Lampiran 9 – Pemrograman Perangkat Keras Pada Visual Basic

Artikel ini akan menjelaskan fungsi file .dll serta cara pembuatan file 8255.dll untuk Visual Basic dengan menggunakan bahasa C yang kemudian di-*compile* dengan Visual C++, sehingga memungkinkan untuk pemrograman perangkat keras dalam hal ini pengaksesan port pada PPI 8255.

Programming Custom Hardware in Visual Basic

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Introduction

Audience :

You are developing custom hardware for Windows 95

You are frustrated learning how to create a DLL

You want Port I/O in Visual Basic

You want to mimic QuickBasic's INPUT and OUTPUT statements in VB

You want to mimic Turbo C's inportb() and outportb() statements in VB

Level : ALL

Pre-requisites: Some Visual Basic programming, Win95 PC.

Compilers :

Visual Basic 4.0 or 5.0, Microsoft Visual C++ 4.0 or 5.0 (not neccessary if you just want to use the DLL and not program your own)

Downloads:

All source code to DLL, compiled DLL and apps programs.

Motivation :

You might be curious how to write Visual Basic (VB) applications for your unique hardware device. For example, you custom developed a PC card. It might be a data acquisition card, or perhaps a motor controller. This tutorial will show you can write VB programs using a Dynamically linked library (DLL). This tutorial is in response to the dozens of postings on the VB usenet group every month:

"How do I create a DLL?"

"How do you get VB to call functions written in Visual C++ or other languages?"

Sadly, you might be frustrated with the posted responses. You might be frustrated scouring over reference books. You might be frustrated that the DLL's on the Internet don't provide source code - thus wondering what magic is used to create it.

Here, this tutorial gives you *step-by-step instructions* along with GIF image screen shots to show you *how* to easily make your own DLL. This tutorial is also in response to the hundreds of email Boondog gets each month about writing VB apps for the 8255 PC Interface Card. This simple tutorial will show you how to get started.

Dynamically Linked Libraries (DLL)

Why do I need DLLs?

You might have just started using Visual Basic (VB), appreciating how easy it is to write Win95 32-bit applications with it. The learning curve is relatively quick. You might have migrated from QuickBasic or Turbo C, thus having some knowledge of the fundamental statements.

If you have migrated from DOS' QuickBasic to VB, you soon realize that QuickBasic's INPUT and OUTPUT (or Turbo C's inportb and outportb) functions were not implemented in VB. These functions are crucial for PC hardware developers and programmers because they allowed you to read and write to ports. Thus without INPUT or OUPUT you can't read from or write to your device.

There is a way around this, using a DLL. As the name implies, DLLs allows VB to link (a step before compiling) code (libraries you coded up in another language like Delphi, Borland C++ or Microsoft's Visual C++) during run-time (dynamically). VC++ has port I/O (input and output) read/write functions. Also VC++'s compiler allows you to create DLLs (in addition to executable EXE files). Thus you:

1. Write VC++ code that uses these read/write functions
2. Compile it into a DLL (instead of an executable EXE file) file
3. Call your functions from VB

Writing your own DLL or just using one?

If you don't have VC++ don't worry. You can still use the FREE DLL here to read/write to ports.

Download 8255.ZIP which contains 8255.def, 8255.cpp and the 8255.dll files. You just copy the 8255.DLL file to your C:\windows directory. You can then have your VB program use them. But if you are curious then writing a DLL is very easy. The steps in this tutorial specifically use Visual C++ 5.0, but easy enough to mimic in Delphi, Visual C++ 4.0 and Borland C++.

Writing the DLL

There are two files you need to create. The first is a DEF (define) file. The second is the CPP (C++ source) file. Both are simple ASCII text files. You can use any editor (e.g. DOS' edit, or Windows' Notepad). These are listed below:

8255.def listing:

```
------------------------------------------------------
LIBRARY 8255
DESCRIPTION DLL FOR 8255 CARD

EXPORTS
       Out8255        @1
        In8255         @2
------------------------------------------------------
```

The name of your DLL library is given on the first line. It is 8255. The second line is just a comment. Exports list the names of the functions you will eventually define in your VC++. These functions are: Out8255 and In8255. If you eventually wish to add more functions, give the name of your function and the next number, like MyFunction @3.

