is finished, the progress indicator disappears. This means that the board has received the program successfully. After the program has been successful downloaded, it can be started using the Mode button on the main Toolbar:

Mode button

The Mode button is Red in Program mode and Green in Run mode. Following a download, the Mode button will be Red. Click the Mode button to change the mode to Run mode. The program **hello.bas** that you just downloaded starts executing.

You should now see the message "hello world" being displayed on the Terminal window.

Congratulations!!! You have built and executed your first program on the MINI-MAX/51.

2.3.3 Writing Your Own BASCOM-51 Programs

2.3.3.1 Creating Projects

To create your own project, select Project menu and select New Project. This will display the New Project dialog:

Enter the name of the new project and its location (this examples uses **test** as the project name and **c:\test** as the project location). Select BASCOM 8051 Compiler as Toolkit. Click OK; the new project with the name of test under **c:\test** will be created.

A blank BASIC file (test.bas) will be automatically created:
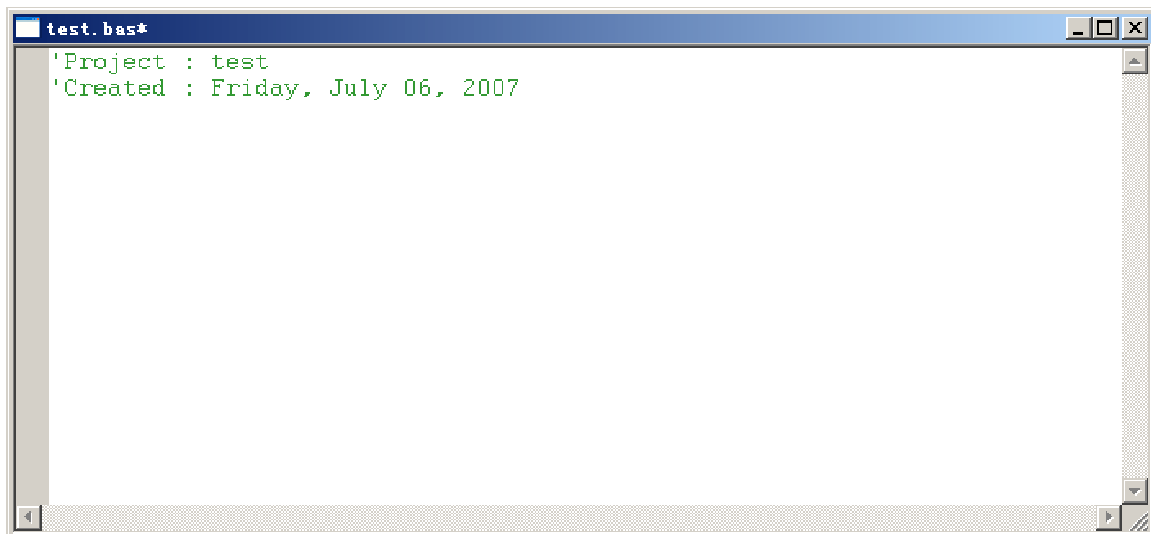
Type the following small BASIC program:

Reset P1.0
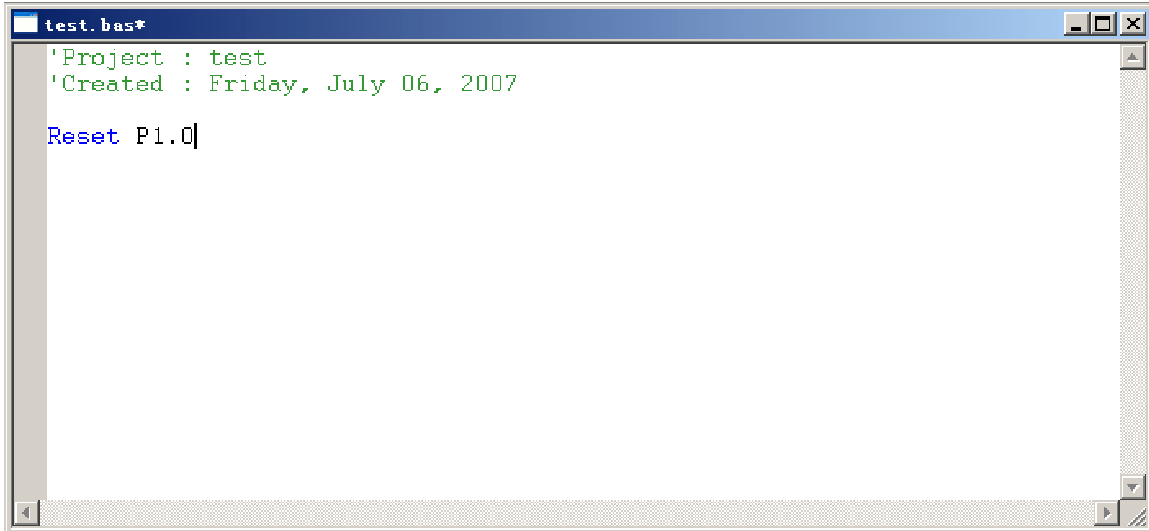
The BASIC program should now look like this:

This program changes port pin P1.0 to logic low level. P1.0 is connected to the Green LED on the Training Board (TB-1) so this program will turn on the Green LED if TB-1 is installed. Build the program by clicking the Build button. If the program builds successfully, you will see the following messages on the Output Window:

Compiling c:\test\test.bas…
Running pre-build or post-build command

2.3.3.2   Downloading the program

Download the program to the board by clicking the Download button on the main toolbar. Run the program by clicking the Mode button on the main toolbar. You will see the Green LED on TB-1 turning on if TB-1 is connected.

