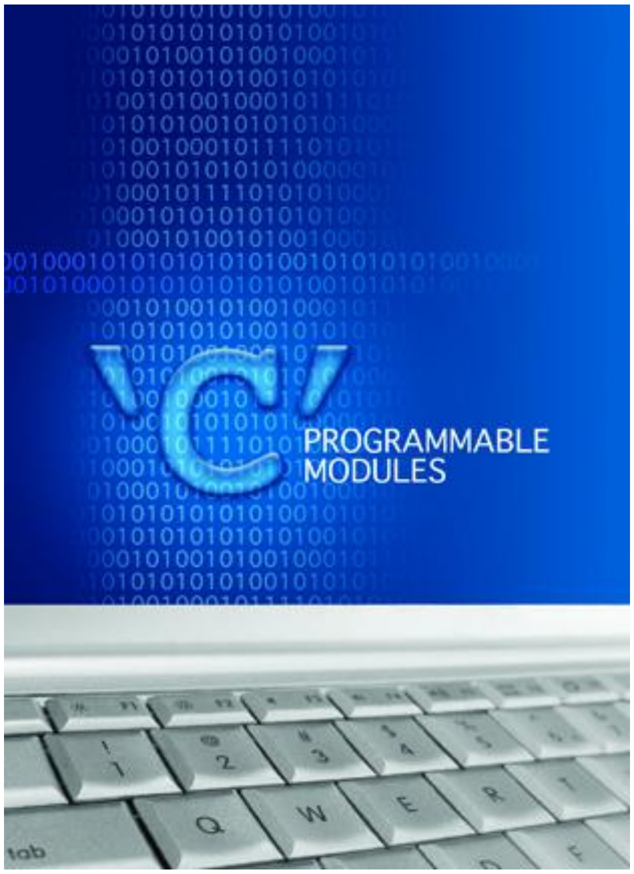
Where Automation Connects.



PLX-ADMNET

'C' Programmable

Ethernet Module

February 20, 2013

DEVELOPER GUIDE

Important Installation Instructions

Power, Input and Output (I/O) wiring must be in accordance with Class I, Division 2 wiring methods, Article 501-4 (b) of the National Electrical Code, NFPA 70 for installation in the U.S., or as specified in Section 18-1J2 of the Canadian Electrical Code for installations in Canada, and in accordance with the authority having jurisdiction. The following warnings must be heeded:

A WARNING - EXPLOSION HAZARD - SUBSTITUTION OF COMPONENTS MAY IMPAIR SUITABILITY FOR CLASS I, DIV. 2;
B WARNING - EXPLOSION HAZARD - WHEN IN HAZARDOUS LOCATIONS, TURN OFF POWER BEFORE REPLACING OR WIRING MODULES
C WARNING - EXPLOSION HAZARD - DO NOT DISCONNECT EQUIPMENT UNLESS POWER HAS BEEN SWITCHED OFF OR THE AREA IS KNOWN TO BE NONHAZARDOUS.
D THIS DEVICE SHALL BE POWERED BY CLASS 2 OUTPUTS ONLY.

All ProLinx® Products

WARNING – EXPLOSION HAZARD – DO NOT DISCONNECT EQUIPMENT UNLESS POWER HAS BEEN SWITCHED OFF OR THE AREA IS KNOWN TO BE NON-HAZARDOUS.

AVERTISSEMENT – RISQUE D'EXPLOSION – AVANT DE DÉCONNECTER L'EQUIPMENT, COUPER LE COURANT OU S'ASSURER QUE L'EMPLACEMENT EST DÉSIGNÉ NON DANGEREUX.

Markings

UL/cUL	ISA 12.12.01 Class I, Div 2 Groups A, B, C, D
cUL	C22.2 No. 213-M1987

243333 183151

CL I Div 2 GPs A, B, C, D

Temp Code T5

II 3 G

Ex nA nL IIC T5 X

0° C <= Ta <= 60° C

II – Equipment intended for above ground use (not for use in mines).

3 – Category 3 equipment, investigated for normal operation only.

G – Equipment protected against explosive gasses.

ProLinx Gateways with Ethernet Ports

Series C ProLinx™ Gateways with Ethernet ports do **NOT** include the HTML Web Server. The HTML Web Server must be ordered as an option. This option requires a factory-installed hardware addition. The HTML Web Server now supports:

- 8 MB file storage for HTML files and associated graphics files (previously limited to 384K)
- 32K maximum HTML page size (previously limited to 16K)

To upgrade a previously purchased Series C model:

Contact your ProSoft Technology distributor to order the upgrade and obtain a Returned Merchandise Authorization (RMA) to return the unit to ProSoft Technology.

Your Feedback Please

We always want you to feel that you made the right decision to use our products. If you have suggestions, comments, compliments or complaints about the product, documentation, or support, please write or call us.

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PLX-ADMNET Developer Guide

February 20, 2013

In an effort to conserve paper, ProSoft Technology no longer includes printed manuals with our product shipments. User Manuals, Datasheets, Sample Ladder Files, and Configuration Files are provided on the enclosed CD-ROM, and are available at no charge from our web site: www.prosoft-technology.com.

Content Disclaimer

Printed documentation is available for purchase. Contact ProSoft Technology for pricing and availability.

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Contents

1 Introduction

In This Chapter

This document provides information needed to develop application programs for the PLX ADMNET 'C' Programmable Module with Ethernet. The modules are programmable to accommodate devices with unique Ethernet protocols.

This document includes information about the available Ethernet communication software API libraries, programming information, and example code.

This document assumes the reader is familiar with software development in the 16-bit DOS environment using the 'C' programming language.

1.1 Operating System

The PLX module includes General Software Embedded DOS 6-XL. This operating system provides DOS compatibility along with real-time multitasking functionality. The operating system is stored in Flash ROM and is loaded by the BIOS when the module boots.

DOS compatibility allows you to develop applications using standard DOS tools, such as Borland compilers. In addition to PLX-ADMNET, WATTCP.CFG is required to assign an IP address to the module.

The format of the WATTCP.CFG is as follows:

```
# ProSoft Technology
# Default private class 3 address
my_ip=192.168.0.148
# Default class 3 network mask
netmask=255.255.255.0
# name server 1 up to 9 may be included
# nameserver=xxx.xxx.xxx.xxx
# name server 2
# nameserver=xxx.xxx.xxx.xxx
# The gateway I wish to use
gateway=192.168.0.1
# some networks (class 2) require all three parameters
# gateway,network,subnetmask
# gateway 192.168.0.1,192.168.0.0,255.255.255.0
# The name of my network
# domainslist="mynetwork.name"
```

Note: DOS programs that try to access the video or keyboard hardware directly will not function correctly on the PLX module. Only programs that use the standard DOS and BIOS functions to perform console I/O are compatible.

2 Preparing the PLX-ADMNET Module

In This Chapter

2.1 Package Contents

Your PLX-ADMNET package includes:

- PLX-ADMNET Module
- ProSoft Technology Solutions CD-ROM (includes all documentation, sample code, and sample ladder logic).
- Null Modem Cable
- Mini-DIN to DB-9 Cable

2.2 Jumper Locations and Settings

Each module has the following jumpers:

- Debug
- Port 0

2.2.1 Debug and Port 0 Jumpers

These jumpers, located at the bottom of the module, configure the port settings to RS-232, RS-422, or RS-485. By default, the jumpers for both ports are set to RS-232. These jumpers must be set properly before using the module.

2.3 Connections

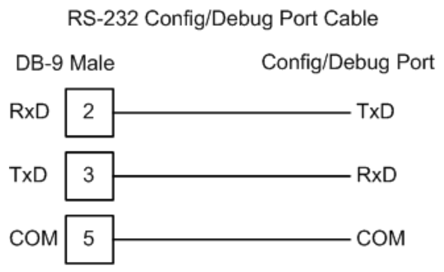
2.3.1 PLX-ADMNET Communication Ports

Depending on the specific hardware and protocol configuration of the gateway, the PLX-ADMNET module has the following physical connectors:

- Ethernet RJ45 application port
- For gateways implementing a serial protocol only, up to four Mini-DIN serial application ports
- One Mini-DIN serial debugging port.

RS-232 Configuration/Debug Port

This port is physically a Mini-DIN connection. A Mini-DIN to DB-9 adapter cable is included with the module. This port permits a PC based terminal emulation program to view configuration and status data in the module and to control the module. The cable for communications on this port is shown in the following diagram:

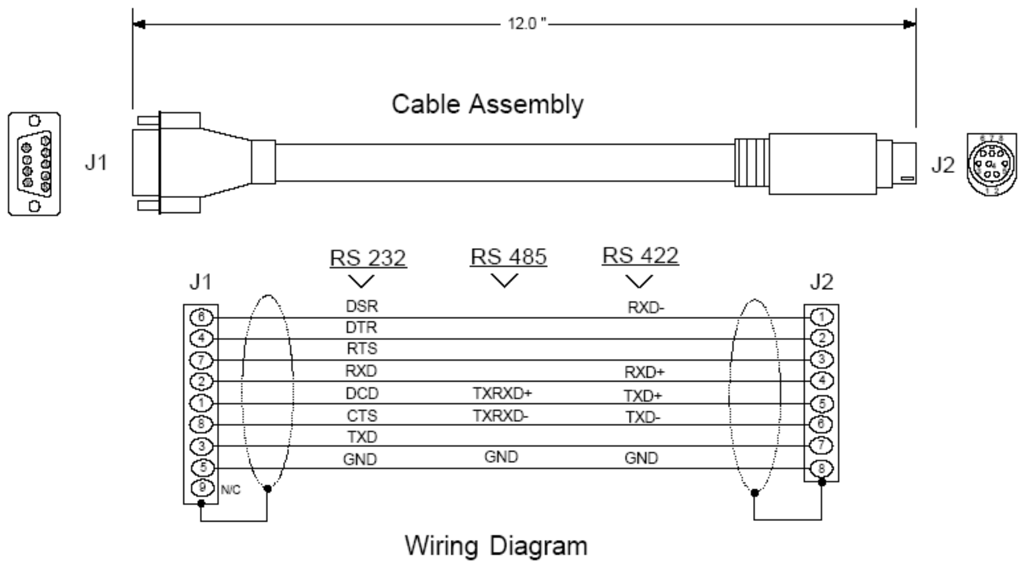


Ethernet Connection

The PLX-ADMNET module has an RJ45 port located on the front of the module labeled "Ethernet", for use with the TCP/IP network. The module is connected to the Ethernet network using an Ethernet cable between the module's Ethernet port and an Ethernet switch or hub.

Note: Depending on hardware configuration, you may see more than one RJ45 port on the module. The Ethernet port is labeled "Ethernet".
Warning: The PLX-ADMNET module is NOT compatible with Power Over Ethernet (IEEE802.3af / IEEE802.3at) networks. Do NOT connect the module to Ethernet devices, hubs, switches or networks that supply AC or DC power over the Ethernet cable. Failure to observe this precaution may result in damage to hardware, or injury to personnel.
Important: The module requires a static (fixed) IP address that is not shared with any other device on the Ethernet network. Obtain a list of suitable IP addresses from your network administrator BEFORE configuring the Ethernet port on this module.

DB9 to Mini-DIN Adaptor (Cable 09)



3 Setting Up Your Development Environment

In This Chapter

3.1 Setting Up Your Compiler

There are some important compiler settings that must be set in order to successfully compile an application for the PLX platform. The following topics describe the setup procedures for each of the supported compilers.

3.1.1 Configuring Digital Mars C++ 8.49

The following procedure allows you to successfully build the sample ADM code supplied by ProSoft Technology using Digital Mars C++ 8.49. After verifying that the sample code can be successfully compiled and built, you can modify the sample code to work with your application.

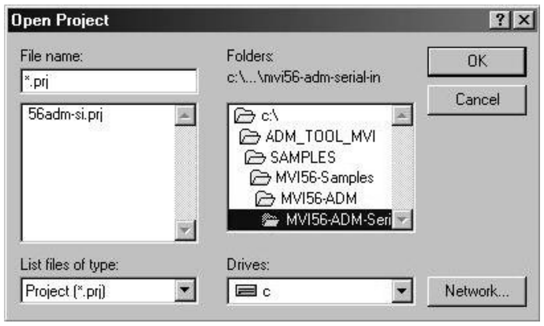
Note: This procedure assumes that you have successfully installed Digital Mars C++ 8.49 on your workstation.

Downloading the Sample Program

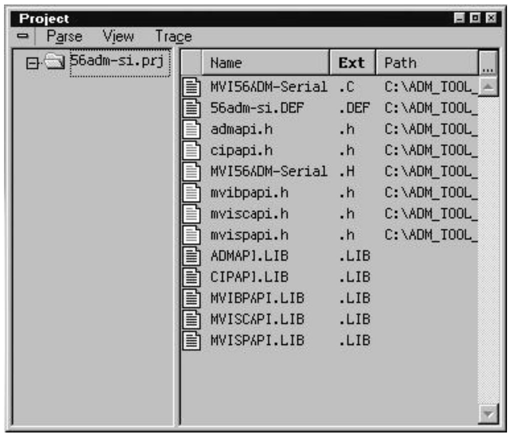
The sample code files are located in the ADM_TOOL_PLX.ZIP file. This zip file is available from the CD-ROM shipped with your system or from the www.prosoft-technology.com web site. When you unzip the file, you will find the sample code files in \ADM_TOOL_PLX\SAMPLES\.