8255.cpp listing:

```
-----------------------------------------------------
//   FILE: 8255.cpp
//   AUTH: P.OH/Boondog Automation
//   DATE: 07/01/98
//   DESC: CPP source file for 8255 DLL - compiled with
Microsoft Visual C++ 5.0

#include
#include   // contains Visual C++'s inp and out
functions

// -----------------------------------------------------
//   FUNC: Out8255
//   DESC: uses Microsoft's Visual C++ _outp() function
//         to output a PortData to PortAddress
// -----------------------------------------------------

short _stdcall Out8255( int PortAddress, int PortData )
{
  short Dummy;
  // Need Dummy since _outp officially returns int
  // short is a 16-bit integer in Win32 C++
  // whereas int is 32-bit integer Win32 C++
  // use (short) to force returning 16-bit integer
  // back to VB
  Dummy = (short)(_outp( PortAddress, PortData ));

  return(Dummy);

}; // end of Out8255


// -----------------------------------------------------
//   FUNC: In8255
//   DESC: uses Microsoft's Visual C++ _inp() function
//         to read PortAddress
// -----------------------------------------------------

short _stdcall In8255( int PortAddress )
{
  short PortData;
  // short is a 16-bit integer in Win32 C++
  // whereas int is 32-bit integer in Win32 C++
  // use (short) to force returning 16-bit integer
  // back to VB
```

```
  PortData = (short)(_inp( PortAddress ));
  return( PortData );

}; /* end of In8255 */
-------------------------------------------------------
```

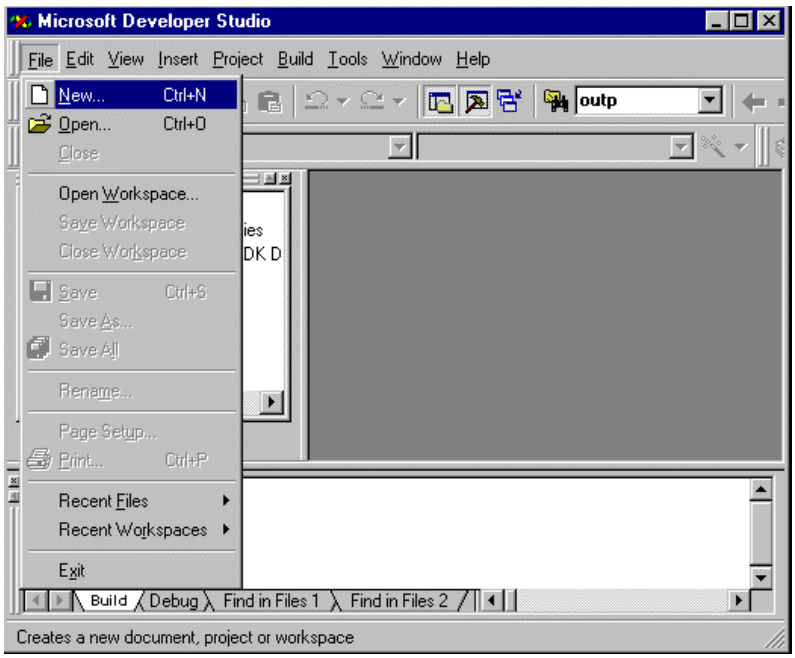
8255.cpp defines In8255 and Out8255. It uses VC++'s _inp() and _out() functions. The single underscore before inp and outp are needed. This underscore notation refers to downloadly compatiable functions that were defined in older versions of VC++.

Step 1: Write your .def and .cpp files

Create a directory called c:\port. Type and save the DEF file as 8255.def and the CPP file as 8255.cpp - if you want, just cut, paste and save these files, or just download and save them.

Step 2: Visual C++ 5.0

Bring up Visual C++. Select FILE - NEW as seen in Figure 1:



Step 3: Create Your Project

This brings up the NEW window. Make sure the Projects tab is selected and choose Win32 Dynamic-Link Library (Figure 2). Make sure that Location is c:\port (you can click the ... button to explore your directories). This is why you created a directory c:\port in Step 1. Type 8255 in the Project Name field. Click on OK. You should now see the result (Figure 3). If not, click on the classes tab. You have just created a project called 8255.

