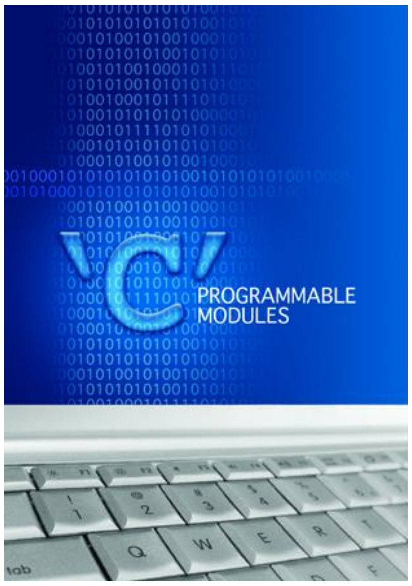
Where Automation Connects.

inRAx®

MVI-ADMNET

'C' Programmable

'C' Programmable Application Development Module with Ethernet



February 20, 2013

DEVELOPER'S GUIDE

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 our products, documentation, or support, please write or call us.

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MVI-ADMNET Developer's 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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Latin America: +1.281.298.9109

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 NON-HAZARDOUS.

D THIS DEVICE SHALL BE POWERED BY CLASS 2 OUTPUTS ONLY.

MVI (Multi Vendor Interface) Modules

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'ÉQUIPEMENT, COUPER LE COURANT OU S'ASSURER QUE L'EMPLACEMENT EST DÉSIGNÉ NON DANGEREUX.

Warnings

North America Warnings

A Warning - Explosion Hazard - Substitution of components may impair suitability for Class I, Division 2.

B Warning - Explosion Hazard - When in Hazardous Locations, turn off power before replacing or rewiring modules.
Warning - Explosion Hazard - Do not disconnect equipment unless power has been switched off or the area is known to be nonhazardous.

C Suitable for use in Class I, division 2 Groups A, B, C and D Hazardous Locations or Non-Hazardous Locations.

ATEX Warnings and Conditions of Safe Usage:

Power, Input, and Output (I/O) wiring must be in accordance with the authority having jurisdiction

A Warning - Explosion Hazard - When in hazardous locations, turn off power before replacing or wiring modules.

B Warning - Explosion Hazard - Do not disconnect equipment unless power has been switched off or the area is known to be non-hazardous.

C These products are intended to be mounted in an IP54 enclosure. The devices shall provide external means to prevent the rated voltage being exceeded by transient disturbances of more than 40%. This device must be used only with ATEX certified backplanes.

D DO NOT OPEN WHEN ENERGIZED.

Electrical Ratings

- Backplane Current Load: 800 mA @ 5 V DC; 3mA @ 24V DC
- Operating Temperature: 0 to 60°C (32 to 140°F)
- Storage Temperature: -40 to 85°C (-40 to 185°F)
- Shock: 30g Operational; 50g non-operational; Vibration: 5 g from 10 to 150 Hz
- Relative Humidity 5% to 95% (non-condensing)
- All phase conductor sizes must be at least 1.3 mm(squared) and all earth ground conductors must be at least 4mm(squared).

Markings - MVI56, MVI69, PTQ

CE	EMC-EN61326-1:2006; EN6100-6-4:2007
CSA/cUL	C22.2 No. 213-1987
CSA CB Certified	IEC61010
ATEX	EN60079-0 Category 3, Zone 2 EN60079-15

243333 **ME06**

Markings - MVI46, MVI71

ANSI / ISA	ISA 12.12.01 Class I Division 2, GPs A, B, C, D
CSA/cUL	C22.2 No. 213-1987
CSA CB Certified	IEC61010
ATEX	EN60079-0 Category 3, Zone 2 EN60079-15

243333

Warning: This module is not hot-swappable! Always remove power from the rack before inserting or removing this module, or damage may result to the module, the processor, or other connected devices.

Battery Life Advisory

The MVI46, MVI56, MVI56E, MVI69, and MVI71 modules use a rechargeable Lithium Vanadium Pentoxide battery to backup the real-time clock and CMOS. The battery should last for the life of the module. The module must be powered for approximately twenty hours before the battery becomes fully charged. After it is fully charged, the battery provides backup power for the CMOS setup and the real-time clock for approximately 21 days. When the battery is fully discharged, the module will revert to the default BIOS and clock settings.

Note: The battery is not user replaceable.

Contents

1 Introduction

In This Chapter

This document provides information needed to develop application programs for the MVI ADM Ethernet Serial Communication Module. The MVI suite of modules is designed to allow devices with a serial and Ethernet port to be accessed by a PLC. The modules and their corresponding platforms are as follows:

- MVI46: 1746 (SLC)
- MVI56: 1756 (ControlLogix)
- MVI69: 1769 (CompactLogix)
- MVI71: 1771 (PLC)

The modules are programmable to accommodate devices with unique Serial-Ethernet protocols.

This document includes information about the available ethernet communication software API libraries, programming information, and example code. For tools, module configuration, serial communication software API, serial communication programming information, and example code for both the module and the PLC, refer to *MVI ADM Developer's Guide*.

This document assumes the reader is familiar with software development in the 16-bit DOS environment using the 'C' programming language. This document also assumes that the reader is familiar with Rockwell Automation programmable controllers and the PLC platform.

1.1 Operating System

The MVI 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 user applications to be developed using standard DOS tools, such as Digital Mars and Borland compilers. User programs may be executed automatically by loading them from either the CONFIG.SYS file or an AUTOEXEC.BAT file. In addition to MVI-ADMNET, ADMTCP.CFG is required to assign an IP address to the module. Users can store the ADMTCP.CFG file directly to a Compact Flash.

The format of the ADMTCP.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 MVI module. Only programs that use the standard DOS and BIOS functions to perform console I/O are compatible.

2 Preparing the MVI-ADMNET Module

In This Chapter

2.1 Package Contents

Your MVI-ADMNET package includes:

- MVI-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 three jumpers:

- Setup
- Port 1
- Port 2

2.2.1 Setup Jumper

The Setup jumper, located at the bottom of the module, should have the two pins jumpered when programming the module. Once programmed, the jumper should be removed.

2.2.2 Port 1 and Port 2 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 MVI-ADMNET Communication Ports

The MVI-ADMNET module has three physical connectors: two application ports and one debugging port, with an RJ45 plug and Ethernet port located on the front of the module.

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 MVI 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.

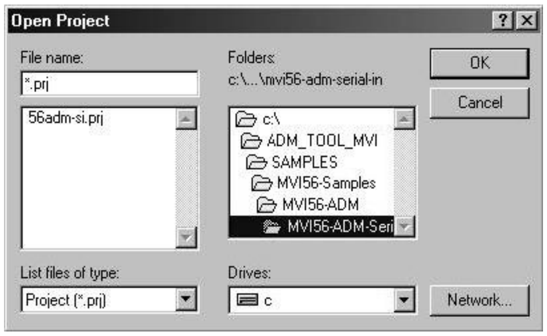
Downloading the Sample Program

The sample code files are located in the ADM_TOOL_MVI.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_MVI\SAMPLES\.

Important: The sample code and libraries in the 1756-MVI-Samples folder are not compatible with, and are not supported for, the Digital Mars compiler.