__Building an Existing Digital Mars C++ 8.49 ADM Project__

1 Start Digital Mars C++ 8.49, and then click **Project** → **Open** from the *Main Menu*.

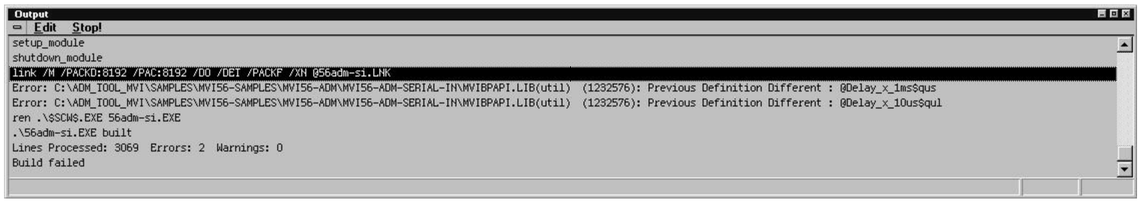


2 From the *Folders* field, navigate to the folder that contains the project (C:\ADM_TOOL_PLX\SAMPLES\…).
3 In the *File Name* field, click on the project name (56adm-si.prj).
4 Click **OK**. The *Project* window appears:



Name	Ext	Path
MVI56ADM-Serial	.C	C:\ADM_TOOL_
56adm-si.DEF	.DEF	C:\ADM_TOOL_
admapi.h	.h	C:\ADM_TOOL_
cipapi.h	.h	C:\ADM_TOOL_
MVI56ADM-Serial	.H	C:\ADM_TOOL_
mvibpapi.h	.h	C:\ADM_TOOL_
mviscapi.h	.h	C:\ADM_TOOL_
mvispapi.h	.h	C:\ADM_TOOL_
ADMAPI.LIB	.LIB	
CIPAPI.LIB	.LIB	
MVIBPAPI.LIB	.LIB	
MVISCAPI.LIB	.LIB	
MVISPAPI.LIB	.LIB	

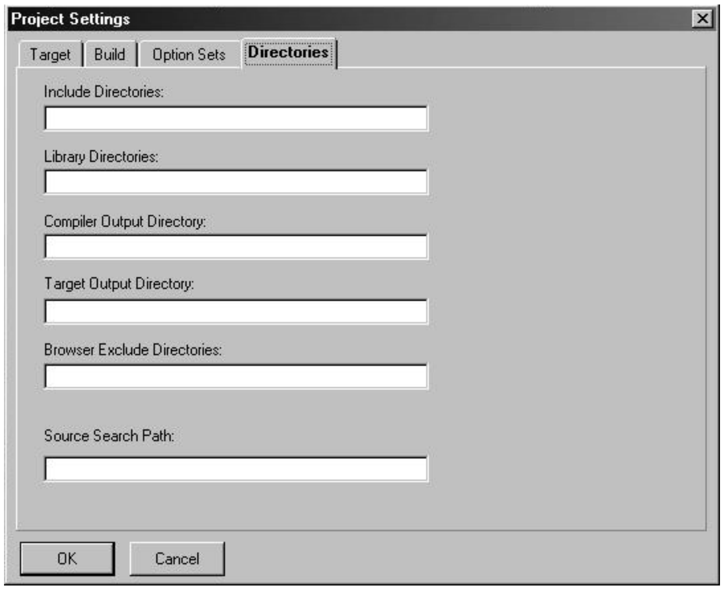
5 Click **Project** → **Rebuild All** from the *Main Menu* to create the .exe file. The status of the build will appear in the Output window:



```
setup_module
shutdown_module
link /M /PACKD:8192 /PAC:8192 /DO /DEI /PACKF /XN @56adm-si.LNK
Error: C:\ADM_TOOL_MVI\SAMPLES\MVI56-SAMPLES\MVI56-ADM\MVI56-ADM-SERIAL-IN\MVIBPAPI.LIB(util)  (1232576): Previous Definition Different : @Delay_x_1ms$qus
Error: C:\ADM_TOOL_MVI\SAMPLES\MVI56-SAMPLES\MVI56-ADM\MVI56-ADM-SERIAL-IN\MVIBPAPI.LIB(util)  (1232576): Previous Definition Different : @Delay_x_10us$qul
ren .\$SCW$.EXE 56adm-si.EXE
.\56adm-si.EXE built
Lines Processed: 3069  Errors: 2  Warnings: 0
Build failed
```

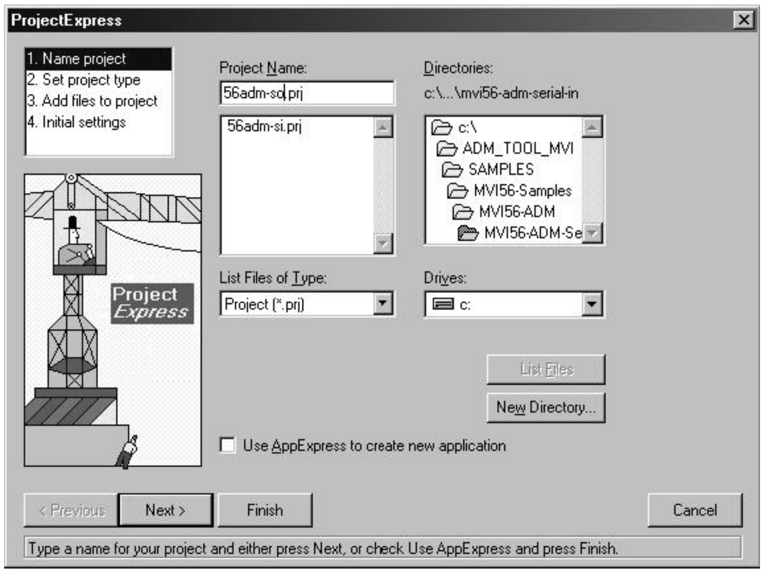
Porting Notes: *The Digital Mars compiler classifies duplicate library names as Level 1 Errors rather than warnings. These errors will manifest themselves as "Previous Definition Different: function name". Level 1 errors are non-fatal and the executable will build and run. The architecture of the ADM libraries will cause two or more of these errors to appear when the executable is built. This is a normal occurrence. If you are building existing code written for a different compiler you may have to replace calls to run-time functions with the Digital Mars equivalent. Refer to the Digital Mars documentation on the Run-time Library for the functions available.*

6 The executable file will be located in the directory listed in the Compiler Output Directory field. If it is blank then the executable file will be located in the same folder as the project file. The *Project Settings* window can be accessed by clicking **Project** → **Settings** from the *Main Menu*.



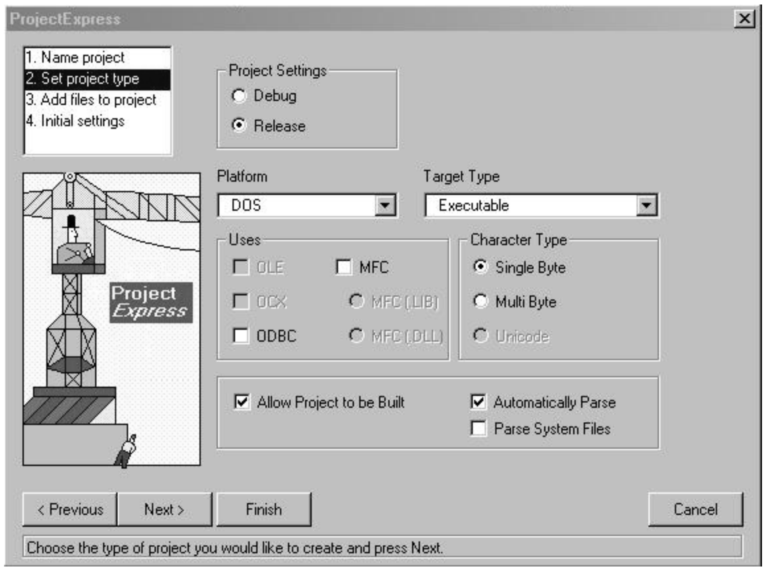
Creating a New Digital Mars C++ 8.49 ADM Project

1 Start Digital Mars C++ 8.49, and then click **Project** → **New** from the *Main Menu*.



Project Name: 56adm-so.prj
56adm-si.prj
Directories: c:\...\mvi56-adm-serial-in
c:\
ADM_TOOL_MVI
SAMPLES
MVI56-Samples
MVI56-ADM
MVI56-ADM-Se
List Files of Type: Project (*.prj)
Drives: c:
☐ Use AppExpress to create new application
Type a name for your project and either press Next, or check Use AppExpress and press Finish.

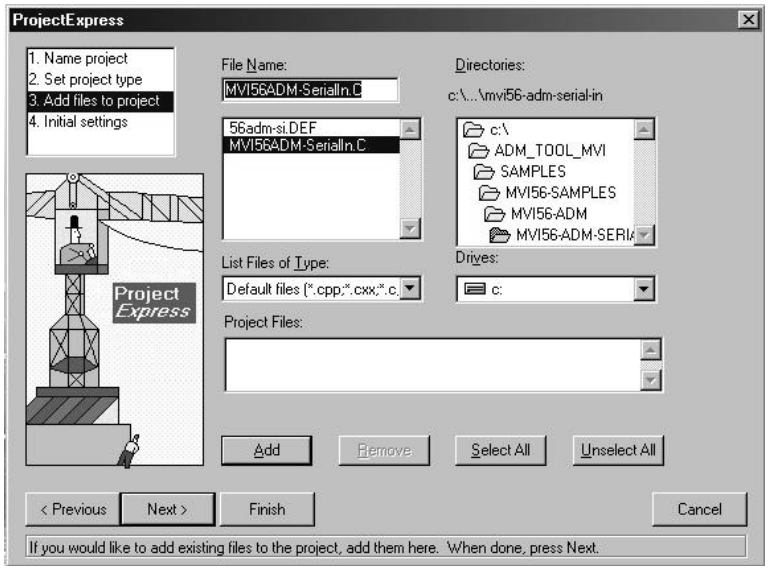
2 Select the path and type in the **Project Name**.
3 Click Next.



Project Settings: ○ Debug ● Release
Platform: DOS
Target Type: Executable
Uses: ☐ OLE ☐ MFC ☐ OCX ○ MFC (LIB) ☐ ODBC ○ MFC (DLL)
Character Type: ● Single Byte ○ Multi Byte ○ Unicode
☑ Allow Project to be Built
☑ Automatically Parse
☐ Parse System Files
Choose the type of project you would like to create and press Next.

4 In the *Platform* field, choose **DOS**.
5 In the Project Settings choose Release if you do not want debug information included in your build.

6 Click Next.



File Name: MVI56ADM-SerialIn.C

56adm-si.DEF
MVI56ADM-SerialIn.C

Directories: c:\...\mvi56-adm-serial-in

c:\
ADM_TOOL_MVI
SAMPLES
MVI56-SAMPLES
MVI56-ADM
MVI56-ADM-SERIA

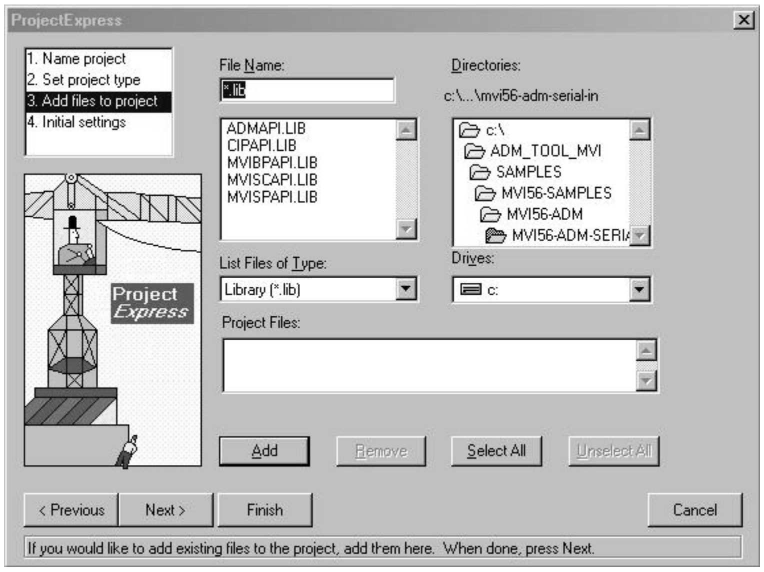
List Files of Type: Default files (*.cpp;*.cxx;*.c;

Drives: c:

Project Files:

If you would like to add existing files to the project, add them here. When done, press Next.

7 Select the first source file necessary for the project.
8 Click Add.
9 Repeat this step for all source files needed for the project.
10 Repeat the same procedure for all library files (.lib) needed for the project.
11 Choose Libraries (*.lib) from the *List Files of Type* field to view all library files:



File Name: *.lib

ADMAPI.LIB
CIPAPI.LIB
MVIBPAPI.LIB
MVISCAPI.LIB
MVISPAPI.LIB

Directories: c:\...\mvi56-adm-serial-in

c:\
ADM_TOOL_MVI
SAMPLES
MVI56-SAMPLES
MVI56-ADM
MVI56-ADM-SERIA

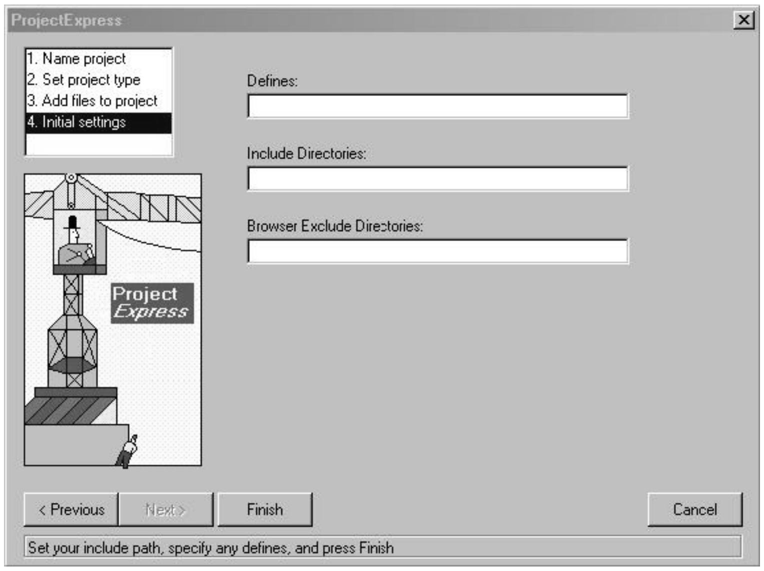
List Files of Type: Library (*.lib)

Drives: c:

Project Files:

If you would like to add existing files to the project, add them here. When done, press Next.

12 Click Next.



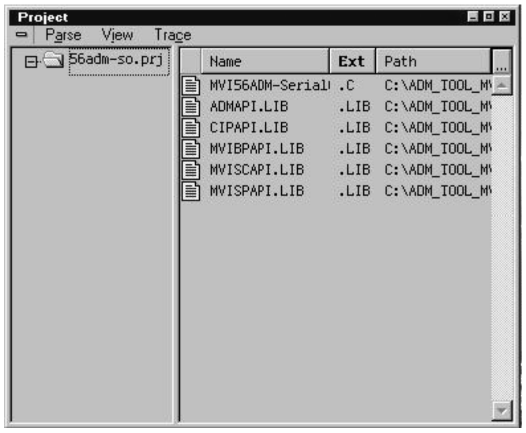
Defines:

Include Directories:

Browser Exclude Directories:

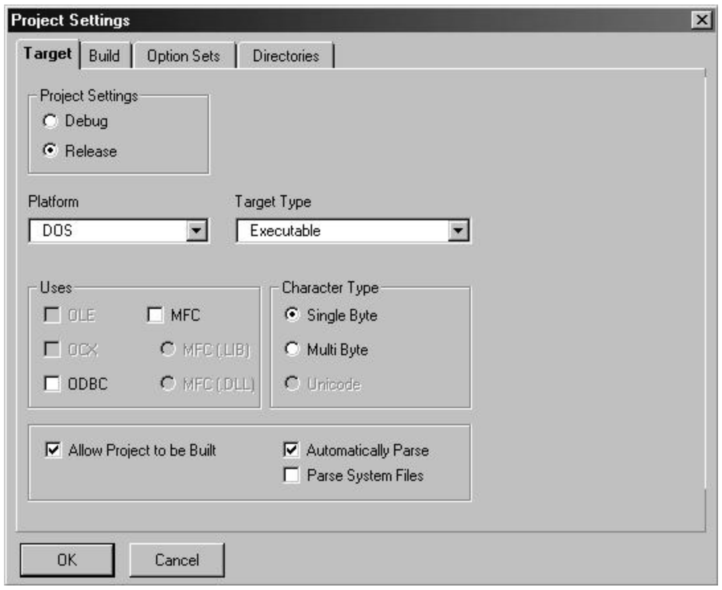
Set your include path, specify any defines, and press Finish

13 Add any defines or include directories desired.
14 Click **Finish**.
15 The *Project* window should now contain all the necessary source and library files as shown in the following window:



Name	Ext	Path
MVI56ADM-Serial	.C	C:\ADM_TOOL_M
ADMAPI.LIB	.LIB	C:\ADM_TOOL_M
CIPAPI.LIB	.LIB	C:\ADM_TOOL_M
MVIBPAPI.LIB	.LIB	C:\ADM_TOOL_M
MVISCAPI.LIB	.LIB	C:\ADM_TOOL_M
MVISPAPI.LIB	.LIB	C:\ADM_TOOL_M