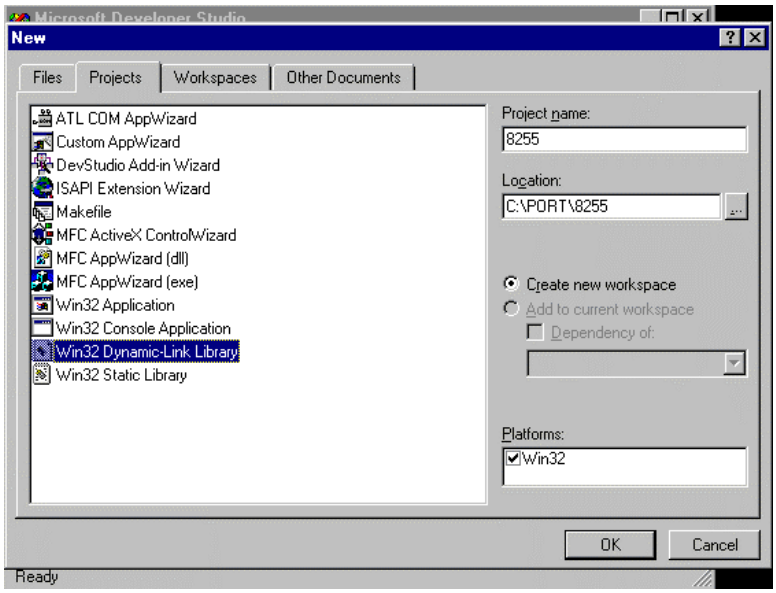


Figure 2

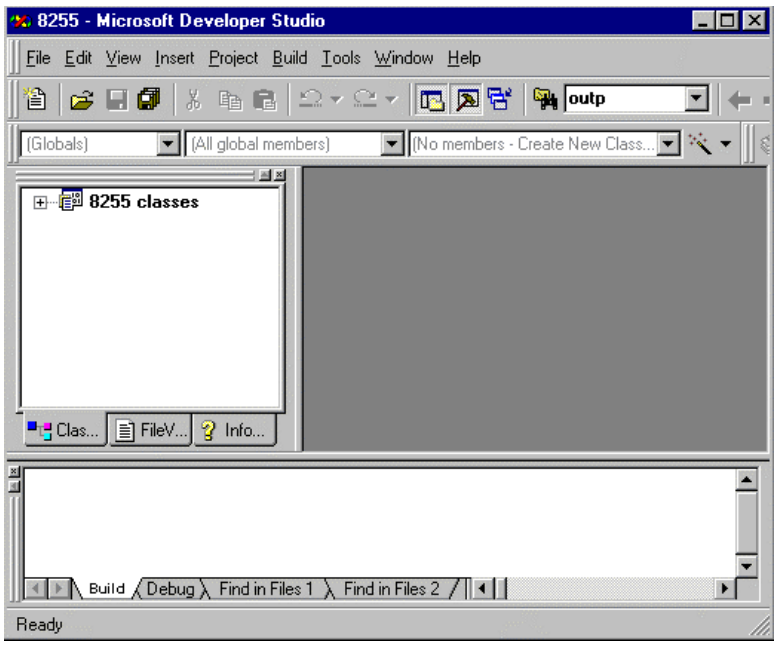


Figure 3

Step 4: Add your .cpp file

Left click on 8255 classes once. This selects it and turns it blue. Next, right click your mouse and choose Add Files to Project (Figure 4).