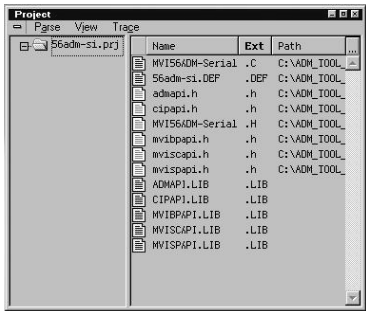
Building an Existing Digital Mars C++ 8.49 ADM Project

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



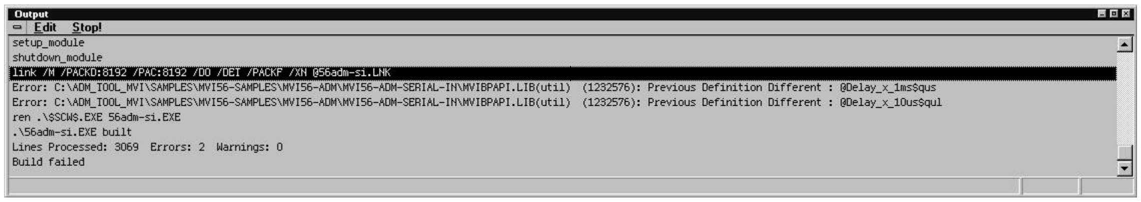
2 From the *Folders* field, navigate to the folder that contains the project (C:\ADM_TOOL_MVI\SAMPLES\…).
3 In the *File Name* field, click on the project name (56adm-si.prj).

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	

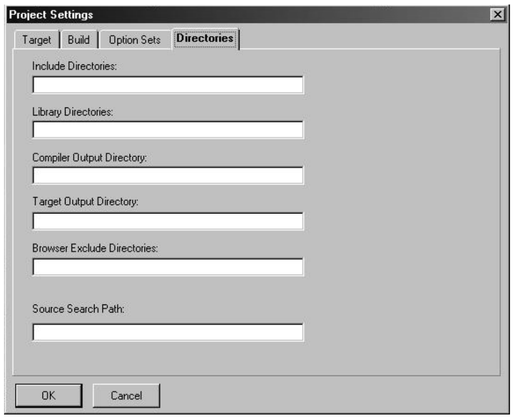
5 Click **Project** → **Rebuild All** from the *Main Menu* to create the .exe file. The status of the build will appear in the Output window:



```
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
```

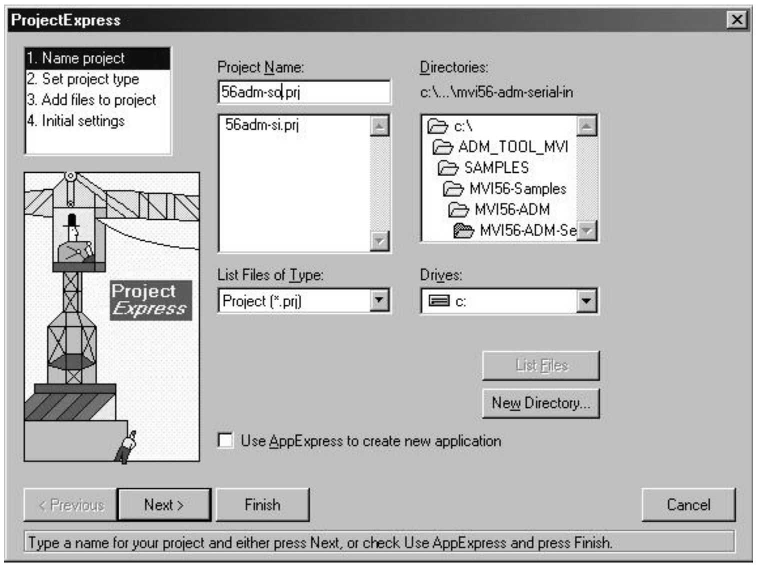
Porting Notes: *The Digital Mars compiler classifies duplicate library names as Level 1 Errors rather than warnings. These errors will manifest themselves as "Previous Definition Different: function name". Level 1 errors are non-fatal and the executable will build and run. The architecture of the ADM 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*.



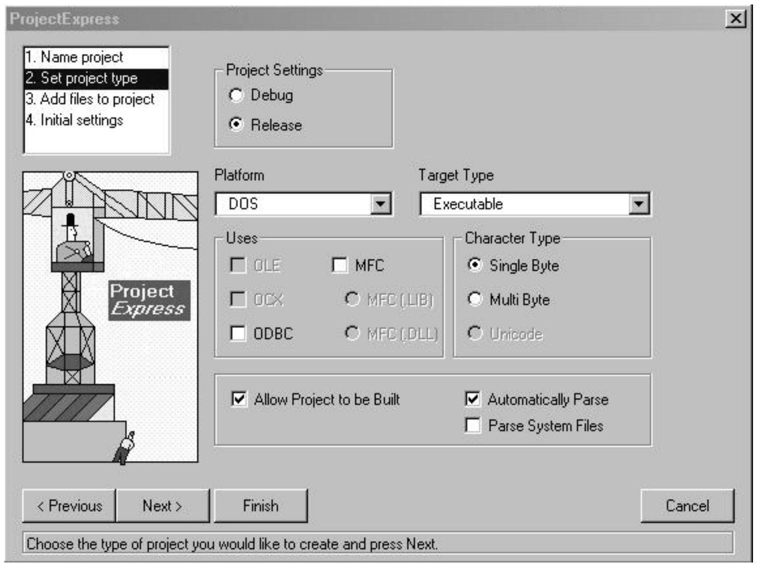
Creating a New Digital Mars C++ 8.49 ADM Project

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.

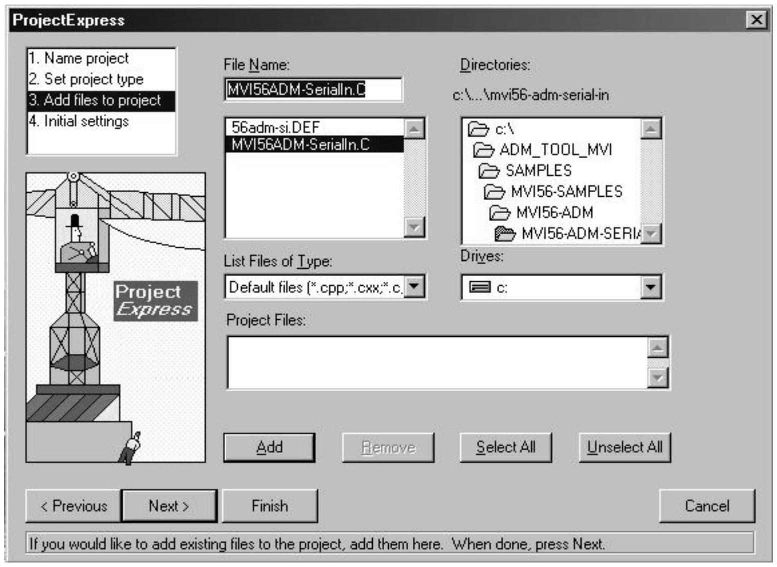
2 Select the path and type in the **Project Name**.
3 Click Next.



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.

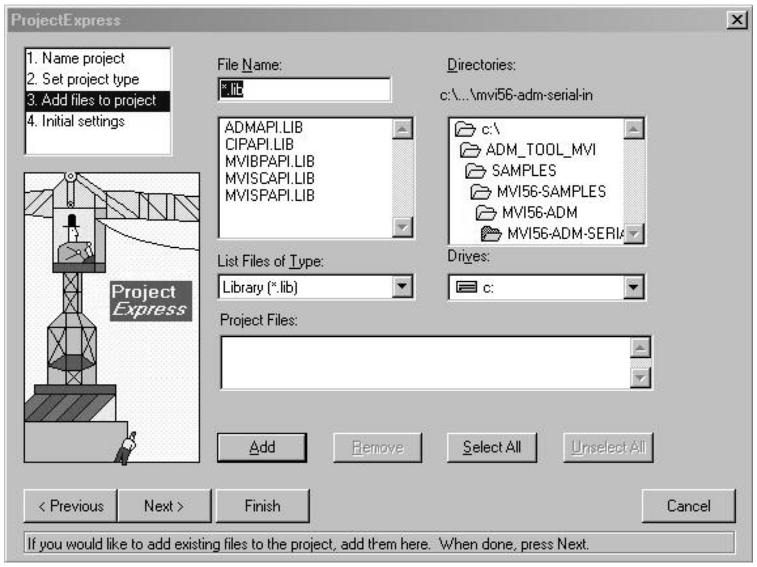
4 In the *Platform* field, choose **DOS**.
5 In the Project Settings choose Release if you do not want debug information included in your build.