16 Click **Project** → **Settings** from the *Main Menu*.



Project Settings: ○ Debug [✓ ● Release]

Platform: DOS

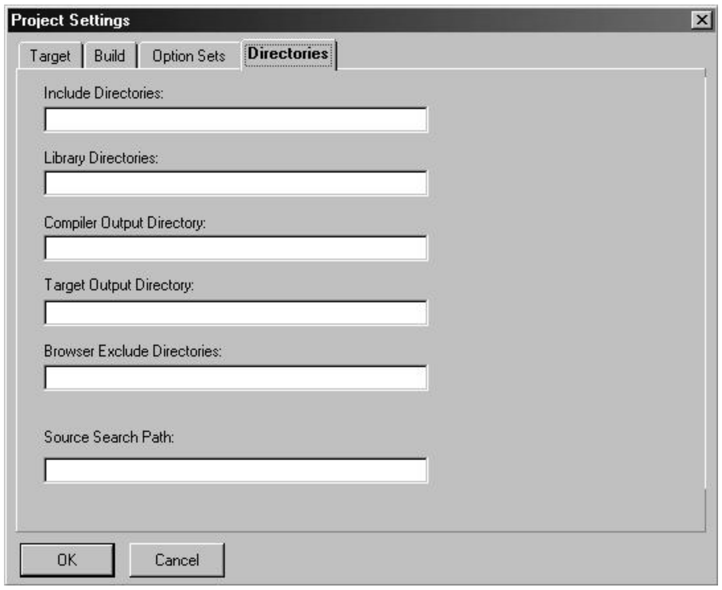
Target Type: Executable

Uses: ☐ OLE ☐ MFC ☐ OCX ○ MFC (LIB) ☐ ODBC ○ MFC (DLL)

Character Type: [✓ ● Single Byte] ○ Multi Byte ○ Unicode

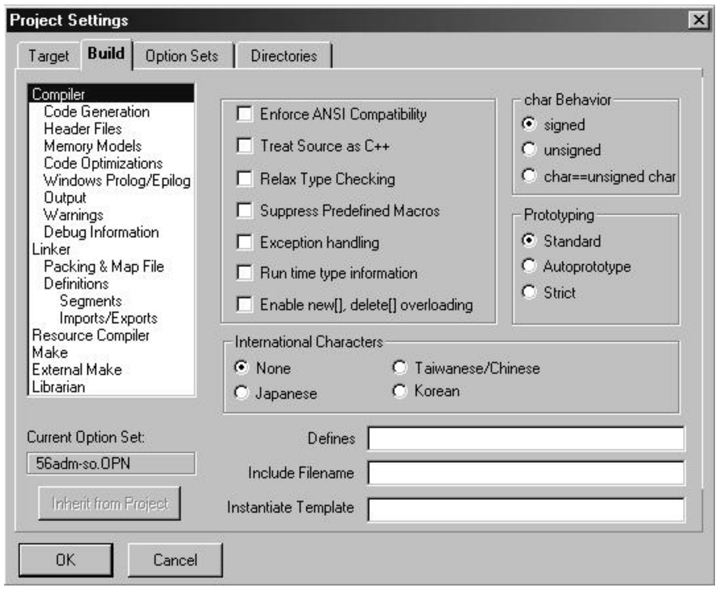
☑ Allow Project to be Built
☑ Automatically Parse
☐ Parse System Files

17 These settings were set when the project was created. No changes are required. The executable must be built as a DOS executable in order to run on the PLX platform.
18 Click the **Directories** tab and fill in directory information as required by your project's directory structure.



19 If the fields are left blank then it is assumed that all of the files are in the same directory as the project file. The output files will be placed in this directory as well.

20 Click on the **Build** tab, and choose the **Compiler** selection. Confirm that the settings match those shown in the following screen:


Project Settings

Target | Build | Option Sets | Directories

Compiler (selected)

- [ ] Enforce ANSI Compatibility
- [ ] Treat Source as C++
- [ ] Relax Type Checking
- [ ] Suppress Predefined Macros
- [ ] Exception handling
- [ ] Run time type information
- [ ] Enable new[], delete[] overloading

char Behavior: [✓ signed] unsigned char==unsigned char

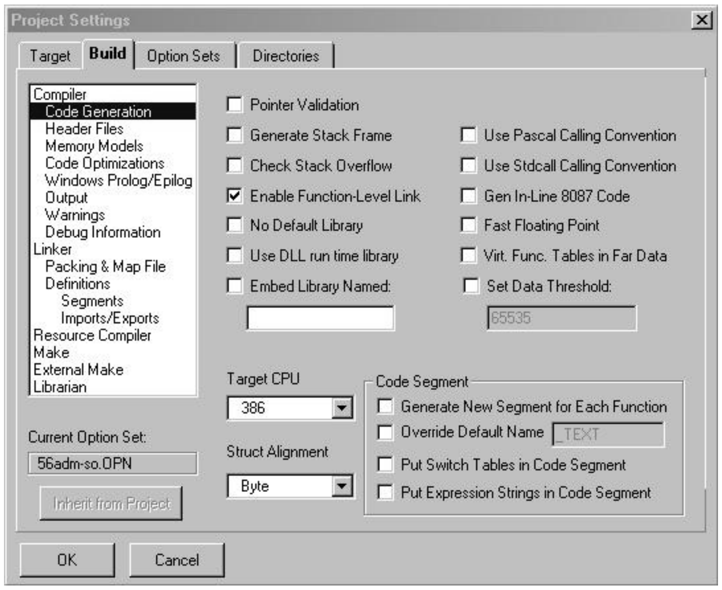
Prototyping: [✓ Standard] Autoprototype Strict

International Characters: [✓ None] Taiwanese/Chinese Japanese Korean

Current Option Set: 56adm-so.OPN

Defines:
Include Filename:
Instantiate Template:

21 Click **Code Generation from** the *Topics* field and ensure that the options match those shown in the following screen:


Project Settings

Target | Build | Option Sets | Directories

Code Generation (selected)

- [ ] Pointer Validation
- [ ] Generate Stack Frame
- [ ] Check Stack Overflow
- [✓] Enable Function-Level Link
- [ ] No Default Library
- [ ] Use DLL run time library
- [ ] Embed Library Named:
- [ ] Use Pascal Calling Convention
- [ ] Use Stdcall Calling Convention
- [ ] Gen In-Line 8087 Code
- [ ] Fast Floating Point
- [ ] Virt. Func. Tables in Far Data
- [ ] Set Data Threshold: 65535

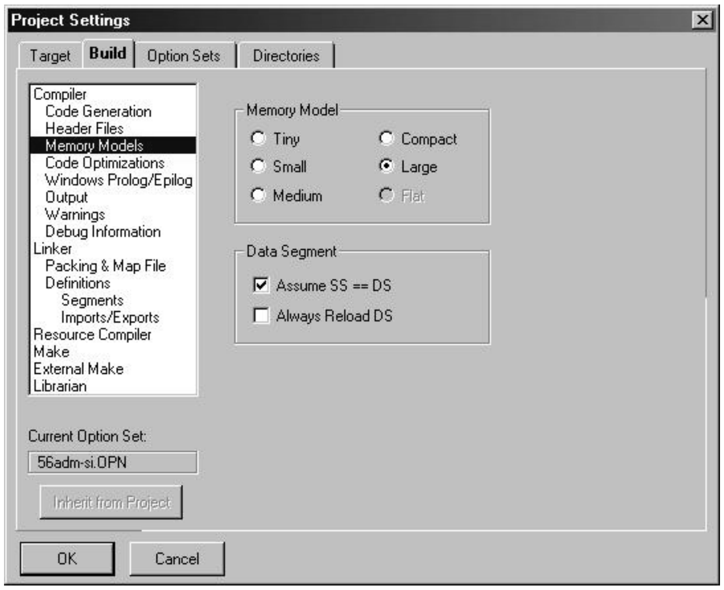
Target CPU: 386

Struct Alignment: Byte

Code Segment:
- [ ] Generate New Segment for Each Function
- [ ] Override Default Name _TEXT
- [ ] Put Switch Tables in Code Segment
- [ ] Put Expression Strings in Code Segment

Current Option Set: 56adm-so.OPN

22 Click **Memory Models from** the *Topics* field and ensure that the options match those shown in the following screen:



Memory Model

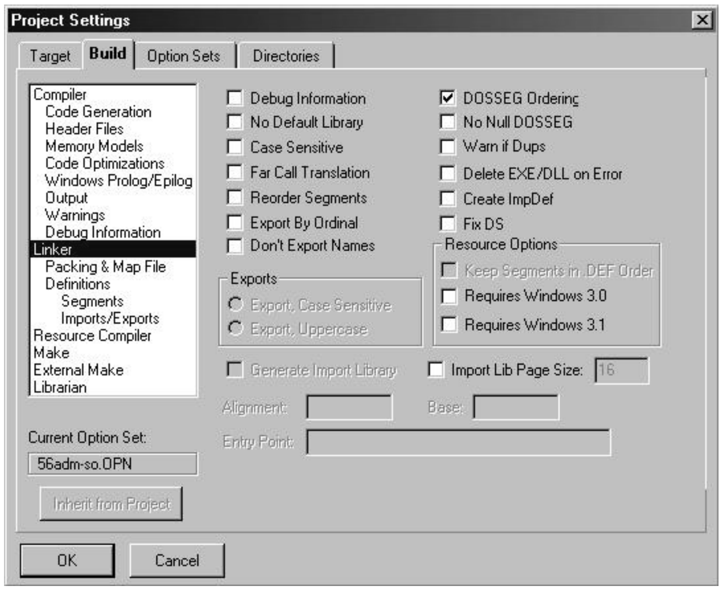
- ○ Tiny
- ○ Small
- ○ Medium
- ○ Compact
- ● Large
- ○ Flat

Data Segment

- [✓] Assume SS == DS
- [ ] Always Reload DS

Current Option Set: 56adm-si.OPN

23 Click **Linker from** the *Topics* field and ensure that the options match those shown in the following screen:



- [ ] Debug Information
- [ ] No Default Library
- [ ] Case Sensitive
- [ ] Far Call Translation
- [ ] Reorder Segments
- [ ] Export By Ordinal
- [ ] Don't Export Names
- [✓] DOSSEG Ordering
- [ ] No Null DOSSEG
- [ ] Warn if Dups
- [ ] Delete EXE/DLL on Error
- [ ] Create ImpDef
- [ ] Fix DS

Exports

- ○ Export, Case Sensitive
- ○ Export, Uppercase

Resource Options

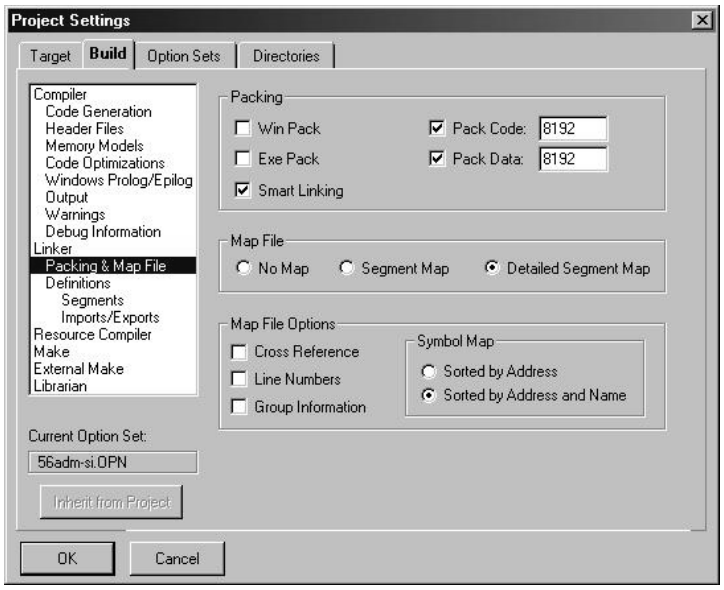
- [ ] Keep Segments in .DEF Order
- [ ] Requires Windows 3.0
- [ ] Requires Windows 3.1

- [ ] Generate Import Library
- [ ] Import Lib Page Size: 16

Alignment:
Base:
Entry Point:

Current Option Set: 56adm-so.OPN

24 Click **Packing & Map File from** the *Topics* field and ensure that the options match those shown in the following screen:


Project Settings

Target | **Build** | Option Sets | Directories

Compiler
- Code Generation
- Header Files
- Memory Models
- Code Optimizations
- Windows Prolog/Epilog
- Output
- Warnings
- Debug Information

Linker
- **Packing & Map File**
- Definitions
  - Segments
  - Imports/Exports

Resource Compiler
Make
External Make
Librarian

Current Option Set: 56adm-si.OPN

Inherit from Project

Packing
- [ ] Win Pack
- [ ] Exe Pack
- [✓] Smart Linking
- [✓] Pack Code: 8192
- [✓] Pack Data: 8192

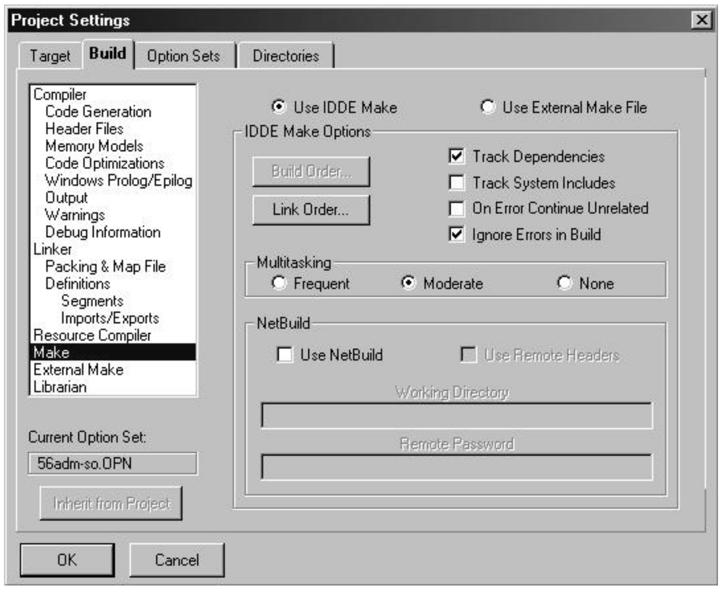
Map File
- ○ No Map
- ○ Segment Map
- ● Detailed Segment Map

Map File Options
- [ ] Cross Reference
- [ ] Line Numbers
- [ ] Group Information

Symbol Map
- ○ Sorted by Address
- ● Sorted by Address and Name

OK | Cancel

25 Click **Make from** the *Topics* field and ensure that the options match those shown in the following screen:


Project Settings

Target | **Build** | Option Sets | Directories

Compiler
- Code Generation
- Header Files
- Memory Models
- Code Optimizations
- Windows Prolog/Epilog
- Output
- Warnings
- Debug Information

Linker
- Packing & Map File
- Definitions
  - Segments
  - Imports/Exports

Resource Compiler
Make
External Make
Librarian

Current Option Set: 56adm-so.OPN

Inherit from Project

- ● Use IDDE Make
- ○ Use External Make File

IDDE Make Options
- Build Order...
- Link Order...
- [✓] Track Dependencies
- [ ] Track System Includes
- [ ] On Error Continue Unrelated
- [✓] Ignore Errors in Build

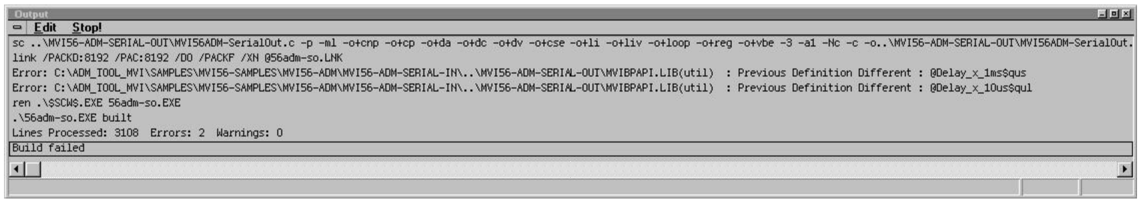
Multitasking
- ○ Frequent
- ● Moderate
- ○ None

NetBuild
- [ ] Use NetBuild
- [ ] Use Remote Headers
- Working Directory:
- Remote Password:

OK | Cancel

26 Click **OK**.
27 Click **Parse** → **Update All** from the Project Window *Menu*. The new settings may not take effect unless the project is updated and reparsed.
28 Click **Project** → **Build All** from the Main Menu.