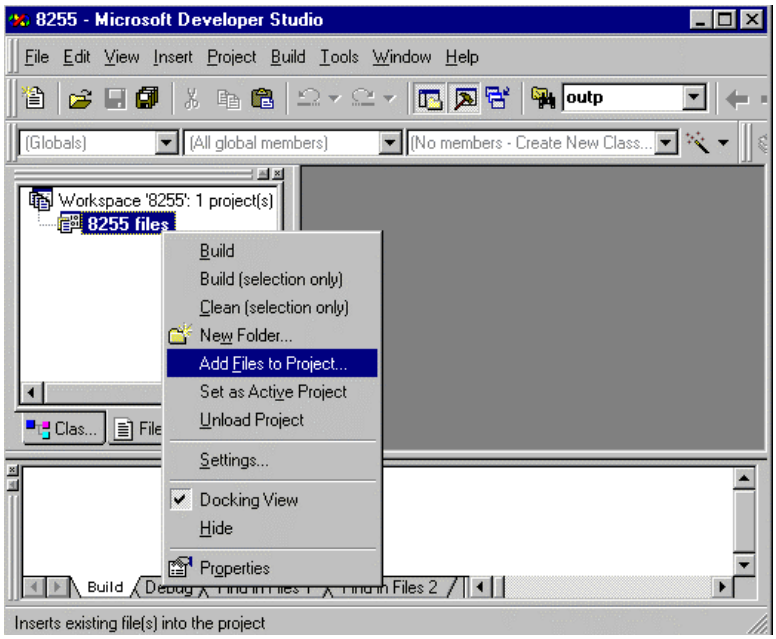


Figure 4

An Insert Files to Project (Figure 5) will pop up. Make sure the Files of Type is set to C++ files. Next, choose the 8255.cpp file and hit OK

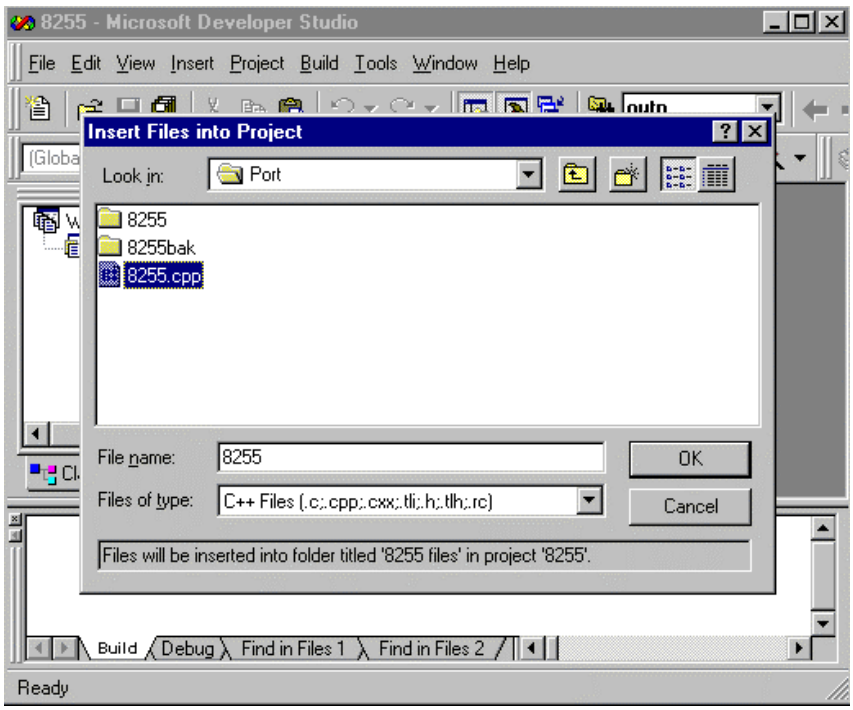


Figure 5

Step 5: Add your .def file

Similar to Step 4, click on 8255 classes once. Right click and select Add Files to Project. Again the Insert File into Project window pops up (Figure 6). This time make sure the Files of Type is set for Definition (.def) files. Click on 8255.def and hit OK. Your 8255 Project now has the 8255.def and 8255.cpp files added (Figure 7). Save everything by clicking FILE - SAVE ALL.