6 Click Next.



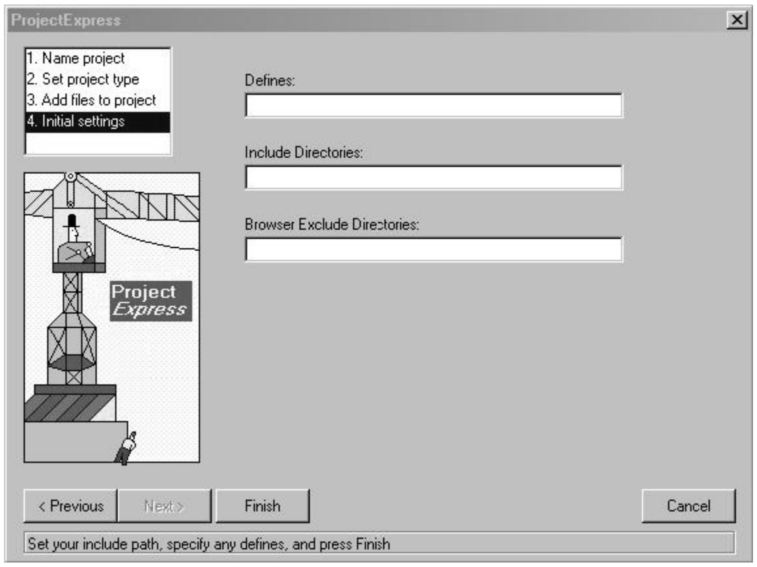
If you would like to add existing files to the project, add them here. When done, press Next.

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:



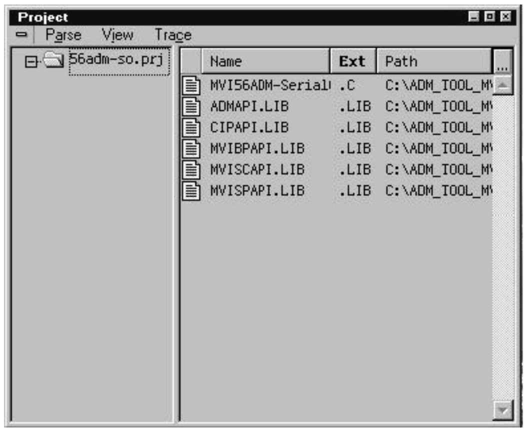
If you would like to add existing files to the project, add them here. When done, press Next.

12 Click Next.



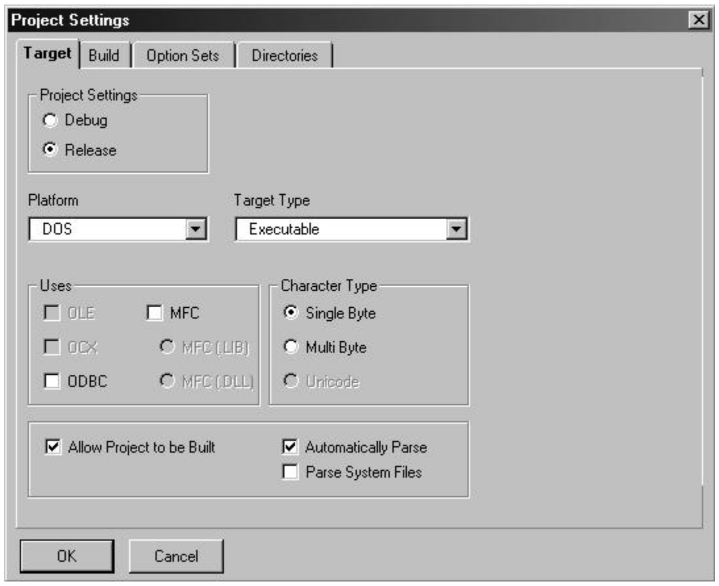
Set your include path, specify any defines, and press Finish

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-Seriall	.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

Target | Build | Option Sets | Directories

Project Settings
- Debug
- [✓ Release]

Platform: DOS

Target Type: Executable

Uses
- ☐ OLE
- ☐ OCX
- ☐ ODBC
- ☐ MFC
- MFC (.LIB)
- MFC (.DLL)

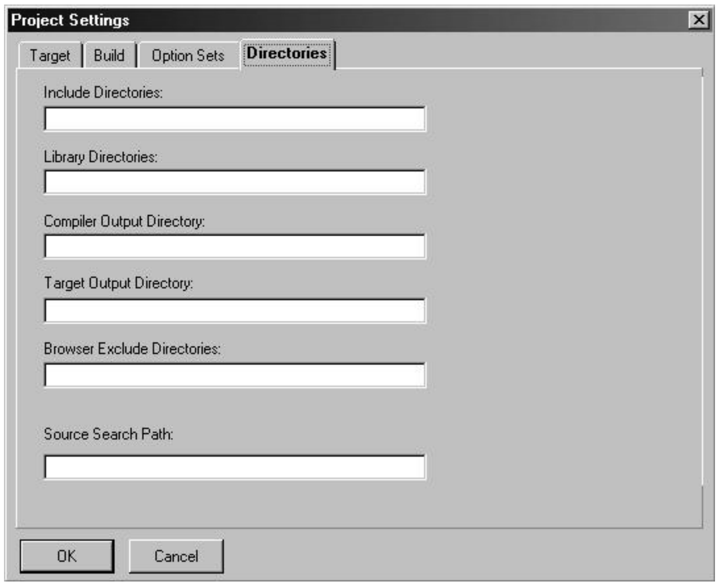
Character Type
- [✓ Single Byte]
- Multi Byte
- Unicode

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

OK | Cancel

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 MVI platform.

18 Click the **Directories** tab and fill in directory information as required by your project's directory structure.


Project Settings

Target | Build | Option Sets | Directories

Include Directories:

Library Directories:

Compiler Output Directory:

Target Output Directory:

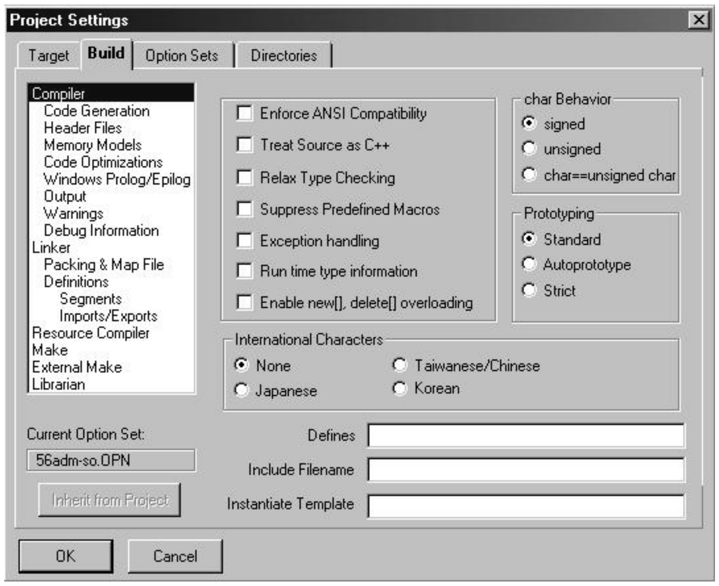
Browser Exclude Directories:

Source Search Path:

OK | Cancel

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

Topics: Compiler (selected), 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