29 When complete, the build results will appear in the Output window:



```
sc ..\MVI56-ADM-SERIAL-OUT\MVI56ADM-SerialOut.c -p -ml -o+cnp -o+cp -o+da -o+dc -o+dv -o+cse -o+li -o+liv -o+loop -o+reg -o+vbe -3 -a1 -Nc -c -o..\MVI56-ADM-SERIAL-OUT\MVI56ADM-SerialOut.
link /PACKD:8192 /PAC:8192 /DO /PACKF /XN @56adm-so.LNK
Error: C:\ADM_TOOL_MVI\SAMPLES\MVI56-SAMPLES\MVI56-ADM\MVI56-ADM-SERIAL-IN\..\MVI56-ADM-SERIAL-OUT\MVIBPAPI.LIB(util)  : Previous Definition Different : @Delay_x_1ms$qus
Error: C:\ADM_TOOL_MVI\SAMPLES\MVI56-SAMPLES\MVI56-ADM\MVI56-ADM-SERIAL-IN\..\MVI56-ADM-SERIAL-OUT\MVIBPAPI.LIB(util)  : Previous Definition Different : @Delay_x_10us$qul
ren .\$SCW$.EXE 56adm-so.EXE
.\56adm-so.EXE built
Lines Processed: 3108  Errors: 2  Warnings: 0
Build failed
```

The executable file will be located in the directory listed in the Compiler Output Directory box of the Directories tab (that is, C:\ADM_TOOL_PLX\SAMPLES\…). The *Project Settings* window can be accessed by clicking **Project** → **Settings** from the *Main Menu.*

Porting Notes: *The Digital Mars compiler classifies duplicate library names as Level 1 Errors rather than warnings. These errors will manifest themselves as "Previous Definition Different: function name". Level 1 errors are non-fatal and the executable will build and run. The architecture of the ADM libraries will cause two or more of these errors to appear when the executable is built. This is a normal occurrence. If you are building existing code written for a different compiler you may have to replace calls to run-time functions with the Digital Mars equivalent. Refer to the Digital Mars documentation on the Run-time Library for the functions available.*

3.1.2 Configuring Borland C++5.02

The following procedure allows you to successfully build the sample ADM code supplied by ProSoft Technology, using Borland C++ 5.02. After verifying that the sample code can be successfully compiled and built, you can modify the sample code to work with your application.

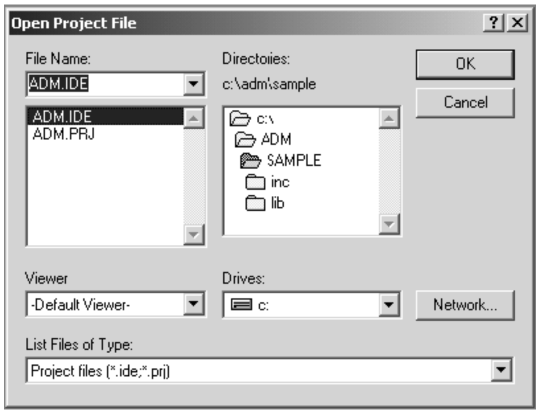
Note: This procedure assumes that you have successfully installed Borland C++ 5.02 on your workstation.

Downloading the Sample Program

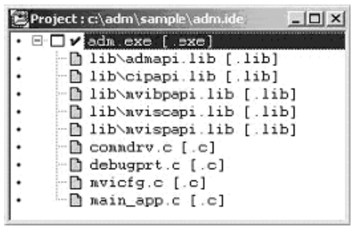
The sample code files are located in the ADM_TOOL_PLX.ZIP file. This zip file is available from the CD-ROM shipped with your system or from the www.prosoft-technology.com web site. When you unzip the file, you will find the sample code files in \ADM_TOOL_PLX\SAMPLES\.

<u>*Building an Existing Borland C++ 5.02 ADM Project*</u>

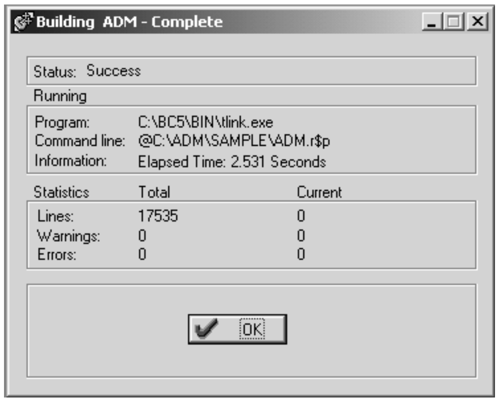
1 Start Borland C++ 5.02, then click **Project → Open Project** from the *Main Menu*.



2 From the *Directories* field, navigate to the directory that contains the project (C:\adm\sample).
3 In the *File Name* field, click on the project name (adm.ide).
4 Click **OK**. The *Project* window appears:



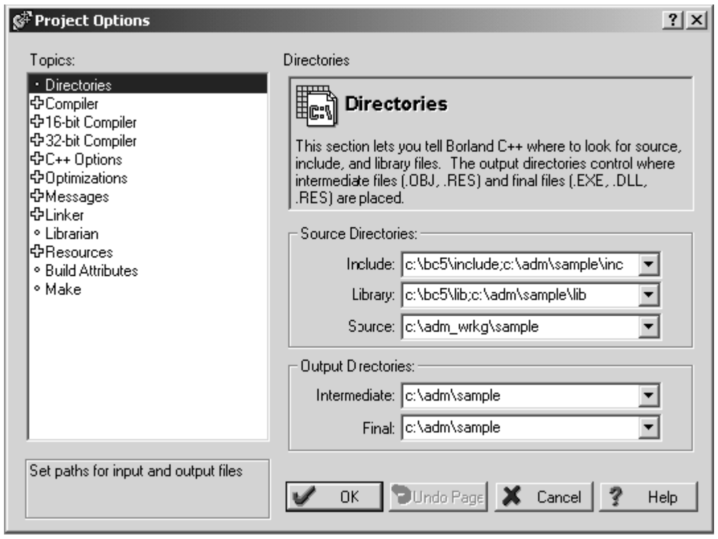
5 Click **Project → Build All** from the *Main Menu* to create the .exe file. The *Building ADM* window appears when complete:



```
Status:  Success
Running
Program:       C:\BC5\BIN\tlink.exe
Command line:  @C:\ADM\SAMPLE\ADM.r$p
Information:   Elapsed Time: 2.531 Seconds

Statistics     Total          Current
Lines:         17535          0
Warnings:      0              0
Errors:        0              0
```

6 When Success appears in the *Status* field, click **OK**.

The executable file will be located in the directory listed in the *Final* field of the Output Directories (that is, C:\adm\sample). The *Project Options* window can be accessed by clicking **Options → Project Menu** from the *Main Menu*.



Directories

This section lets you tell Borland C++ where to look for source, include, and library files. The output directories control where intermediate files (.OBJ, .RES) and final files (.EXE, .DLL, .RES) are placed.

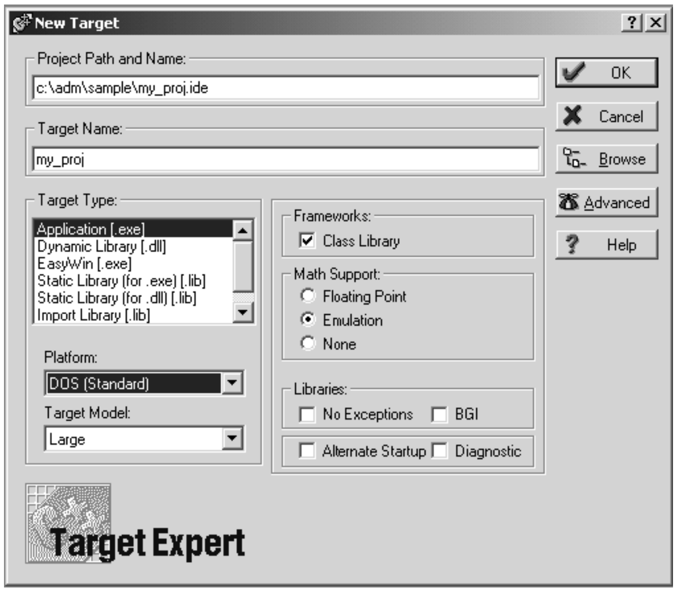
Source Directories:
Include: c:\bc5\include;c:\adm\sample\inc
Library: c:\bc5\lib;c:\adm\sample\lib
Source: c:\adm_wrkg\sample

Output Directories:
Intermediate: c:\adm\sample
Final: c:\adm\sample

Set paths for input and output files

Creating a New Borland C++ 5.02 ADM Project

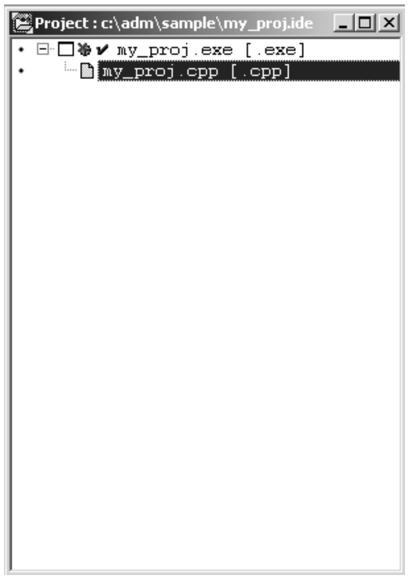
1 Start Borland C++ 5.02, and then click **File → Project** from the *Main Menu*.



Project Path and Name: c:\adm\sample\my_proj.ide
Target Name: my_proj
Target Type: Application [.exe] (selected); Dynamic Library [.dll]; EasyWin [.exe]; Static Library (for .exe) [.lib]; Static Library (for .dll) [.lib]; Import Library [.lib]
Platform: DOS (Standard)
Target Model: Large
Frameworks: [✓] Class Library
Math Support: Floating Point [✓ Emulation] None
Libraries: No Exceptions, BGI, Alternate Startup, Diagnostic

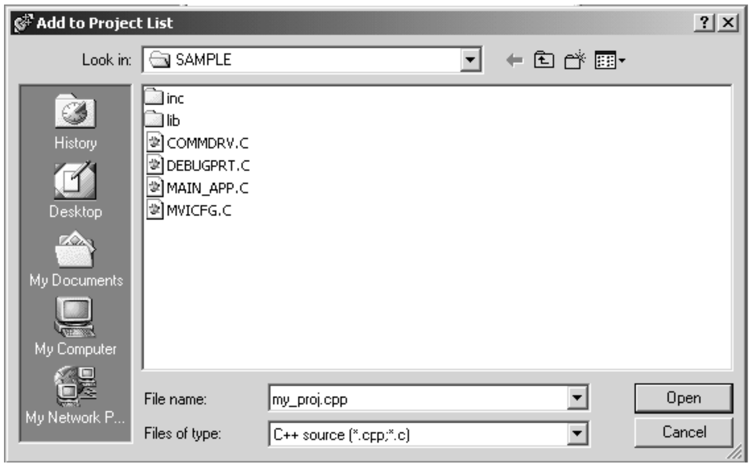
2 Type in the **Project Path and Name**. The Target Name is created automatically.
3 In the *Target Type* field, choose **Application (.exe)**.
4 In the *Platform* field, choose **DOS (Standard)**.
5 In the *Target Model* field, choose **Large**.

6 Ensure that **Emulation** is checked in the *Math Support* field.
7 Click **OK**. A Project window appears:



```
my_proj.exe [.exe]
    my_proj.cpp [.cpp]
```

8 Click on the .cpp file created and press the **Delete** key. Click **Yes** to delete the .cpp file.
9 Right click on the .exe file listed in the *Project* window and choose the *Add Node* menu selection. The following window appears:



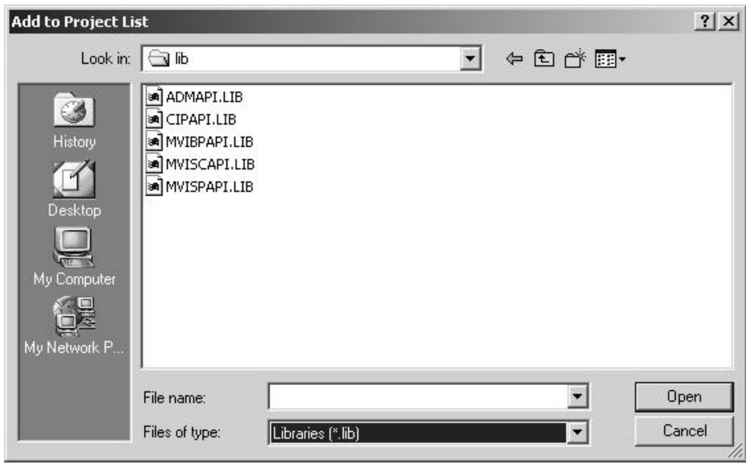
Look in: SAMPLE

```
inc
lib
COMMDRV.C
DEBUGPRT.C
MAIN_APP.C
MVICFG.C
```

File name: my_proj.cpp
Files of type: C++ source (*.cpp;*.c)

10 Click source file, then click **Open** to add source file to the project. Repeat this step for all source files needed for the project.
11 Repeat the same procedure for all library files (.lib) needed for the project.