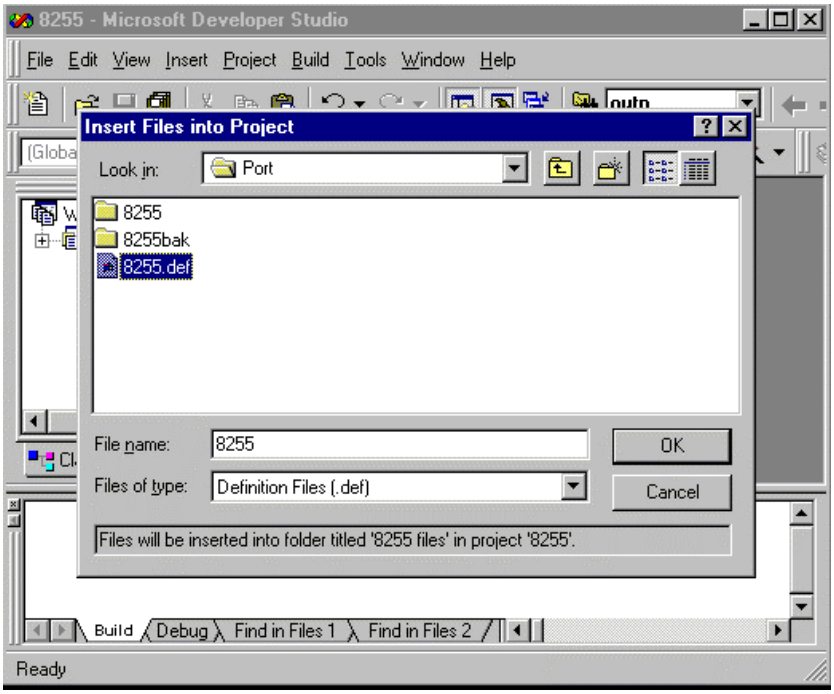


Figure 6

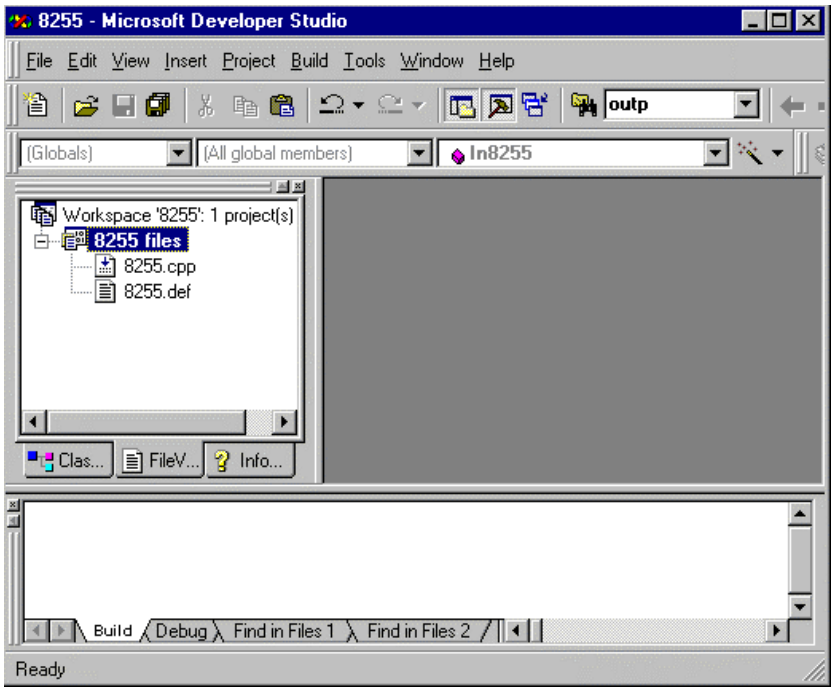


Figure 7

Step 6: Build your .dll file

On the top bar click on Build and select Build 8255.dll (Figure 8). This will start compiling and create th2 8255.dll file. If you didn't mistype and lines in 8255.def or 8255.cpp (or just cut/paste/save or download/save) VC++ will respond with 0 errors. Your new 8255.dll file is now saved in c:\port\8255\debug (Figure 9).