3 Expanding Your System

3.1 Connecting Peripheral Boards

MINI-MAX/51-C2 can be connected to a wide variety of low-cost peripheral boards to enhance its functionality. Some possibilities are:

I   Prototyping board (PROTO-1)
I   Training Board (TB-1)
I   Digital Input/Output Expander Board (DIO-1)
I   Analog (ADC and DAC) Input/Output Boards (DAQ-2543, DAQ-2543-DA1)
I   Relay peripheral boards (RELAY-1, RELAY-2, RELAY-4REED)
I   Real Time Clock boards with a Multi Media Card socket (RTC board, MMC/RTC board)
I   A peripheral board with four 7-segment LED displays with decimal point (LED-1).

Peripheral boards can either be stacked on top of MINI-MAX/51-C2 using stand-offs or connected in a chain configuration using flat ribbon cable.

The following Figure shows how MINI-MAX/51-C2 can be connected to a peripheral board in a stacked fashion.
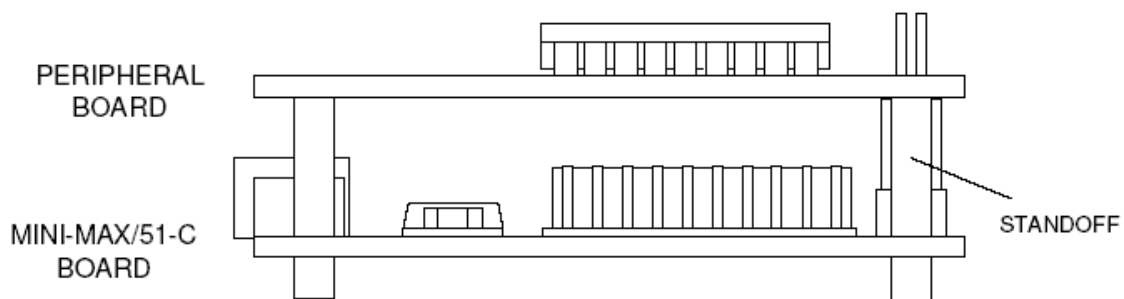
The following Figure shows chain connection.
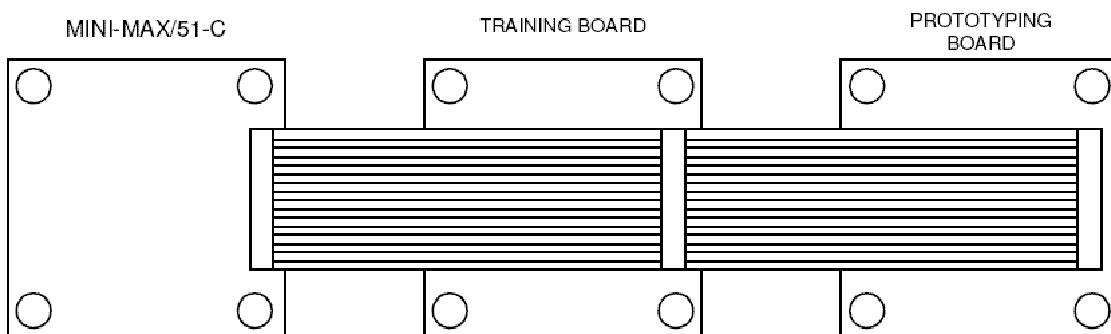
3.2 LCD

Alphanumeric 24 Characters x 2 lines LCD such as BiPOM's LCD242 (http://www.bipom.com/lcd_parallel.php) or any generic LCD display with 4-bit parallel interface can be connected directly to MINI-MAX/51-C2 using the included cable.

3.3 Keypad

MINI-MAX/51-C2 provides a Keypad Connector that contains the eight Port 2 pins of the 8051. Matrix keypads such 3 by 5 or 4 by 4 can be connected directly to the connector. 5 Volt and Ground power lines are also available on the Keypad Connector.

3.4 MicroTRAK

Please see http://www.bipom.com/documents/labbooks/8051tk.pdf for training and project kits based on the MINI-MAX platform.

3.5 Wireless

MaxStream, Inc. sells some wireless RS232 modules that you can use to interface our microcontroller boards to each other through the wireless with rates up to 38,400 bps and up to 300 feet (90meters) indoor, 1000 feet (300 meters) outdoor/line-of-sight range. We have tested these modules with our microcontroller boards. Please contact us for more information.

4 Accessories

Please see http://localhost/web/peripherals.php for a full range of accessories.