12 Choose Libraries (*.lib) from the *Files of Type* field to view all library files:

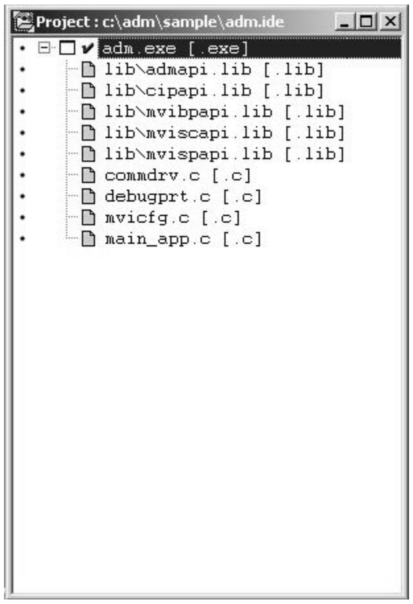


lib

ADMAPI.LIB
CIPAPI.LIB
MVIBPAPI.LIB
MVISCAPI.LIB
MVISPAPI.LIB

File name:
Files of type: Libraries (*.lib)

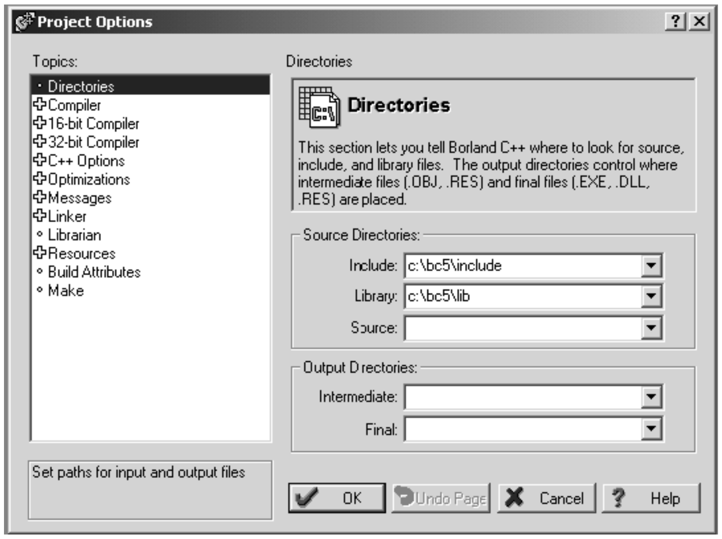
13 The *Project* window should now contain all the necessary source and library files as shown in the following window:



Project : c:\adm\sample\adm.ide

```
adm.exe [.exe]
    lib\admapi.lib [.lib]
    lib\cipapi.lib [.lib]
    lib\mvibpapi.lib [.lib]
    lib\mviscapi.lib [.lib]
    lib\mvispapi.lib [.lib]
    commdrv.c [.c]
    debugprt.c [.c]
    mvicfg.c [.c]
    main_app.c [.c]
```

14 Click **Options** → **Project** from the *Main Menu*.



Directories

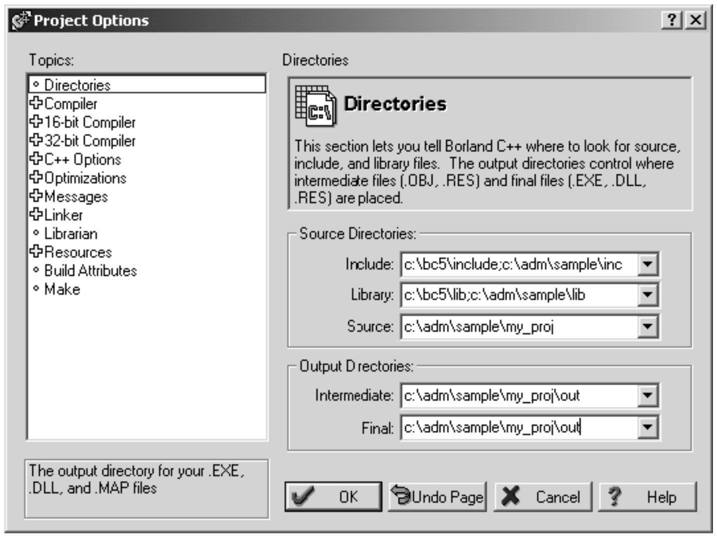
This section lets you tell Borland C++ where to look for source, include, and library files. The output directories control where intermediate files (.OBJ, .RES) and final files (.EXE, .DLL, .RES) are placed.

Source Directories:
Include: c:\bc5\include
Library: c:\bc5\lib
Source:

Output Directories:
Intermediate:
Final:

Set paths for input and output files

15 Click **Directories** from the *Topics* field and fill in directory information as required by your project's directory structure.



Directories

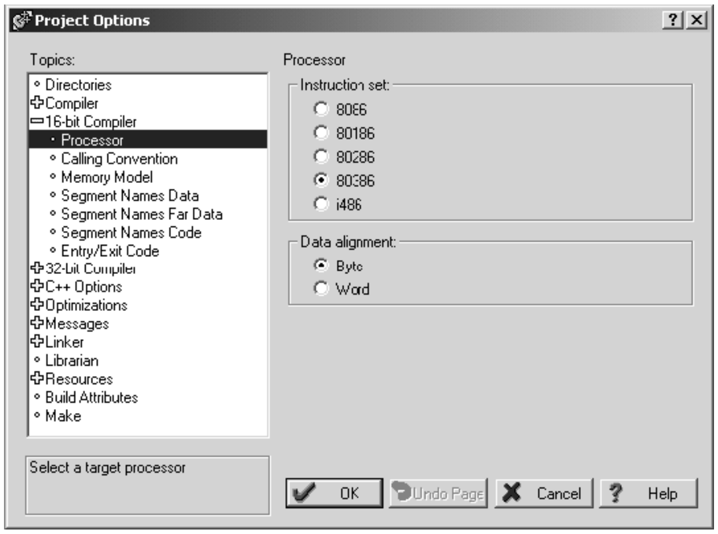
This section lets you tell Borland C++ where to look for source, include, and library files. The output directories control where intermediate files (.OBJ, .RES) and final files (.EXE, .DLL, .RES) are placed.

Source Directories:
Include: c:\bc5\include;c:\adm\sample\inc
Library: c:\bc5\lib;c:\adm\sample\lib
Source: c:\adm\sample\my_proj

Output Directories:
Intermediate: c:\adm\sample\my_proj\out
Final: c:\adm\sample\my_proj\out

The output directory for your .EXE, .DLL, and .MAP files

16 Double-click on the **Compiler** header in the *Topics* field, and choose the **Processor** selection. Confirm that the settings match those shown in the following screen:



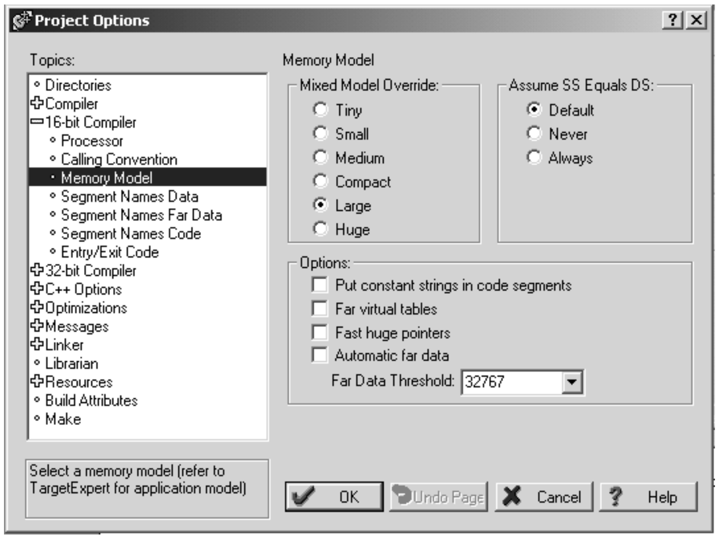
Processor

Instruction set: ( ) 8086 ( ) 80186 ( ) 80286 [✓ 80386] ( ) i486

Data alignment: [✓ Byte] ( ) Word

Select a target processor

17 Click **Memory Model** from the *Topics* field and ensure that the options match those shown in the following screen:



Memory Model

Mixed Model Override: ( ) Tiny ( ) Small ( ) Medium ( ) Compact [✓ Large] ( ) Huge

Assume SS Equals DS: [✓ Default] ( ) Never ( ) Always

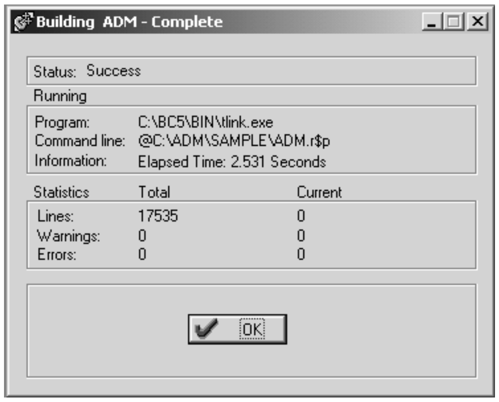
Options:
- [ ] Put constant strings in code segments
- [ ] Far virtual tables
- [ ] Fast huge pointers
- [ ] Automatic far data

Far Data Threshold: 32767

Select a memory model (refer to TargetExpert for application model)

18 Click **OK**.
19 Click **Project** → **Build All** from the *Main Menu*.

20 When complete, the *Success* window appears:



Status: Success
Running
Program: C:\BC5\BIN\tlink.exe
Command line: @C:\ADM\SAMPLE\ADM.r$p
Information: Elapsed Time: 2.531 Seconds

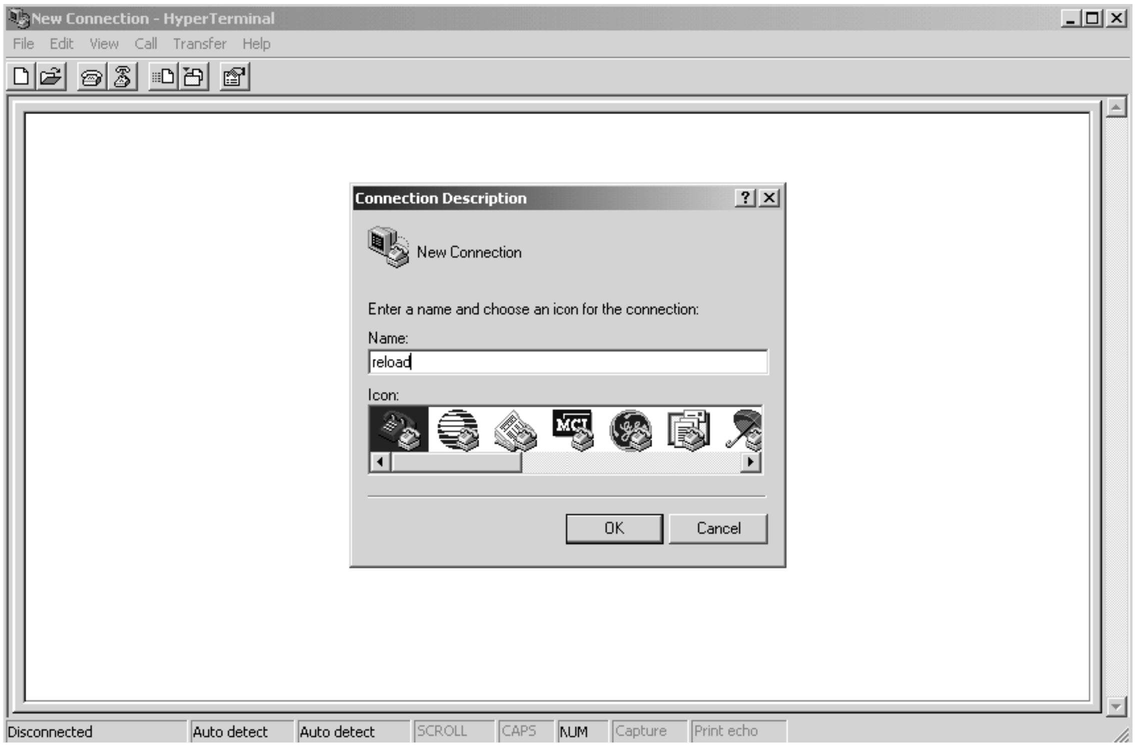
Statistics	Total	Current
Lines:	17535	0
Warnings:	0	0
Errors:	0	0

21 Click **OK**. The executable file will be located in the directory listed in the Final box of the Output Directories (that is, C:\adm\sample). The *Project Options* window can be accessed by clicking **Options** → **Project** from the *Main Menu.*

3.2 Downloading Files to the Module

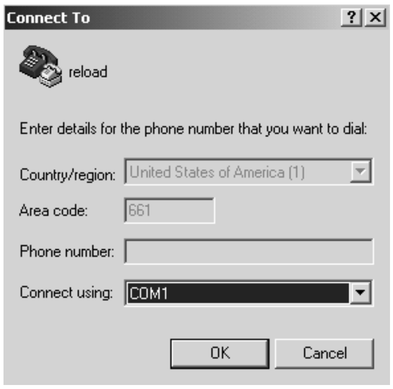
1 Connect your PC's COM port to the ProLinx Configuration/Debug port using the Null Modem cable and ProLinx Adapter cable.

2 From the Start Menu on your PC, select **Programs** → **Accessories** → **Communications** → **HyperTerminal**. The *New Connection* Screen appears:



Enter a name and choose an icon for the connection:
Name: reload
Icon:

3 Enter a name and choose **OK**. The *Connect To* window appears:



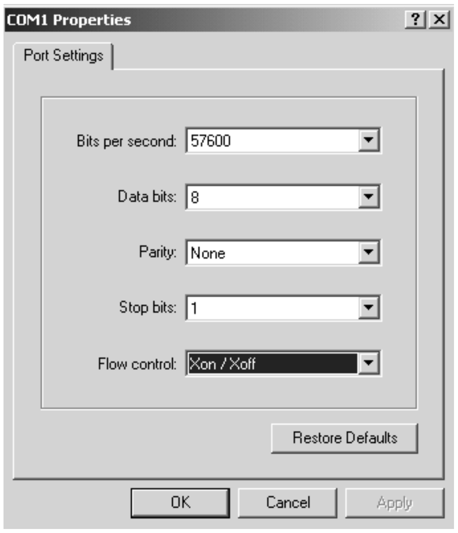
Connect To

reload

Enter details for the phone number that you want to dial:

Country/region:	United States of America (1)
Area code:	661
Phone number:	
Connect using:	COM1

4 Choose the COM port that your ProLinx module is connected to and choose **OK**. The COM1 Properties window appears.



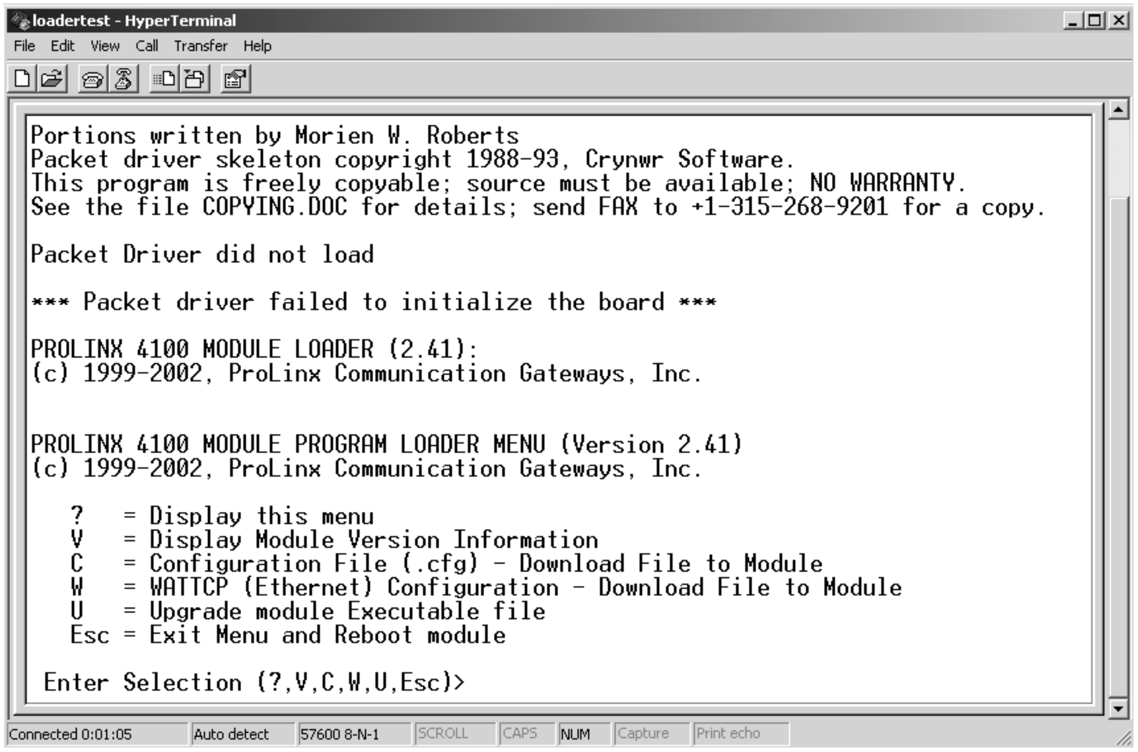
COM1 Properties

Port Settings

Bits per second:	57600
Data bits:	8
Parity:	None
Stop bits:	1
Flow control:	Xon / Xoff

5 Ensure that the settings shown on this screen match those on your PC.
6 Click **OK**. The HyperTerminal window appears with a DOS prompt and blinking cursor.