- ☐ 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

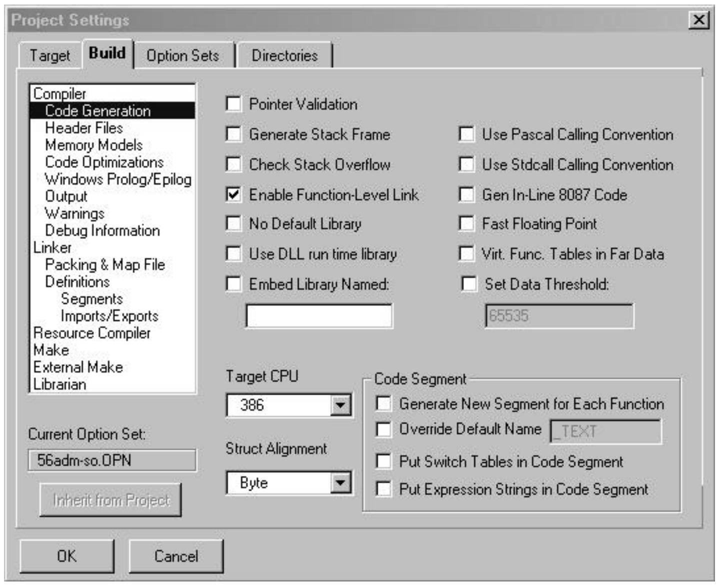
Prototyping: [✓ Standard] Autoprototype Strict

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

Topics: Compiler, Code Generation (selected), 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

- ☐ 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

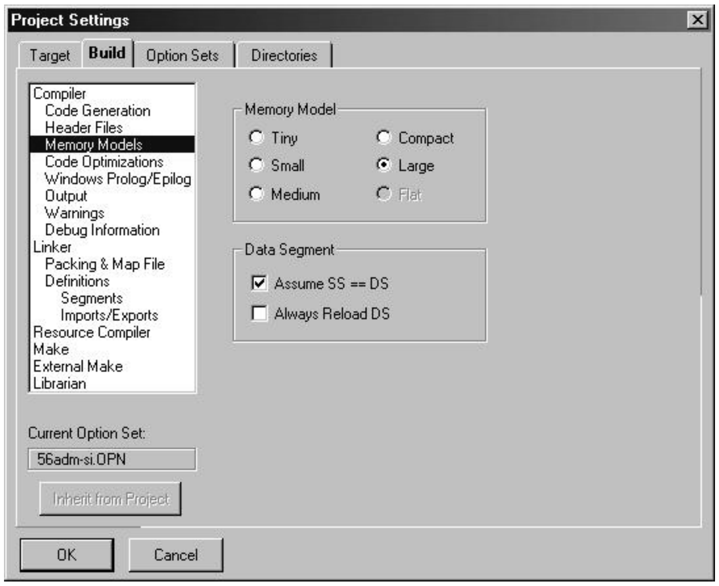
Target CPU: 386

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:

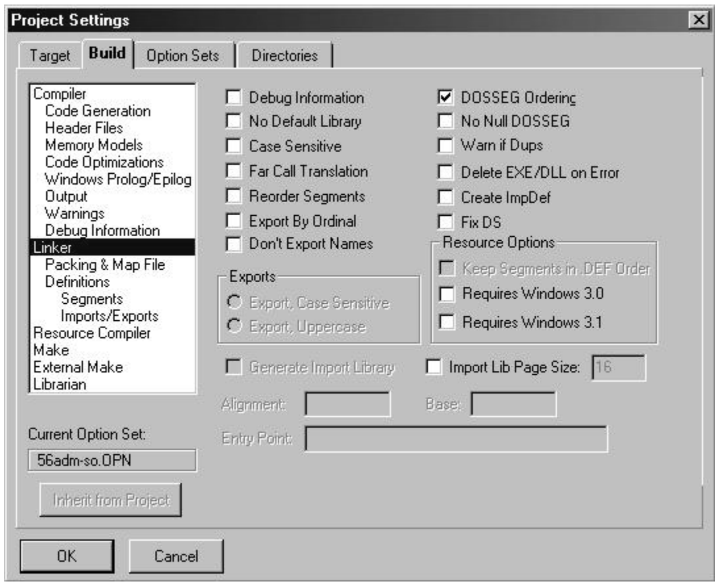


Memory Model: Tiny, Small, Medium, Compact, [✓ Large], Flat

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

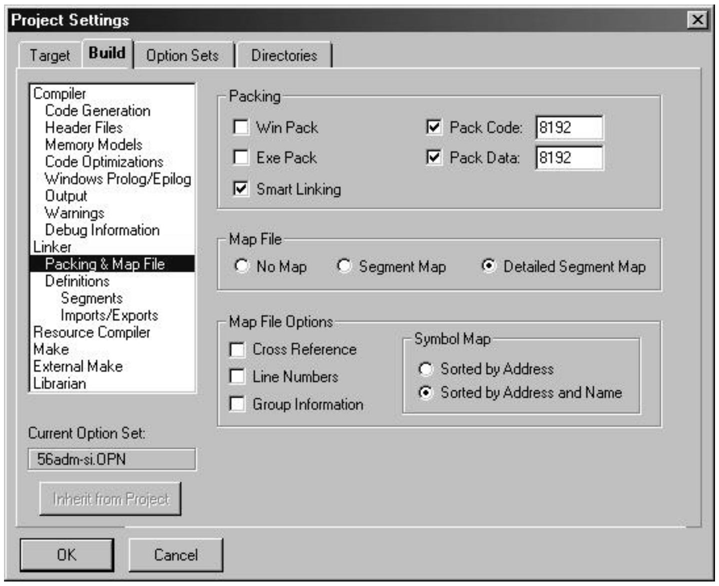
Generate Import Library, Import Lib Page Size: 16

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

Tabs: Target | Build | Option Sets | Directories

Topics: 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

Packing:
- ☐ Win Pack
- ☐ Exe Pack
- ☑ Smart Linking
- ☑ Pack Code: 8192
- ☑ Pack Data: 8192

Map File: ○ No Map ○ Segment Map [✓ ● Detailed Segment Map]

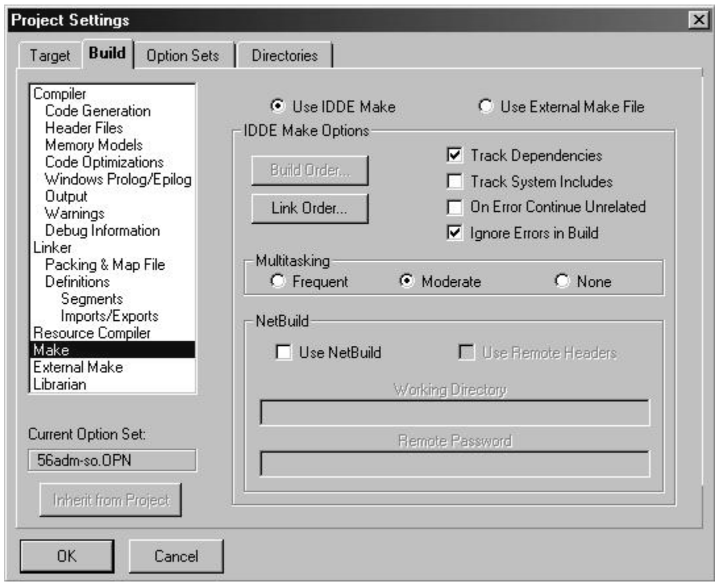
Map File Options:
- ☐ Cross Reference
- ☐ Line Numbers
- ☐ Group Information

Symbol Map: ○ Sorted by Address [✓ ● Sorted by Address and Name]

Current Option Set: 56adm-si.OPN

Inherit from Project | OK | Cancel

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



Project Settings

Tabs: Target | Build | Option Sets | Directories

Topics: 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

[✓ ● 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:

Current Option Set: 56adm-so.OPN

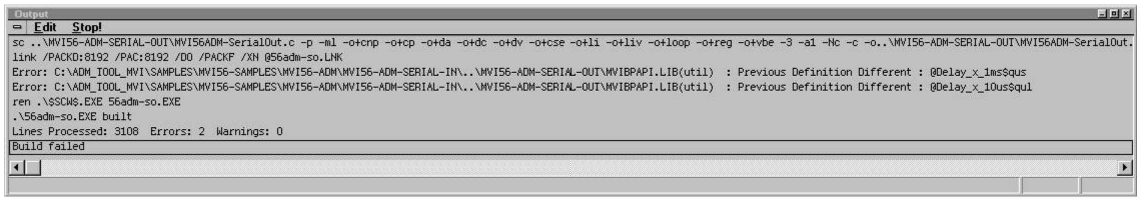
Inherit from Project | OK | Cancel

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_MVI\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.