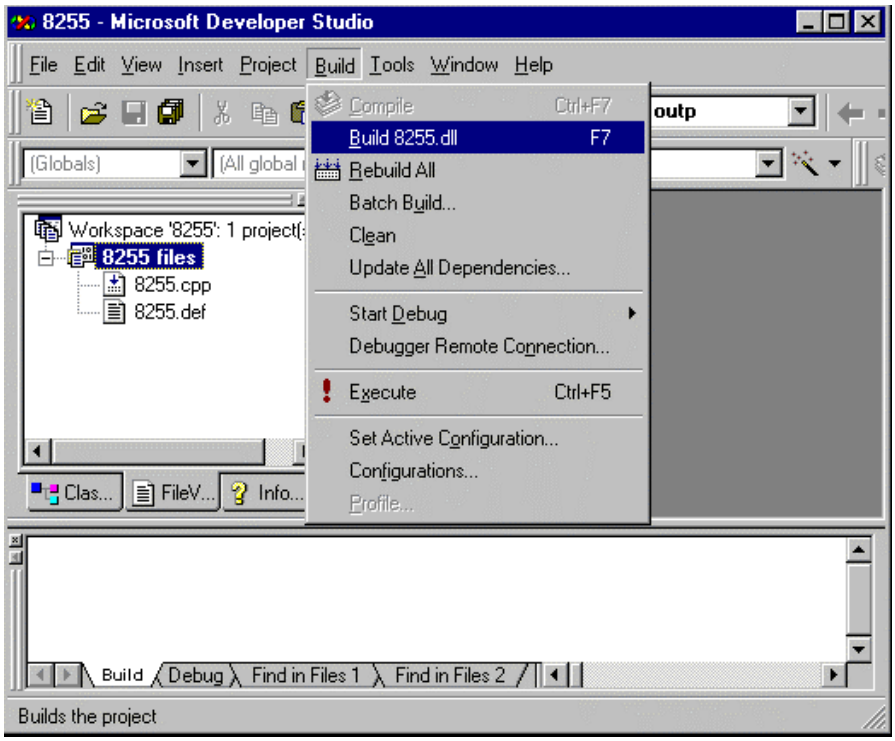


Figure 8

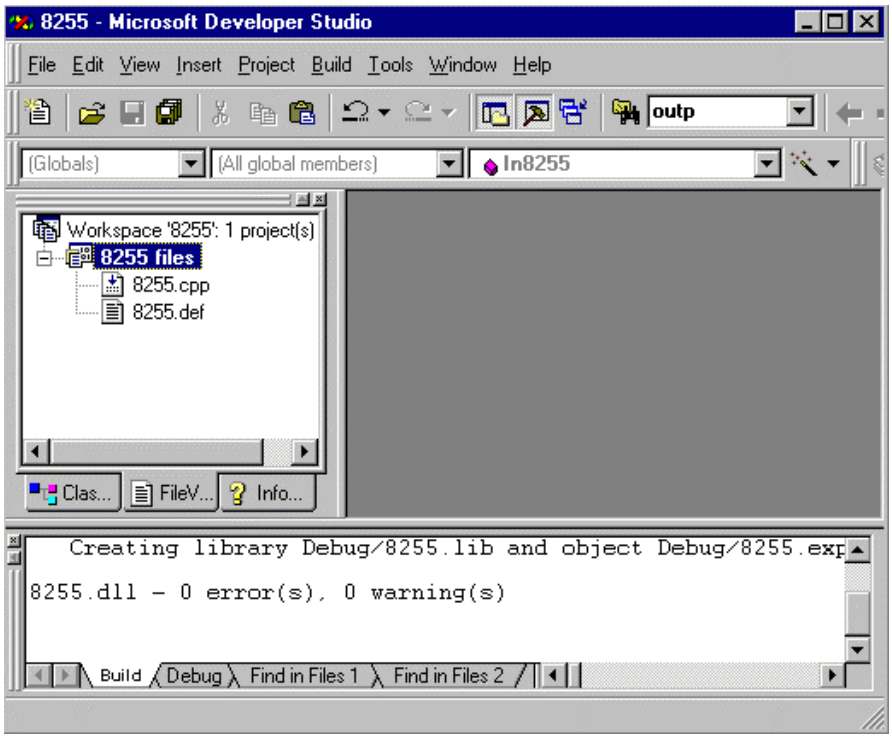


Figure 9

Step 7: Copy your .dll file to c:\windows

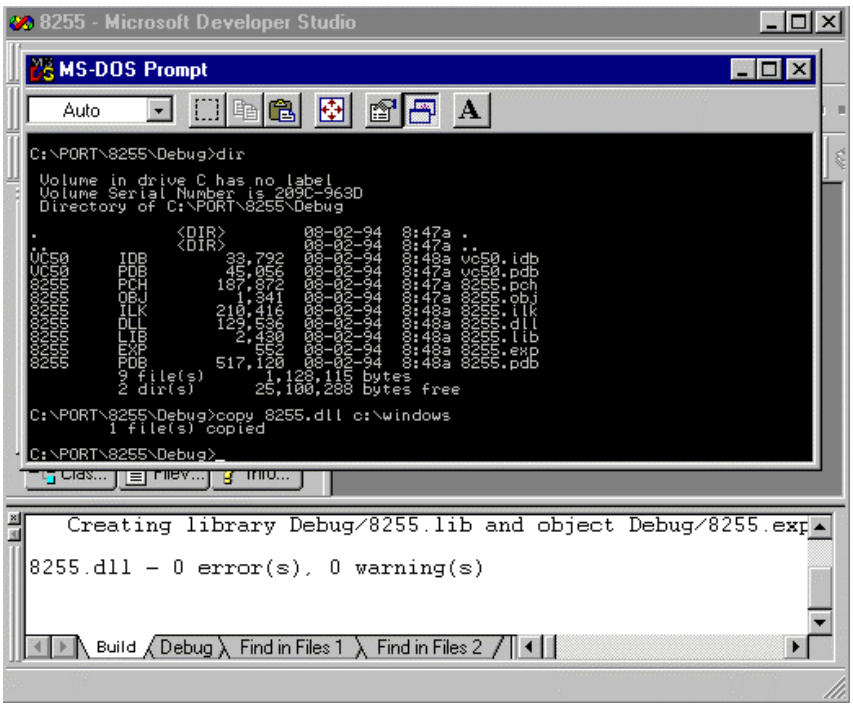


Figure 10

Copy your new DLL file to your c:\windows directory. You can do this from DOS (my habit), by bringing up MS-DOS prompt and cd`ing to c:\port\8255\Debug (Figure 10). Of course, you can drag-and-drop from Explorer. Congradulations! Your .dll is ready to use in your Visual Basic programs! Easy right?

Using Your DLL in Your VB Programs

To use your DLL functions, you add the following lines in your VB program's declaration section. Typically right after the Option Explicit statement. (Note: the underscore in VB means that the statement is spread over several lines)

```
Private Declare Function Out8255 Lib "8255.dll" _
     (ByVal PortAddress As Integer, _
      ByVal PortData As Integer) As Integer
Private Declare Function In8255 Lib "8255.dll" _
     (ByVal PortAddress As Integer) As Integer
```

To *write* to a port, use Out8255:

```
Dummy = Out8255(Cntrl, 128)
```

where Dummy, Cntrl are integers. Here, the decimal value 128 is written to the port address assigned to Cntrl. It is necessary to use associate an integer variable (I called it "Dummy" here) with the Out8255 function. This is because the DLL was built using VC++'s outp(), which returns an integer (1 if successfully accomplished and and 0 if failed).

To *read* from a port, use In8255:

```
PortValue = In8255(PortSelected)
```

where PortValue and PortSelected are integers. The 8-bit number at port PortSelected will be assigned (in decimal form) to PortValue.

Conclusion

As you can read in this tutorial, VB programming using DLL's is quite simple. There are many compiler's today like VC++ 4.0, 5.0, Delphi, and Borland C++ that can generate DLLs. Furthermore, these compilers all have port I/O functions. By writing the DLL you can have VB access them.

Hopefully the step-by-step tutorial on DLL creation sheds light on how they are made. This is in response to the flood of questions on DLL programming on the VB usenet groups.

One caveat is that if you use the wrong memory address (e.g you mistype the address) you can cause Windows 95 to freeze. As a developer/programmer, you might wish to use some error checking in your VB program to make sure that you always write/read to your custom-build card's address.

Boondog hopes that you have found this tutorial useful. Hopefully a new world of VB/Win95 programming/PC interfacing brings you a lot of excitement and fun.