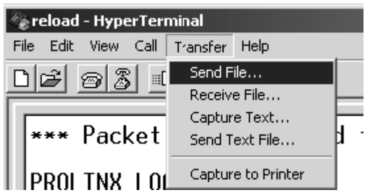
7 Apply power to the ProLinx module and hold down the **[L]** key. The screen displays information and ultimately displays the Loader menu:



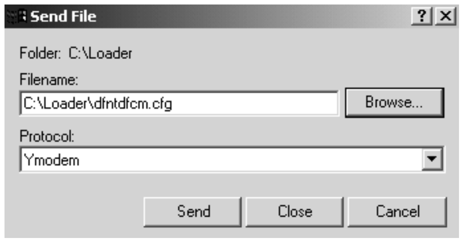
```
Portions written by Morien W. Roberts
Packet driver skeleton copyright 1988-93, Crynwr Software.
This program is freely copyable; source must be available; NO WARRANTY.
See the file COPYING.DOC for details; send FAX to +1-315-268-9201 for a copy.

Packet Driver did not load

*** Packet driver failed to initialize the board ***

PROLINX 4100 MODULE LOADER (2.41):
(c) 1999-2002, ProLinx Communication Gateways, Inc.


PROLINX 4100 MODULE PROGRAM LOADER MENU (Version 2.41)
(c) 1999-2002, ProLinx Communication Gateways, Inc.

   ?   = Display this menu
   V   = Display Module Version Information
   C   = Configuration File (.cfg) - Download File to Module
   W   = WATTCP (Ethernet) Configuration - Download File to Module
   U   = Upgrade module Executable file
   Esc = Exit Menu and Reboot module

 Enter Selection (?,V,C,W,U,Esc)>
```

This menu provides options that allow you to download a configuration file **[C]**, a WATTCP file **[W]**, or a new executable file **[U]**. You can also press **[V]** to view module version information.

1 Type **[U]** at the prompt to transfer executable files from the computer to the ProLinx unit.
2 Type **[Y]** when the program asks if you want to load an .exe file.
3 From the HyperTerminal menu, select **Transfer** → **Send**.



4 When the *Send To* screen appears, browse for the executable file to send to the module. Be sure to select **Y Modem** in the Protocol field.



Folder: C:\Loader
Filename: C:\Loader\dfntdfcm.cfg
Protocol: Ymodem

5 Click **Send**. The program loads the new executable file to the ProLinx module. When the download is complete, the program returns to the Loader menu.

If you want to load a new configuration file or a WATTCP file, select the appropriate option and perform the same steps to download these files.

6 Press **[Esc]**, then **[Y]** to confirm module reboot.

4 Understanding the PLX-ADMNET API

<u>In This Chapter</u>

The PLX ADM API Suite allows software developers access to the top layer of the serial and Ethernet ports. The PLX-ADMNET API suite accesses the Ethernet port. Both APIs can be easily used without having detailed knowledge of the module's hardware design. The PLX ADMNET API Suite consists of the Ethernet Port API. The Ethernet Port API provides access to the Ethernet network.

Applications for the PLX ADMNET module may be developed using industry-standard DOS programming tools and the appropriate API components.

This section provides general information pertaining to application development for the PLX ADMNET module.

4.1 API Libraries

Each API provides a library of function calls. The library supports any programming language that is compatible with the Pascal calling convention.

Each API library is a static object code library that must be linked with the application to create the executable program. It is distributed as a 16-bit large model OMF library, compatible with Digital Mars C++ or Borland development tools.

Note: The following compiler versions are intended to be compatible with the PLX module API:
Digital Mars C++ 8.49
Borland C++ V5.02
More compilers will be added to the list as the API is tested for compatibility with them.

4.1.1 Calling Convention

The API library functions are specified using the 'C' programming language syntax. To allow applications to be developed in other industry-standard programming languages, the standard Pascal calling convention is used for all application interface functions.

4.1.2 *Header File*

A header file is provided along with each library. This header file contains API function declarations, data structure definitions, and miscellaneous constant definitions. The header file is in standard 'C' format.

4.1.3 *Sample Code*

A sample application is provided to illustrate the usage of the API functions. Full source for the sample application is also provided. The sample application may be compiled using Digital Mars or Borland C++.

4.1.4 *Multithreading Considerations*

The DOS 6-XL operating system supports the development of multi-threaded applications.

Note: The multi-threading library *kernel.lib* in the DOS folder on the distribution CD-ROM is compiler-specific to Borland C++ 5.02. It is *not* compatible with Digital Mars C++ 8.49. ProSoft Technology, Inc. does not support multi-threading with Digital Mars C++ 8.49.

Note: The ADM DOS 6-XL operating system has a system tick of 5 milliseconds. Therefore, thread scheduling and timer servicing occur at 5ms intervals. Refer to the *DOS 6-XL Developer's Guide* on the distribution CD-ROM for more information.

Multi-threading is also supported by the API.

- *DOS* libraries have been tested and are thread-safe for use in multi-threaded applications.
- *MVIsp* libraries are safe to use in multi-threaded applications with the following precautions: If you call the same *MVIsp* function from multiple threads, you will need to protect it, to prevent task switches during the function's execution. The same is true for different *MVIsp* functions that share the same resources (for example, two different functions that access the same read or write buffer).

WARNING: *ADM* and *ADMNET* libraries are *not* thread-safe. ProSoft Technology, Inc. does not support the use of *ADM* and *ADMNET* libraries in multi-threaded applications.

4.2 Development Tools

An application that is developed for the PLX-ADMNET module must be stored on the module's Flash ROM disk to be executed. A loader program is provided with the module, to download an executable, configuration file or wattcp.cfg file via module port 0, as needed.

4.3 Theory of Operation

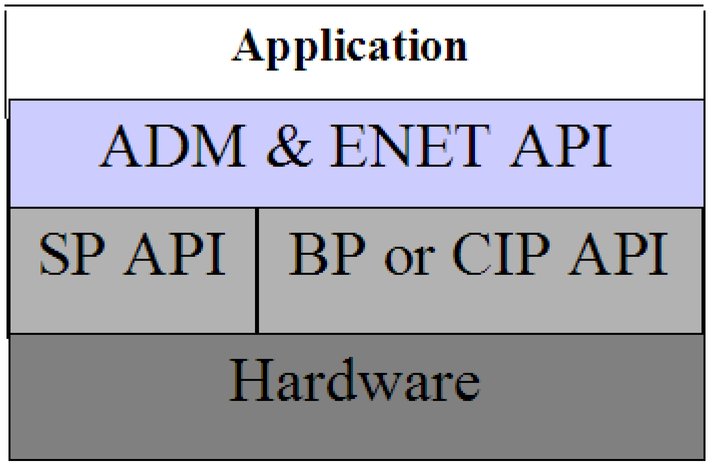
4.3.1 ADM API

The ADMNET API is one component of the PLX ADM API Suite. The ADMNET API provides a simple module-level interface that is portable between members of the PLX Family. This is useful when developing an application that implements a serial-Ethernet protocol for a particular device, such as a scale or bar code reader. After an application has been developed, it can be used on any of the PLX family modules.

4.3.2 ADMNET API Architecture

The ADMNET API is composed of a statically-linked library (called the ADMNET library). Applications using the ADMNET API must be linked with the ADMNET library.

The following illustration shows the relationship between the API components.



4.4 ADM API Files

The following table lists the supplied API file names. These files should be copied to a convenient directory on the computer where the application is to be developed. These files need not be present on the module when executing the application.

File Name	Description
`ADMNETAPI.H`	Include file
`ADMNETAPI.LIB`	Library (16-bit OMF format)

4.4.1 ADM Interface Structure

The ADMNET interface structure functions mainly as a protocol UDP and TCP socket. Pointers to structures are used so that the API can access lower-level Ethernet communication. The ADMNET API requires the interface structure and the structures referenced by it. Refer to the example code section for examples of the functions.

The interface structure is as follows:

```
typedef struct   _tcp_socket {
   struct        _tcp_socket *next;
   word          ip_type;                   // always set to TCP_PROTO
   char          *err_msg;
   char          *usr_name;
   void          (*usr_yield)(void);
   byte           rigid;
   byte           stress;
   word           sock_mode;                // a logical OR of bits

   longword       usertimer;                // ip_timer_set, ip_timer_timeout
   dataHandler_t  dataHandler;              // called with incoming data
   eth_address    hisethaddr;               // ethernet address of peer
   longword       hisaddr;                  // internet address of peer
   word           hisport;                  // tcp ports for this connection
   longword       myaddr;
   word           myport;
   word           locflags;

   int            queuelen;
   byte           *queue;

   int            rdatalen;                 // must be signed
   word           maxrdatalen;
   byte           *rdata;
   byte           rddata[tcp_MaxBufSize+1];  // received data
   longword       safetysig;
   word           state;                    // connection state

   longword       acknum;
   longword       seqnum;                   // data ack'd and sequence num
   long           timeout;                  // timeout, in milliseconds
   byte           unhappy;                  // flag, indicates retransmitting
segt's
   byte           recent;                   // 1 if recently transmitted
   word           flags;                    // tcp flags word for last packet sent

   word           window;                   // other guy's window
   int            datalen;                  // number of bytes of data to send
                                            // must be signed
   int            unacked;                  // unacked data

   byte           cwindow;                  // Van Jacobson's algorithm
   byte           wwindow;
```

```
      word          vj_sa;                    // VJ's alg, standard average
      word          vj_sd;                    // VJ's alg, standard deviation
      longword      vj_last;                  // last transmit time
      word          rto;
      byte          karn_count;               // count of packets
      byte          tos;                      // priority
                                              // retransmission timeout procedure
                                              // these are in clock ticks
      longword      rtt_lasttran;             // last transmission time
      longword      rtt_smooth;               // smoothed round trip time
      longword      rtt_delay;                // delay for next transmission
      longword      rtt_time;                 // time of next transmission

      word          mss;
      longword      inactive_to;              // for the inactive flag
      int           sock_delay;

      byte          data[tcp_MaxBufSize+1];   // data to send
   } tcp_Socket;

   typedef struct _udp_socket {
      struct        _udp_socket *next;
      word          ip_type;                  // always set to UDP_PROTO
      char          *err_msg;                 // null when all is ok
      char          *usr_name;
      void         (*usr_yield)( void );
      byte          rigid;
      byte          stress;
      word          sock_mode;                // a logical OR of bits
      longword      usertimer;                // ip_timer_set, ip_timer_timeout
      dataHandler_t dataHandler;
      eth_address   hisethaddr;               // peer's ethernet address
      longword      hisaddr;                  // peer's internet address
      word          hisport;                  // peer's UDP port
      longword      myaddr;
      word          myport;
      word          locflags;

      int           queuelen;
      byte          *queue;

      int           rdatalen;                 // must be signed
      word          maxrdatalen;
      byte          *rdata;
      byte          rddata[ tcp_MaxBufSize + 1];  // if dataHandler = 0, len == 512
      longword      safetysig;
   } udp_Socket;
```

5 Application Development Function Library - ADMNET API

In This Chapter

5.1 ADMNET API Functions

This section provides detailed programming information for each of the ADMNET API library functions. The calling convention for each API function is shown in 'C' format.

The same set of API functions is supported for all of the modules in the PLX family.

API library routines are categorized according to functionality.

Function Category	Function Name	Description
Initialize Socket	ADM_init_socket	Initialize number of sockets used on each port number and assign name to each port.
	ADM_open_sk	Open and reopen each socket separately after socket is initialized or closed.
Release Socket	ADM_release_sockets	Release all sockets that have been initialized using ADM_init_socket.
	ADM_close_sk	Close each socket separately without release socket.
Send Socket	ADM_send_socket	Send socket according to name assign throughout initialization process as either UDP or TCP. This function also takes care of opening socket connection.
	ADM_send_sk	Send socket with previously open with function ADM_open_sk.

Function Category	Function Name	Description
Receive Socket	ADM_receive_socket	Receive socket according to name assigned throughout initialization process as either UDP or TCP. This function also takes care of opening socket connection.
	ADM_receive_sk	Receive socket with previously open with function ADM_open_sk.
Miscellaneous	ADM_NET_GetVersionInfo	Get ADMNET API version information.
	ADM_is_sk_open	Test if the socket is still open.

5.2 ADMNET API Initialize Functions

The following topics describe the ADMNET API Initialize functions.

ADM_init_socket

Syntax

```
int ADM_init_socket(int numSK, int portNum, int buffSize, char *name);
```

Parameters

numSK	Variable indicating how many sockets to use.
portNum	Port Number.
buffSize	The size of the buffer available in each socket.
name	The name of the socket.

Description

ADM_init_socket acquires access to the ADMNET API and dynamically generates a set of sockets according to numSK and assigns portNum, buffSize, then names each socket that the application will use in subsequent functions. This function must be called before any of the other API functions can be used.

IMPORTANT After the API has been opened, ADM_Release_Sockets should always be called before exiting the application.

Return Value

SK_SUCCESS	API has successfully initialized variables.
SK_PORT_NOT_ALLOW	API does not allow port number used.
SK_CANNOT_ALLOCATE_MEMORY	API cannot allocate memory.

Example

```
int numSK = 5;
int portNum = 5757;
int buffSize = 1000;

if(ADM_init_socket(numSK, portNum, buffSize, "ReceiveSK") != SK_SUCCESS)
{
   printf("\nFailed to open ADM API... exiting program\n");
   ADM_release_sockets();
}
```

See Also

ADM_release_sockets (page 43)

ADM_open_sk

Syntax

```
int ADM_open_sk(char *skName, char *ServerIPAddress, int protocol);
```

Parameters

skName	Name of the socket that has been initialized and used to send data.
ServerIPAddress	IP address that will be used to send data to.
protocol	Specified protocol to send over Ethernet (USE_TCP or USE_UDP).

Description

ADM_open_sk opens a socket according to the name previously initialized, skName, with ADM_init_socket given, and assigns IP address, ServerIPAddress for send function with specific protocol, either UDP or TCP. ADM_init_socket must be used before this function.

IMPORTANT: After the API has been opened, ADM_close_sk should always be called for closing the socket. 0.0.0.0 passes as ServerIPAddress to open socket as a server to listen to a message from client.