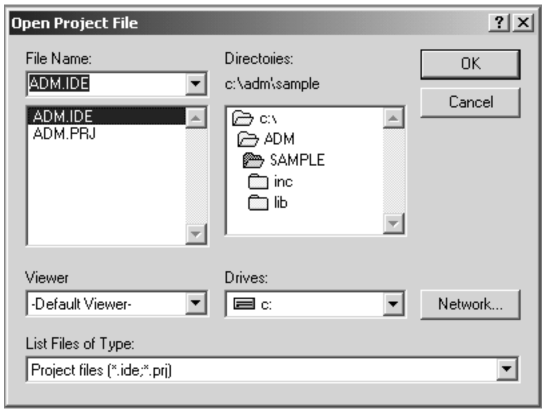
Downloading the Sample Program

The sample code files are located in the ADM_TOOL_MVI.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_MVI\SAMPLES\.

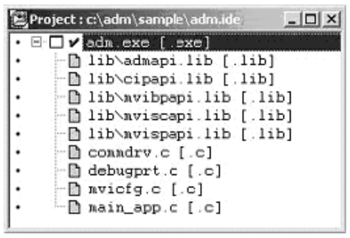
Important: The sample code and libraries in the 1756-MVI-Samples folder are not compatible with, and are not supported for, the Digital Mars compiler.

Building an Existing Borland C++ 5.02 ADM Project

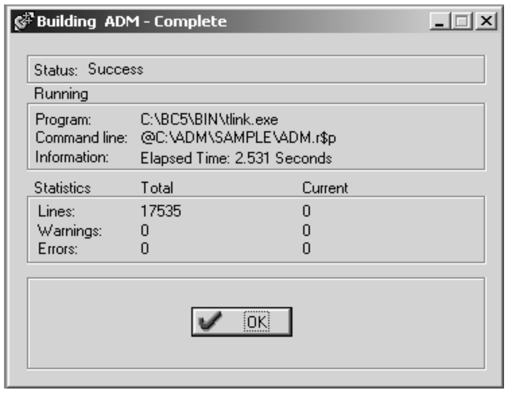
1 Start Borland C++ 5.02, then click **Project → Open Project** from the *Main Menu*.



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

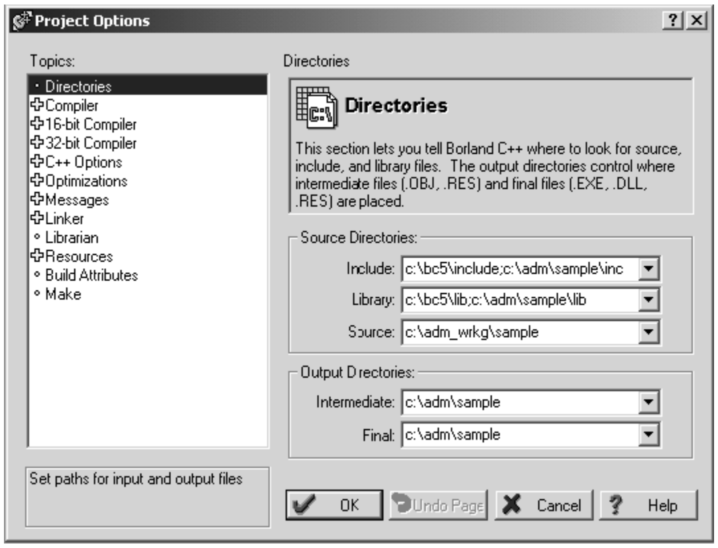
Running

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.

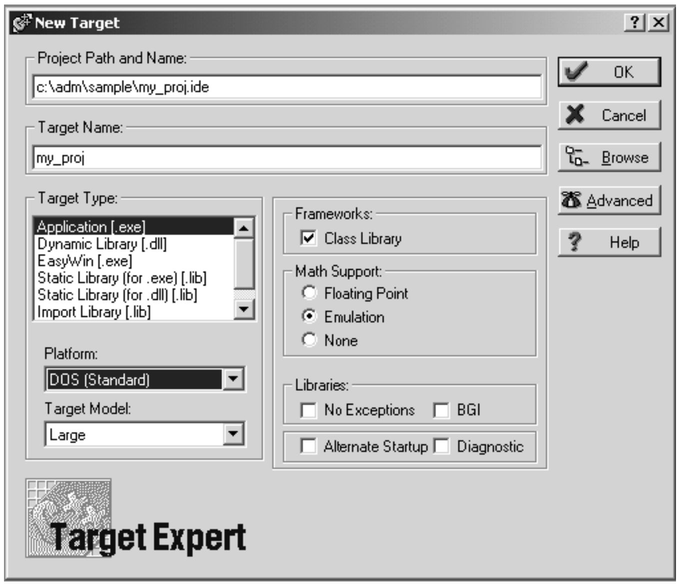
Source Directories:
Include: c:\bc5\include;c:\adm\sample\inc
Library: c:\bc5\lib;c:\adm\sample\lib
Source: c:\adm_wrkg\sample

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

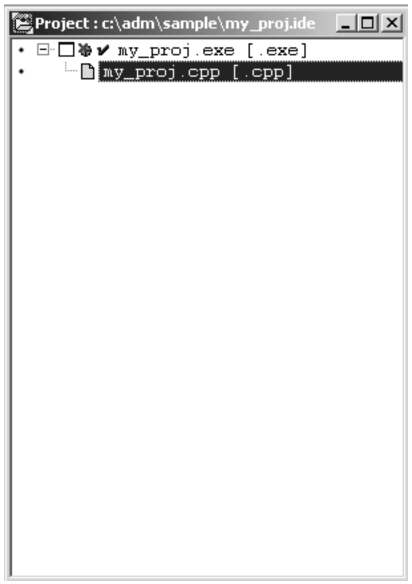
1 Start Borland C++ 5.02, and then click **File → Project** from the *Main Menu*.



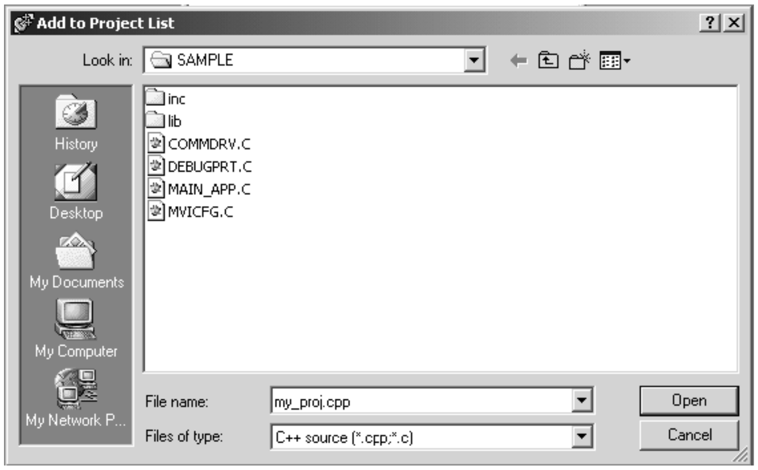
Project Path and Name: c:\adm\sample\my_proj.ide
Target Name: my_proj
Target Type: Application [.exe] (selected), Dynamic Library [.dll], EasyWin [.exe], Static Library (for .exe) [.lib], Static Library (for .dll) [.lib], Import Library [.lib]
Platform: DOS (Standard)
Target Model: Large
Frameworks: [✓] 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:

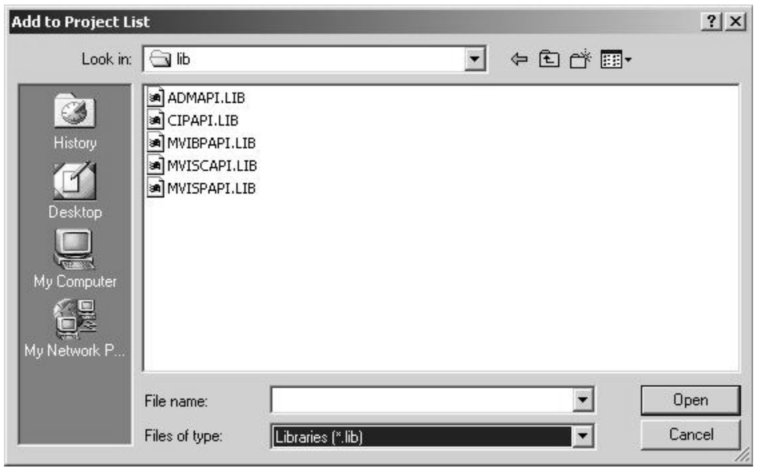


8 Click on the .cpp file created and press the **Delete** key. Click **Yes** to delete the .cpp file.
9 Right click on the .exe file listed in the *Project* window and choose the *Add Node* menu selection. The following window appears:



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.

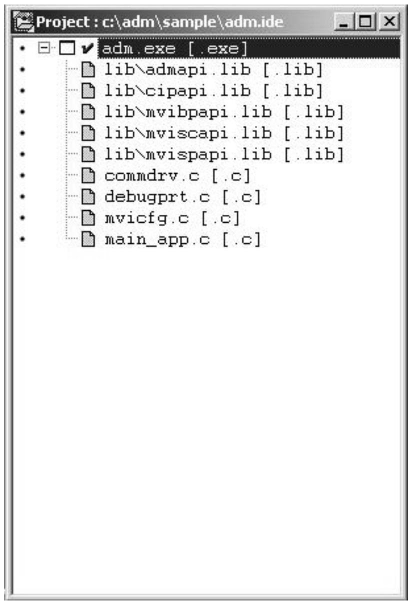
12 Choose Libraries (*.lib) from the *Files of Type* field to view all library files:



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

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

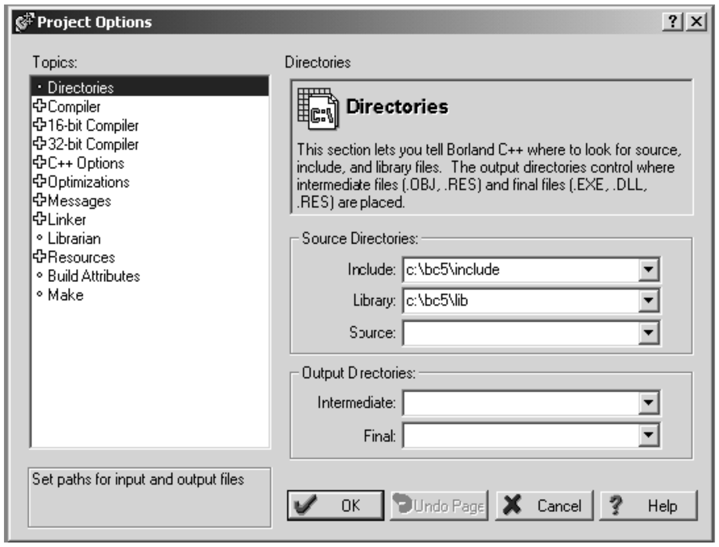
13 The *Project* window should now contain all the necessary source and library files as shown in the following window:



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:

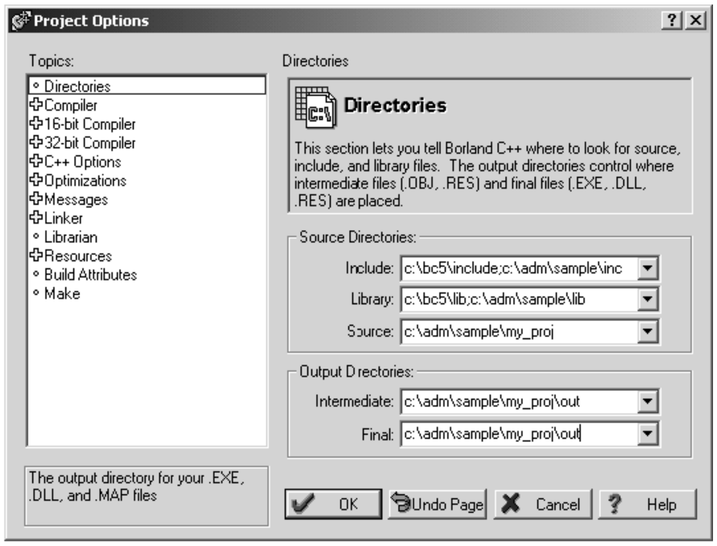
Include:	c:\bc5\include
Library:	c:\bc5\lib
Source:	

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:

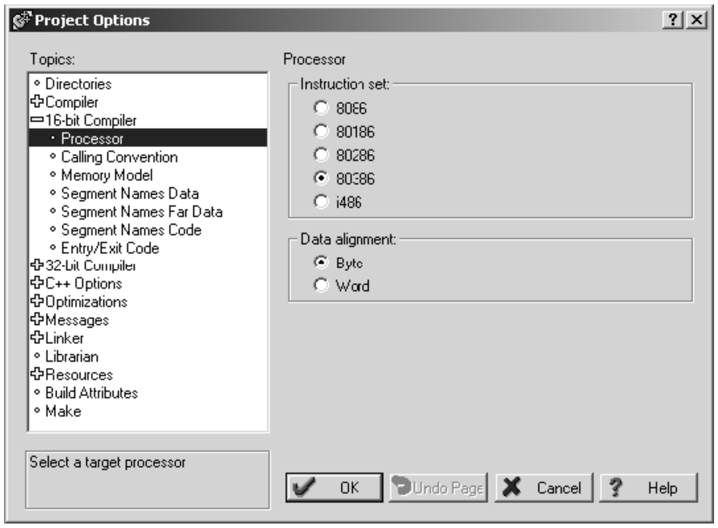
Include:	c:\bc5\include;c:\adm\sample\inc
Library:	c:\bc5\lib;c:\adm\sample\lib
Source:	c:\adm\sample\my_proj

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:



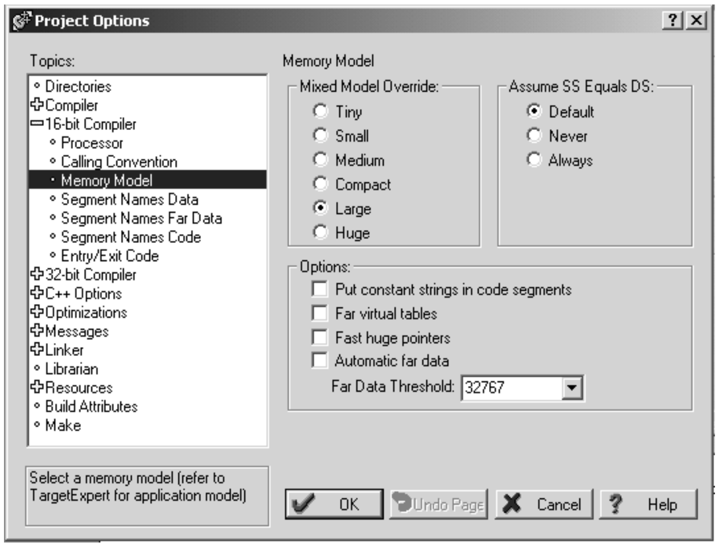
Processor

Instruction set: 8086 [✓ 80386] 80186 80286 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

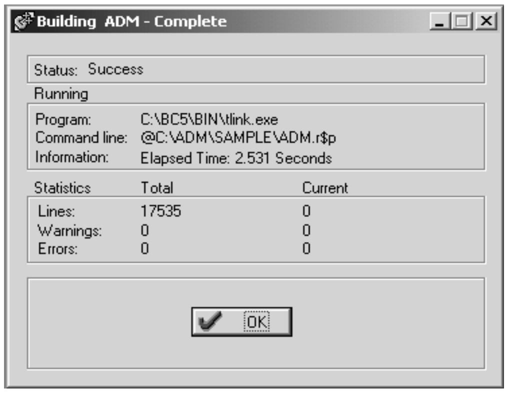
Far Data Threshold: 32767

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:


Building ADM - 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

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 ROM Disk Configuration

User programs are stored in the MVI-ADMNET module's ROM disk. This disk is actually a portion of Flash ROM that appears as Drive A:.