Return Value

SK_SUCCESS	API has successfully opened socket.
SK_PROCESS_SOCKET	Open is still in process.
SK_NOT_FOUND	API could not find an initialized socket with the name passed to the function.
SK_TIMEOUT	Time out opening socket.
SK_OPEN_FAIL	Socket could not be opened.

Example

```
char sockName1[ ] = "SendSocket";
int buffSize1 = 4096;
int port_1 = 6565;
int numSocket1 = 1;
int result;

sock_init();    //initialize the socket interface
ADM_init_socket(numSocket1, port_1, buffSize1, sockName1);

while ((result = ADM_open_sk(sockName1, "0.0.0.0",
USE_TCP))==SK_PROCESS_SOCKET);

if (result==SK_SUCCESS)
{
   printf("successfully Opened a connection!\n");
} else {
   printf("Error Opening a connection!  %d\n", result);
}
```

See Also

ADM_close_sk (page 44)

5.3 ADMNET API Release Socket Functions

This section describes the ADMNET API Release Socket Functions.

ADM_release_sockets

Syntax

```
int ADM_release_sockets(void);
```

Parameters

none

Description

This function is used by an application to release all sockets created by ADM_init_socket.

IMPORTANT: After a socket has been generated, this function should always be called before exiting the application.

Return Value

SK_SUCCESS	API was successfully released all the sockets.

Example

```
ADM_release_sockets();
```

See Also

ADM_init_socket (page 41)

ADM_close_sk

Syntax

```
int ADM_close_sk(char *skName);
```

Parameters

skName	Name of the socket that has been initialized and used to send data.

Description

This function is used by an application to close socket opened by ADM_open_sk.

IMPORTANT: After a socket has been opened, this function should always be called to close socket, but not release socket.

Return Value

SK_SUCCESS	API was successfully released all the sockets.
SK_NOT_FOUND	API could not find an initialized socket with the name passed to the function.

Example

```
char sockName1[ ] = "SendSocket";

ADM_close_sk(sockName1);
printf ("Connection Closed!\n");
```

See Also

ADM_init_socket (page 41)

5.4 ADMNET API Send Socket Functions

This section describes the ADMNET API Send Socket functions.

ADM_send_socket

Syntax

```
int ADM_send_socket(char *skName, char *holdSendPtr, int *sendLen, char
*ServerIPAddress, int protocol);
```

Parameters

skName	Name of the socket that has been initialized and used to send data.
holdSendPtr	Pointer to a string of data that will be sent to the ServerIPAddress
sendLen	Number of data specified to send.
ServerIPAddress	IP address that will be used to send data to.
protocol	Specified protocol to send over Ethernet (USE_TCP or USE_UDP).

Description

To simplify a program, this function opens connection and sends message. *skName* must be a valid name that has been initialized with ADM_init_socket.

Return Value

SK_SUCCESS	Socket is successfully sent.
SK_NOT_FOUND	Socket could not be found.
SK_PROCESS_SOCKET	Socket is in the process of sending.

Example

```
int sendLen = 10;
int se;

se = ADM_send_socket("sendSK", "1234567890", &sendLen, "192.168.0.148",
USE_UDP);
if(se == SK_SUCCESS)
{
   printf("send Success\n");
}
```

See Also

ADM_receive_socket (page 47)

ADM_send_sk

Syntax

```
int ADM_send_sk(char *skName, char *holdSendPtr, int *sendLen);
```

Parameters

skName	Name of the socket that has been initialized and used to send data.
holdSendPtr	Pointer to a string of data that will be sent to the ServerIPAddress
sendLen	Number of data specified to send.

Description

ADM_ send _sk sends with a socket previously open using ADM_open_sk.

Return Value

SK_SUCCESS	API has successfully open socket.
SK_PROCESS_SOCKET	Open process is still in
SK_NOT_FOUND	API could not find an initialized socket with the name passed to the function.

Example

```
char sockName1[ ] = "SendSocket";
char holdingReg[100];
int buffSize1 = 4096;
int port_1 = 6565;
int numSocket1 = 1;
int result;

sock_init();    //initialize the socket interface
ADM_init_socket(numSocket1, port_1, buffSize1, sockName1);

sprintf(holdingReg,"abcdefghijklmnopqrstuvwxyz-");
sendLen = 27;

while ((result = ADM_send_sk(sockName1, holdingReg, &sendLen)) ==
SK_PROCESS_SOCKET);

if(result == SK_SUCCESS)
{
printf("Data: %s Sent \n", holdingReg);
} else {
printf("Error sending data\n");
}
```

See Also

ADM_receive_sk (page 48)

5.5 ADMNET API Receive Socket Functions

This section describes the ADMNET API Receive Socket functions.

ADM_receive_socket

Syntax

```
int ADM_receive_socket(char *skName, char *holdRecPtr, int *readLen, int
protocol);
```

Parameters

skName	Name of the socket that has been initialized and used to receive data.
holdRecPtr	Pointer to a buffer to hold data that will be received by the API.
readLen	Length of data received by the API.
protocol	Specified protocol to receive over Ethernet (USE_TCP or USE_UDP).

Description

To simplify a program, this function opens connection and receives message.

Return Value

SK_SUCCESS	Socket is successfully sent.
SK_NOT_FOUND	Socket could not be found.
SK_PROCESS_SOCKET	Socket is in the process of sending.

Example

```
char hold[5000];
int readLen;
int se, i;

se = ADM _receive_socket("receiveSK", holdingReg, &readLen, USE_UDP);
if(se == SK_SUCCESS)
{
   printf("Length == %d\n", readLen);
   for (i=0; i<readLen; i++)
   {
     printf("%02X ", *(holdingReg+i));
     if(i%10 == 0) printf("\n");
   }
   printf("\n");
}
```

See Also

ADM_send_socket (page 45)

ADM_receive_sk

Syntax

```
int ADM_receive_sk(char *skName, char *holdRecPtr, int *readLen, char *fromIP);
```

Parameters

skName	Name of the socket that has been initialized and used to receive data.
holdRecPtr	Pointer to a buffer to hold data that will be received by the API.
readLen	Length of data received by the API.
fromIP	Pointer to character array which in turn return with client IP.

Description

This function receives socket after ADM_open_sk is used. skName must be a valid name that has been initialized with ADM_init_socket.

Return Value

SK_SUCCESS	Socket is successfully sent.
SK_NOT_FOUND	Socket could not be found.
SK_PROCESS_SOCKET	Socket is in the process of sending.
SK_TIMEOUT	Time out opening socket.

Example

```
char sockName1[ ] = "SendSocket";
char holdingReg[100];
int result;

while ((result=ADM_receive_sk(sockName1, holdingReg, &readLen, fromIP)) ==
SK_PROCESS_SOCKET);

if(result == SK_SUCCESS){
printf("Received data!\n");
   printf("Length == %d\n", readLen);
   for (i=0; i<readLen; i++)
   {
     printf("%c", *(holdingReg+i));
   }
      printf("\n");

} else {
      printf("Received no data Error: %d\n",result);
}
```

See Also

ADM_send_socket (page 45)

5.6 ADMNET API Miscellaneous Functions

ADM_NET_GetVersionInfo

Syntax

```
void ADM_NET_GetVersionInfo(ADMNETVERSIONINFO* admnet_verinfo);
```

Parameters

admnet_verinfo	Pointer to structure of type ADMNETVERSIONINFO.

Description

ADM_GetVersionInfo retrieves the current version of the ADMNET API library. The information is returned in the structure admnet_verinfo.

The ADMVERSIONINFO structure is defined as follows:

```
typedef struct
{
   char   APISeries[4];
   short  APIRevisionMajor;
   short  APIRevisionMinor;
   long   APIRun;
}ADMNETVERSIONINFO;
```

Return Value

None

Example

```
ADMNETVERSIONINFO verinfo;
/* print version of API library */

ADM_NET_GetVersionInfo(& verinfo);

printf("Revision %d.%d\n", verinfo.APIRevisionMajor, verinfo.APIRevisionMinor);
```

ADM_is_sk_open

Syntax

```
int ADM_is_sk_open(char *skName);
```

Parameters

skName	Name of the socket that has been initialized and used to receive data.

Description

ADM_is_sk_open tests if connection is still valid or not.

Return Value

SK_SUCCESS	Socket is successfully sent.
SK_NOT_FOUND	Socket could not be found.
SK_SOCKET_CLOSE	Socket is closed.

Example

```
char sockName1[ ] = "SendSocket";

if(ADM_is_sk_open(sockName1) != SK_SUCCESS) {
     printf("Socket not Opened\n");
} else {
     printf("Socket Opened\n");
}
```

6 WATTCP API Functions

In This Chapter

6.1 WATTCP API Functions

This API is a TCP/IP stack, which is used on ADMNET API. Parts of this document are brought from Waterloo TCP by Erik Engelke. Each section provides detailed programming information for each WATTCP API library function. The calling convention for each API function is shown in 'C' format.

The API library routines are categorized according to functionality as shown in the following table.

Function Category	Function Name	Description
Initialize Socket	sock_init	TCP/IP system initialization.
System Functionality	tcp_tick	Determine socket connection.
	tcp_open & tcp_open_fast	Generate socket session to a host computer for TCP protocol. tcp_open_fast will have no wait for if the host computer is not found.
	udp_open & udp_open_fast	Generate socket session to a host computer for UDP protocol. udp_open_fast will have no wait for if the host computer is not found.
	resolve	Convert string IP Address into a longword.
	sock_mode	Setup socket protocol transfer mode for the particular use (UDP or TCP).
	sock_established	Check if connect has been established.
	ip_timer_init	Initialize timing.
	ip_timer_expired	Check if timer has been expired.
	set_timeout	Set timer.
	chk_timeout	Check timer if expired.

Function Category	Function Name	Description
	sockerr	Return ASCII error message if there is any.
	sockstate	Return ASCII message what is the current state.
	gethostid	Returned value is the IP address in host format.
Release Socket	sock_exit	Release all the TCP/IP system initialized by sock_init.
	sock_abort	Abort a connection.
	sock_close	Close a connection.
Send Socket	sock_write & sock_fastwrite	Write data out to a port. sock_fastwrite will have no check for data written out to the socket.
	sock_flush	Flush data out to the socket to make sure all the data has been sent.
	sock_flushnext	Call before write the data out to make sure that after write the data out to the socket, buffer will be flushed.
	sock_puts	Put string onto the buffer.
	sock_putc	Put a character onto the buffer.
Receive Socket	sock_read & sock_fastread	Read data coming into a port.
	tcp_listen	Listen to a message coming in to a specified port.
	sock_gets	Get String
	sock_getc	Get Character
	sock_dataready	Return the number data ready to be read.
	rip	Remove carriage returns and line feeds.
Miscellaneous	inet_ntoa	Build ASCII representation of an IP address with a user supply string from decimal representation of the IP address.
	inet_addr	Convert string dot address to host format.
	ntohs	Convert network word to host word
	htons	Convert host word to network word
	ntohl	Convert network longword to host longword
	htonl	Convert host longword to network longword

6.2 ADMNET API Initialize Functions

The following topics detail the ADMNET API Initialize functions.

sock_init

Syntax

```
void sock_init(void);
```

Parameters

None

Description

This function will read a stored TCP/IP configuration file and prepare a variable.

Return Value

SK_SUCCESS	API has successfully initialized variables.
SK_PORT_NOT_ALLOW	API does not allow port number used.
SK_CANNOT_ALLOCATE_MEMORY	API cannot allocate memory.

Example

```
int numSK = 5;
int portNum = 5757;
int buffSize = 1000;

sock_init();    //initialize the socket interface

/* initialize each socket */
if(ADM_init_socket(numSK, portNum, buffSize, "ReceiveSK") != SK_SUCCESS)
{
   printf("\nFailed to open ADM API... exiting program\n");
   ADM_release_sockets();
}
```

See Also

sock_exit (page 69)

6.3 ADMNET API System Functionality

The following topics describe the ADMNET API System Functionality calls.

tcp_tick

Syntax

```
int tcp_tick( sock_type *skType );
```

Parameters

skType	Current socket Type or NULL for all sockets.

Description

This function is used by an application to determine the connection status of the sockets.

Return Value

0	disconnected or reset.
>0	connected.

Example

```
sock_type *socket;

   . . .

if(tcp_tick(socket))  //check socket
{
     printf("Connected\n");
}
```

tcp_open

Syntax

```
int tcp_open( tcp_Socket *sk, word lPort, longword ina, word port,
dataHandler_t datahandler );
```

Parameters

sk	Pointer to the socket that has been initialized.
lPort	Local port number.
ina	Host IP Address.
port	Host port number.
datahandler	Data Handler. Not used in this version. Use NULL for this parameter.

Description

This function opens a TCP socket connection to a host machine using parameters passed to it. *lPort* is an option parameter. Most of the time, *lPort* can be set to 0. The API will find an available port number for the socket. *ina* is a host IP address passed as a longword. Function resolve can be used to convert an IP address into longword-formatted variable.

Return Value

	Connection cannot be made
>0	Connection is made

Example

```
tcp_Socket *socket;

   . . .

if(tcp_open(socket, 0, resolve("192.168.0.1"), 5656, NULL))
{
   printf("Open Successfully\n");
}
```

See Also

resolve (page 59)

tcp_open_fast

Syntax

```
int tcp_open_fast( tcp_Socket *sk, word lPort, longword ina, word port,
dataHandler_t datahandler );
```

Parameters

sk	Pointer to the socket that has been initialized.
lPort	Local port number.
ina	Host IP Address.
port	Host port number.
datahandler	Data Handler. Not used in this version. Use NULL for this parameter.

Description

This function opens a TCP socket connection to a host machine using parameters passed to it. For this function, there is no wait to resolve the IP address. *lPort* is an option parameter. Most of the time, *lPort* can be set to 0. The API will find an available port number for the socket. *ina* is a host IP address passed as a longword. Function resolve can be used to convert an IP address into a longword-formatted variable.

Return Value

	Connection cannot be made
>0	Connection is made

Example

```
tcp_Socket *socket;

   . . .

if(tcp_open_fast(socket, 0, resolve("192.168.0.1"), 5656, NULL))
{
   printf("Open Successfully\n");
}
```

See Also

resolve (page 59)

udp_open

Syntax

```
int udp_open( udp_Socket *sk, word lPort, longword ina, word port,
dataHandler_t datahandler );
```

Parameters

sk	Pointer to the socket that has been initialized.
lPort	Local port number.
ina	Host IP Address.
port	Host port number.
datahandler	Data Handler. Not used in this version. Use NULL for this parameter.

Description

This function opens a UDP socket connection to a host machine using parameters passed to it. *lPort* is an option parameter. Most of the time, *lPort* can be set to 0. The API will find an available port number for the socket. *ina* is a host IP address passed as a longword. Function resolve can be use to convert an IP address into a longword-formatted variable.

Return Value

	Connection cannot be made
>0	Connection is made

Example

```
udp_Socket *socket;

   . . .

if(udp_open(socket, 0, resolve("192.168.0.1"), 5656, NULL))
{
   printf("Open Successfully\n");
}
```

See Also

resolve (page 59)

udp_open_fast

Syntax

```
int udp_open_fast( tcp_Socket *sk, word lPort, longword ina, word port,
dataHandler_t datahandler );
```

Parameters

sk	Pointer to the socket that has been initialized.
lPort	Local port number.
ina	Host IP Address.
port	Host port number.
datahandler	Data Handler. Not used in this version. Use NULL for this parameter.