The ROM disk size is:

Module Type	Disk Size
MVI46	896K bytes
MVI56	896K bytes
MVI69	896K bytes
MVI71	896K bytes
MVI94	384K bytes

This section describes the contents of the ROM disk.

Along with the user application, the ROM disk image must also contain, at a minimum, a CONFIG.SYS file and the backplane device driver file.

Module Type	File Name
MVI46	MVI46BP.EXE
MVI56	MVI56BP.EXE & MVI56DD.EXE
MVI69	MVI69BP.EXE
MVI71	MVI71BP.EXE
MVI94	MVI94BP.EXE

If a command interpreter is needed, it should also be included.

3.2.1 CONFIG.SYS File

The following lines should always be present in your CONFIG.SYS file:

MVI46

```
IRQPRIORITY=1
INSTALL=A:\MVI46bp.exe -iomix=0 -class=4 -m0size=3000 -m1size=10000
```

Note: The MVI46 driver file is called **MVI46BP.EXE**, and may be loaded from the **CONFIG.SYS** or **AUTOEXEC.BAT** files. The driver must be loaded before executing an application which uses the MVI API.

The SLC platform supports several classes of modules. The MVI46 can be configured as a Class 1 or Class 4 module. Also, the I/O image sizes are configurable. If the MVI46 is configured as Class 4, M0 and M1 files are supported and their sizes are configurable.

Note: Messaging is only supported when the MVI46 is Class 4.

To configure the class of the MVI46, use the command line options shown below when loading the MVI driver MVI46BP.EXE. If no options are given, the MVI46 MVI driver defaults to Class 4, 32 words of I/O, and M0 and M1 sizes of 1024 words (module ID = 13635).

```
[C:\]MVI46bp -?
MVI46 MVI Driver V1.00
Copyright (c) 2000 Online Development, Inc.
Usage:
C:\MVI46bp.EXE [-iomix=n] [-class=n] [-m0size=n] [-m1size=n]
where:
- iomix=n sets the I/O image sizes. Valid values for n are:
0 => 2 words of IO 5 => 12 words of IO
1 => 4 words of IO 6 => 16 words of IO
2 => 6 words of IO 7 => 24 words of IO
3 => 8 words of IO 8 => 32 words of IO (default)
4 => 10 words of IO
- class=n sets the module class. Valid values for n are:
1 => Class 1 (Messaging disabled)
4 => Class 4 (Messaging enabled, default)
- m0size=n sets the number of words for the Messaging
receive buffer, default m0size=1024
- m1size=n sets the number of words for the Messaging
send buffer, default m1size=1024
NOTE: m0size + m1size must be less than 16320 words.
```

When configuring the Host Controller for the MVI46, the programming software requires the Module ID for each module in the system. The Module ID for the MVI46 depends upon the configuration set by the driver. When the driver is loaded, it prints to the console the Module ID value that can be entered into the programming software for the Host Controller. For example, the default configuration prints the following information:

```
[C:\]MVI46bp
MVI46 MVI Driver V1.00
Copyright (c) 2000 Online Development, Inc.
1746 MVI Configuration
----------------------
Class 4
IO mix 8 = 32 words of IO
M0 File size = 1024 words
M1 File size = 1024 words
SLC Module ID = 13635
```

The first line, IRQPRIORITY=1, assigns the highest interrupt priority to the I/O backplane interrupt. The next line loads the backplane device driver. In this example, the backplane device driver file (MVI46BP.EXE) must be located in the root directory of the ROM disk. In the case of the MVI46, the module I/O is set when the backplane driver is loaded. The module is set to class 4 with a 3000 word M0 file and a 10000 word M1 file. The Module ID for installing and configuring the module in the ladder program will be printed to the console when the backplane driver is loaded.

If a command interpreter is needed, a line like the following should be included in CONFIG.SYS:

```
SHELL=A:\TINYCMD.COM /s /p
```

If a command interpreter is not needed, the user application may be executed directly from the CONFIG.SYS file as shown (where USERAPP.EXE is the user application executable file name):

```
SHELL=A:\USERAPP.EXE
```

The user application may also be executed automatically from an AUTOEXEC.BAT file, or manually from the console command line. In either case, a command interpreter (page 35) must be loaded.

MVI56

```
IRQPRIORITY=1
INSTALL=A:\MVI56bp.exe
INSTALL=A:\MVI56dd.exe
```

MVI69

```
IRQPRIORITY=1
SYSTEMPOOL=16384
STACKS=5
SHELL=A:\TINYCMD.COM /s /p
INSTALL=A:\MVI69bp.exe
```

Note: At this time, messaging is not supported on the MVI69.

MVI71

```
IRQPRIORITY=1
INSTALL=A:\MVI71bp.exe
```

MVI94

```
IRQPRIORITY=1
INSTALL=A:\MVI94bp.exe
```

3.2.2 Command Interpreter

A command interpreter is needed if you want the module to boot to a command prompt, or if you want to execute an AUTOEXEC.BAT file. Two command interpreters are included, a full-featured COMMAND.COM, and the smaller, more limited TINYCMD.COM. Refer to the **General Software Embedded DOS 6-XL Developer's Guide** located on the MVI CD-ROM for more information.

3.2.3 Sample ROM Disk Image

The sample ROM disk image that is included with the MVI-ADMNET module contains the following files:

MVI46

File Name	Description
AUTOEXEC.BAT	Runs the executable at startup
CONFIG.SYS	Loads the backplane device driver and the command interpreter
TINYCMD.COM	Command interpreter
MVI46BP.EXE	Backplane device driver
ADMNET46.EXE	Sample application

MVI56

File Name	Description
AUTOEXEC.BAT	Runs the executable at startup
CONFIG.SYS	Loads the backplane device driver and the command interpreter
TINYCMD.COM	Command interpreter
MVI56BP.EXE	Backplane device driver
MVI56DD.EXE	Backplane device driver
ADMNET56.EXE	Sample application

MVI69

File Name	Description
AUTOEXEC.BAT	Runs the executable at startup
CONFIG.SYS	Loads the backplane device driver and the command interpreter
TINYCMD.COM	Command interpreter
MVI69BP.EXE	Backplane device driver
ADMNET69.EXE	Sample application

MVI71

File Name	Description
AUTOEXEC.BAT	Runs the executable at startup
CONFIG.SYS	Loads the backplane device driver and the command interpreter
TINYCMD.COM	Command interpreter
MVI71BP.EXE	Backplane device driver
ADMNET71.EXE	Sample application
SETDNPSC.EXE	Configures the module to use either backplane or side-connect interface.

MVI94

File Name	Description
AUTOEXEC.BAT	Runs the executable at startup
CONFIG.SYS	Loads the backplane device driver and the command interpreter
TINYCMD.COM	Command interpreter
MVI94BP.EXE	Backplane device driver
ADMNET94.EXE	Sample application

3.3 Creating a ROM Disk Image

To change the contents of the ROM disk, a new disk image must be created using the WINIMAGE utility.

The WINIMAGE utility for creating disk images is described in the following topics.