Description

This function opens a UDP socket connection to a host machine using parameters passed to it. For this function, there is no wait to resolve the IP address that passes the function. *lPort* is an option parameter. Most of the time, *lPort* can be set to 0. The API will find an available port number for the socket. *ina* is a host IP address passed as a longword. Function resolve can be used to convert an IP address into a longword-formatted variable.

Return Value

	Connection cannot be made
>0	Connection is made

Example

```
udp_Socket *socket;

   . . .

if(udp_open_fast(socket, 0, resolve("192.168.0.1"), 5656, NULL))
{
   printf("Open Successfully\n");
}
```

See Also

resolve (page 59)

resolve

Syntax

```
longword resolve( char *name );
```

Parameters

name	String IP Address.

Description

This function converts a string IP Address into a long.

Return Value

longword	Value of the IP Address in a long format.

Example

```
resolve("192.168.0.1");
```

sock_mode

Syntax

```
word sock_mode( sock_type *skType, word mode);
```

Parameters

skType	Current socket Type that will be used to set up socket mode.		
mode	The following is the available mode:		
	TCP_BINARY	0	default
	TCP_ASCII	1	treat as ASCII data
	UDP_CRC	0	checksum enable
	UDP_NOCRC	2	checksum disable
	TCP_NAGLE	0	default
	TCP_NONAGLE	4	used for real time application.

Description

This function is used set the socket transfer protocol mode.

Return Value

Current mode.

Example

```
sock_type *socket;

   . . .

sock_mode(socket, TCP_MODE_NONAGLE);
```

sock_established

Syntax

```
int sock_established( sock_type *skType );
```

Parameters

skType	Current socket Type that will be used to check the connection.

Description

This function is used check if the socket has been established.

Return Value

	Not established.
1	Establish

Example

```
sock_type *socket;

   . . .

if(sock_established(socket))
{
   printf("Socket has been established\n");
}
```

ip_timer_init

Syntax

```
void ip_timer_init( sock_type *skType, word second );
```

Parameters

skType	Current socket Type that will be used to check the connection.
second	Number of second to set the timer. 0 mean no timer out.

Description

This function is used initialize the timer.

Return Value

None

Example

```
sock_type *socket;

   . . .

ip_timer_init (socket, 100);
```

ip_timer_expired

Syntax

```
word ip_timer_expired( sock_type *skType );
```

Parameters

skType	Current socket Type that will be used to check the connection.

Description

This function is used check if the timer has been expired.

Return Value

1	timer has been expired.

Example

```
sock_type *socket;

   . . .

if(ip_timer_expired (socket))
{
   printf("time’s up\n");
}
```

set_timeout

Syntax

```
longword set_timeout( word seconds );
```

Parameters

seconds	Number of second to set the timer.

Description

This function is used set the timer.

Return Value

Number of timeout.

Example

```
set_timeout (100);
```

chk_timeout

Syntax

```
word chk_timeout( longword timeout );
```

Parameters

timeout	Number of timeout return from set_timerout.

Description

This function is used check if the time is out.

Return Value

1	timeout

Example

```
int timeout = set_timeout (100);

While(!chk_timeout (timeout))
   printf("Not timeout yet\n");
```

sockerr

Syntax

```
char *sockerr ( sock_type *skType );
```

Parameters

skType	Current socket Type that will be used to check the connection.

Description

This function returns ASCII error message if there is any. Otherwise, NULL is returned.

Return Value

String message or NULL if there is no error.

Example

```
sock_type *socket;
char *p;

   . . .

if(p = sockerr(socket) != NULL)
{
   printf("Error: %s\n", p);
}
```

sockstate

Syntax

```
char *sockstate ( sock_type *skType );
```

Parameters

skType	Current socket Type that will be used to check the connection.

Description

This function returns ASCII message indicating current state.

Return Value

String message.

Example

```
sock_type *socket;
char *p;

   . . .

if(p = sockstate(socket) != NULL)
{
   printf("State: %s\n", p);
}
```

gethostid

Syntax

```
char *gethostid ( void );
```

Parameters

None

Description

This function returns value of the IP address in host format.

Return Value

String IP Address.

Example

```
sock_type *socket;
char *p;

   . . .

if(p = gethostid(socket) != NULL)
{
   printf("My IP: %s\n", p);
}
```

6.4 ADMNET API Release Socket Functions

This section describes the ADMNET API Release Socket Functions.

sock_exit

Syntax

```
void sock_exit( void );
```

Parameters

None

Description

This function is used by an application to release all the TCP/IP variables created by sock_init.

Return Value

None

Example

```
sock_exit();
```

See Also

sock_init (page 53)

sock_abort

Syntax

```
void sock_abort( sock_type *skType);
```

Parameters

skType	Current socket Type that will be used to abort the connection.

Description

This function is used abort a connection. This function is common for TCP connections.

Return Value

None

Example

```
sock_type *socket;

   . . .

sock_abort(socket);
```

See Also

sock_close (page 71)

sock_close

Syntax

```
void sock_close ( sock_type *skType);
```

Parameters

skType	Current socket Type that will be used to close the connection.

Description

This function is used to permanently close a connection. This function is common for UDP connections.

Return Value

None

Example

```
sock_type *socket;

   . . .

sock_close(socket);
```

See Also

sock_abort (page 70)

6.5 ADMNET API Send Socket Functions

This section describes the ADMNET API Send Socket functions.

sock_write

Syntax

```
int sock_write( sock_type *skType, byte *data, int len);
```

Parameters

skType	Socket that will be used to send data.
data	Pointer to a buffer that contains data that will be sent to a server.
len	Length of the data specified to send.

Description

This function writes data to the socket being passed to the function. The function will wait until the all the data is written.

Return Value

Number of Bytes that are written to the socket or -1 if an error occurs.

Example

```
sock_type *socket;
char theBuffer [512];
int len, bytes_sent;

   . . .

bytes_sent = sock_write(socket, (byte*)theBuffer, len);
```

See Also

sock_fastwrite (page 73)

sock_fastwrite

Syntax

```
int sock_fastwrite( sock_type *skType, byte *data, int len);
```

Parameters

skType	Current socket that will be used to send data.
data	Pointer to a buffer that contains data that will be sent to a server.
len	Length of data specified to send.

Description

This function writes data to the socket being passed to the function. The function will not check to the data written out to the socket.

Return Value

Number of bytes that are written to the socket or -1 if an error occurs.

Example

```
sock_type *socket;
char theBuffer [512];
int len, bytes_sent;

   . . .

bytes_sent = sock_fastwrite(socket, (byte*)theBuffer, len);
```

See Also

sock_write (page 72)

sock_flush

Syntax

```
void sock_flush( sock_type *skType );
```

Parameters

skType	Current socket that will be used to flush all the data out of the buffer.

Description

This function is used to flush all the data that is still in the buffer out to the socket. This function has no effect for UDP, since UDP is a connectionless protocol.

Return Value

None

Example

```
sock_type *socket;

   . . .

sock_flush(socket);  // Flush the output
```

See Also

sock_flushnext (page 75)

sock_flushnext

Syntax

```
void sock_flushnext( sock_type *skType );
```

Parameters

skType	Current socket that will be used to flush all the data in the buffer out.

Description

This function is used after the write function is called to ensure that the data in a buffer is flushed immediately.

Return Value

None

Example

```
sock_type *socket;

   . . .

sock_flushnext(socket);  // Flush the output
```

See Also

sock_flush (page 74)

sock_puts

Syntax

```
int sock_puts( sock_type *skType, byte *data);
```

Parameters

e	Socket that will be used to put string data to.
data	Pointer to the string that will be sent.

Description

This function sends a string to the socket. Character new line "\n", will be attached to the end of the string.

Return Value

The length that is written to the socket.

Example

```
sock_type *socket;
char data [512];
int len;

   . . .

len = sock_puts(socket, data);
printf("Put %d\n", len);
```

See Also

sock_putc (page 77)

sock_putc

Syntax

```
byte sock_putc( sock_type *skType, byte character);
```

Parameters

skType	Socket that will be used to get string data from.
character	A character that is used.

Description

This function is used to put one character at a time to the socket.

Return Value

Character put in is returned.

Example

```
sock_type *socket;
char in;

   . . .


in = sock_putc(socket, 'A');
printf("%c", in);
```

See Also

sock_puts (page 76)

6.6 ADMNET API Receive Socket Functions

This section describes the ADMNET API Receive Socket functions.

sock_read

Syntax

```
int sock_read( sock_type *skType, byte *data, int len);
```

Parameters

skType	Socket that will be used to receive data.
data	Pointer to a buffer that contains data that is received.
len	Length of the data specified to receive.

Description

This function reads data from the socket being passed to the function. The function will wait until the all the data is read.

Return Value

Number of Bytes that are read to the socket or -1 if an error occurs.

Example

```
sock_type *socket;
char theBuffer [512];
int len, bytes_receive;

   . . .

bytes_receive = sock_read(socket, (byte*)theBuffer, len);
```

See Also

sock_fastread (page 79)

sock_fastread

Syntax

```
int sock_fastread( sock_type *skType, byte *data, int len);
```

Parameters

skType	Current socket that will be used to receive data.
data	Pointer to a buffer that contains data that is received to a server.
len	Length of data specified to receive.

Description

This function reads data to the socket being passed to the function. The function will not check to the data read into the socket.

Return Value

Number of bytes that are read to the socket or -1 if an error occurs.

Example

```
sock_type *socket;
char theBuffer [512];
int len, bytes_receive;

   . . .

bytes_receive = sock_fastread(socket, (byte*)theBuffer, len);
```

See Also

sock_read (page 78)

tcp_listen

Syntax

```
int tcp_listen( tcp_Socket *sk, word lPort, longword ina, word port,
dataHandler_t datahandler, word timeout );
```

Parameters

sk	Pointer to the socket that has been initialized.
lPort	Local port number.
datahandler	Data Handler. Not used in this version. Use NULL for this parameter.
ina	Host IP Address.
port	Host port number.
timeout	Value used to set the period of time to wait for data. 0 is set to indicate no timeout.

Description

This function is used for listening to an incoming message. *port* is an option parameter. Most of the time, port can be set to 0. The API will find an available port number for the socket. *ina* is a host IP address passed as a longword. Function resolve can be used to convert an IP address into a longword-formatted variable. 0 can be passed as an *ina* value if there is no specific IP Address to listen too.

Example

```
tcp_Socket *socket;
int port = 5656;

    . . .

tcp_listen(socket, port, 0L, 0, NULL, 0);
```

See Also

ADM_send_socket (page 45)

sock_gets

Syntax

```
int sock_gets( sock_type *skType, byte *data, int len);
```

Parameters

skType	Socket that will be used to get string data from.
data	Pointer to the string return.
len	Specified length for the function to get the string.

Description

This function is used for obtaining a string from the socket. The *len* parameter specifies how long the string will be read.

Return Value

The length read from the socket is returned.

Example

```
sock_type *socket;
char data [512];
int len;

   . . .

len = sock_gets(socket, data, 100);
printf("Get %d\n", len);
```

See Also

sock_getc (page 82)

sock_getc

Syntax

```
int sock_getc( sock_type *skType);
```

Parameters

skType	Socket that will be used to get string data from.

Description

This function gets one character at a time from the socket.

Return Value

Character read in is returned.

Example

```
sock_type *socket;
char in;

   . . .


in = sock_getc(socket);
printf("%c", in);
```

See Also

sock_gets (page 81)

sock_dataready

Syntax

```
int sock_dataready( sock_type *skType );
```

Parameters

skType	Current socket that will be used to check if data is ready to be read.

Description

This function is used check if there is data ready to be read.

Return Value

Number of bytes ready to be read or -1 if error occurs.

Example

```
int in;
sock_type *socket;

   . . .


in = sock_dataready(socket);
printf("%d", in);
```

rip

Syntax

```
Char * rip( char *String );
```

Parameters

String	Array of character string.

Description

This function is used to strip out carriage return and line feed. If there are more than one carriage return or line feed, the first one will be replace with 0 and the rest of them will not be defined.

Return Value

Pointer to the new string.

Example

```
char s;

   . . .


s = sock_dataready("This is a test\n\r");
printf("%s", s);
```

inet_ntoa

Syntax

```
Char * inet_ntoa( char *String, longword IP );
```

Parameters

String	Array of character string.
IP	Decimal representation of IP address.

Description

This function builds ASCII representation of an IP address with a user supply string from decimal representation of the IP address. The size of the buffer has to be at least 16 byte.

Return Value

Pointer to the new string.

Example

```
char buffer[ 20 ];

sock_init();

printf("My IP address is %s\n", inet_ntoa( buffer, gethostid()));
```

inet_addr

Syntax

```
longword * inet_addr( char *String);
```

Parameters

String	Array of character string.

Description

This function converts string dot address to host format.

Return Value

Host IP address format.

Example

```
char buffer[ ] = "192.168.0.1";

sock_init();

printf("My IP address is %ld\n", inet_addr( buffer ));
```

7 DOS 6 XL Reference Manual

The DOS 6 XL Reference Manual makes reference to compilers other than Digital Mars C++ or Borland Compilers. The PLX-ADM and ADMNET modules only support Digital Mars C++ and Borland C/C++ Compiler Version 5.02. References to other compilers should be ignored.

8 Glossary of Terms

A

API

Application Program Interface

B

BIOS

Basic Input Output System. The BIOS firmware initializes the module at power up, performs self-diagnostics, and provides a DOS-compatible interface to the console and Flashes the ROM disk.

Byte

8-bit value

C

Connection

A logical binding between two objects. A connection allows more efficient use of bandwidth, because the message path is not included after the connection is established.

Consumer

A destination for data.

D

DLL

Dynamic Linked Library

E

Embedded I/O

Refers to any I/O which may reside on a CAM board.

L

Library

Refers to the library file containing the API functions. The library must be linked with the developer’s application code to create the final executable program.

Linked Library

Dynamically Linked Library. See Library.

Long

32-bit value.

M

Module

Refers to a module attached to the backplane.

Mutex

A system object which is used to provide mutually-exclusive access to a resource.

T

Thread

Code that is executed within a process. A process may contain multiple threads.

W

Word

16-bit value

9 Support, Service & Warranty

In This Chapter

9.1 Contacting Technical Support

ProSoft Technology, Inc. (ProSoft) is committed to providing the most efficient and effective support possible. Before calling, please gather the following information to assist in expediting this process:

1 Product Version Number
2 System architecture
3 Network details

If the issue is hardware related, we will also need information regarding:

1 Module configuration and associated ladder files, if any
2 Module operation and any unusual behavior
3 Configuration/Debug status information
4 LED patterns
5 Details about the serial, Ethernet or fieldbus devices interfaced to the module, if any.

Note: *For technical support calls within the United States, an after-hours answering system allows 24-hour/7-days-a-week pager access to one of our qualified Technical and/or Application Support Engineers. Detailed contact information for all our worldwide locations is available on the following page.*

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Brasil (location in Sao Paulo)	Tel: +55-11-5083-3776, E-mail: brasil@prosoft-technology.com Languages spoken include: Portuguese, English

9.2 Warranty Information

Complete details regarding ProSoft Technology's TERMS AND CONDITIONS OF SALE, WARRANTY, SUPPORT, SERVICE AND RETURN MATERIAL AUTHORIZATION INSTRUCTIONS can be found at www.prosoft-technology.com/warranty.

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