3.3.1 WINIMAGE: Windows Disk Image Builder

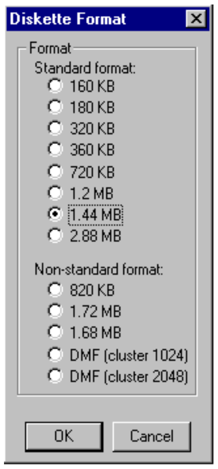
WINIMAGE is a Win9x/NT utility that may be used to create disk images for downloading to the MVI-ADMNET module. It does not require the use of a floppy diskette. Also, it is not necessary to estimate the disk image size, since WINIMAGE does this automatically and can truncate the unused portion of the disk. In addition, WINIMAGE will de-fragment a disk image so that files may be deleted and added to the image without resulting in wasted space.

To install WINIMAGE, unzip the winima40.zip file in a subdirectory on your PC running Win9x or NT 4.0. To start WINIMAGE, run WINIMAGE.EXE.

Follow these steps to build a disk image:

1 Start WINIMAGE.

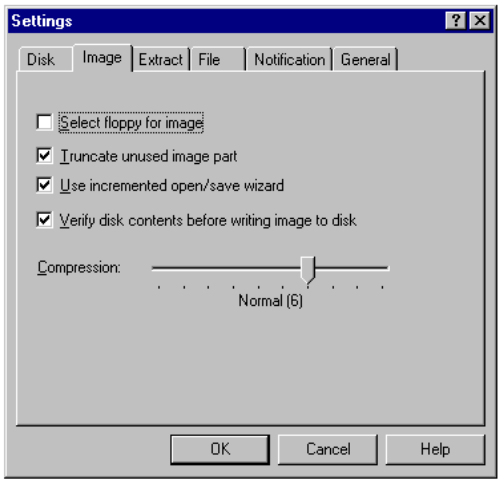
2 Select **File**, **New** and choose a disk format as shown in the following diagram. Any format will do, as long as it is large enough to contain your files. The default is 1.44Mb, which is fine for our purposes. Click on **OK**.



Diskette Format
Format
Standard format:
160 KB [ ] 180 KB [ ] 320 KB [ ] 360 KB [ ] 720 KB [ ] 1.2 MB [✓ 1.44 MB] 2.88 MB
Non-standard format:
820 KB [ ] 1.72 MB [ ] 1.68 MB [ ] DMF (cluster 1024) [ ] DMF (cluster 2048)

3 Drag and drop the files you want in your image to the WINIMAGE window.

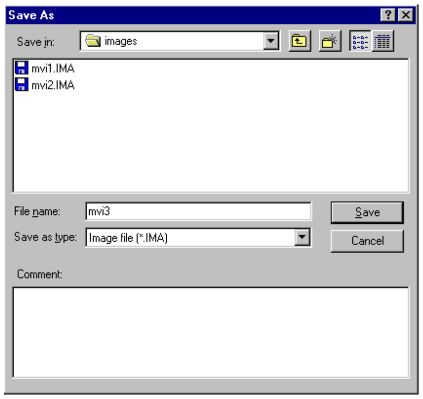
4 Click on **Options**, **Settings** and make sure the **Truncate unused image part** option is selected, as shown in the following figure. Click on **OK**.



☐ Select floppy for image
☑ Truncate unused image part
☑ Use incremented open/save wizard
☑ Verify disk contents before writing image to disk

Compression: Normal (6)

5 Click on **File**, **Save As**, and choose a directory and filename for the disk image file. The image must be saved as an uncompressed disk image, so be sure to select **Save as type: Image file (*.IMA)** as shown in the following figure.



Save in: images

mvi1.IMA
mvi2.IMA

File name: mvi3
Save as type: Image file (*.IMA)
Comment:

6 Check the disk image file size to be sure it does not exceed the maximum size of the MVI-ADMNET module's ROM disk (896K bytes, 384K bytes for MVI94). If it is too large, use WINIMAGE to remove some files from the image, then de-fragment the image and try again (**Note:** To de-fragment an image, click on **Image**, **Defrag current image**.

7 The disk image is now ready to be downloaded to the MVI-ADMNET module.

For more information on using WINIMAGE, refer to the documentation included with it.

Note: WINIMAGE is a shareware utility. If you find this program useful, please register it with the author.

3.4 Downloading a ROM Disk Image

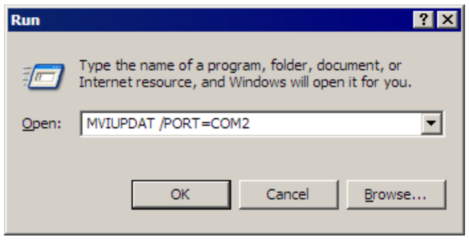
3.4.1 MVIUPDAT

MVIUPDAT.EXE is a DOS-compatible utility for downloading a ROM disk image from a host PC to the MVI-ADMNET module. MVIUPDAT.EXE uses a serial port on the PC to communicate with the module. Follow the steps below to download a ROM disk image:

1 Connect a null-modem serial cable between the serial port on the PC and PRT1 on the MVI module.
2 If you are using HyperTerm or a similar terminal program for the MVI-ADMNET module console, exit or disconnect from the serial port before running the MVI Flash Update tool.
3 Turn off power to the MVI module. Install the Setup Jumper as described in the Installation Instructions.

For DOS:

1 Click the **START** button, and then choose **RUN.**
2 In the **OPEN:** field, enter `MVIUPDAT`. Specify the PC port on the command line as shown in the following illustration. The default is COM1.


Run
Type the name of a program, folder, document, or Internet resource, and Windows will open it for you.
Open:
OK
Cancel
Browse...

MVIUPDAT /PORT=COM2

3 Turn on power to the MVI module. You should see the following menu shown on the host PC.

```
+----------------------------+
| Main Menu                  |
|----------------------------|
| Verify Module Connection   |
| Update Flash Disk Image    |
| Reboot Module              |
+----------------------------+
```

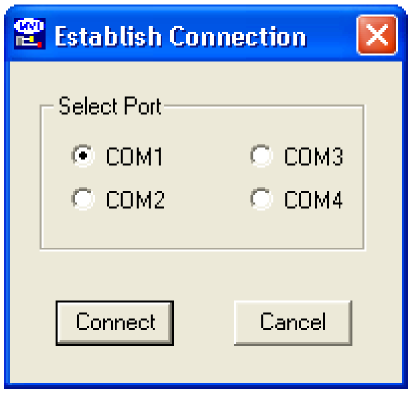
4 Select **VERIFY MODULE CONNECTION** to verify the connection to the MVI module. If the connection is working properly, the message "Module Responding" will be displayed.

Note: If an error occurs, check your serial port assignments and cable connections. You may also need to cycle power more than once before the module responds.

5 Select **UPDATE FLASH DISK IMAGE** to download the ROM disk image. Type the image file name when prompted. The download progress is displayed as the file is being transmitted to the module.
6 After the disk image has been transferred, reboot the MVI module by selecting the **REBOOT MODULE** menu item.
7 Exit the MVIUPDAT.EXE utility by pressing **[ESC].**

For Windows:

Double Click on the **MVI FLASH UPDATE** icon to open the *Establish Connection* dialog box.

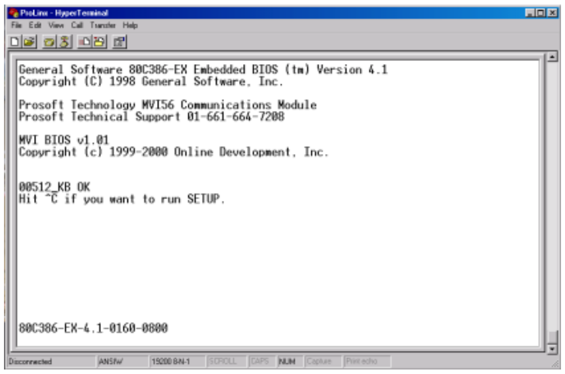


Select Port: (● COM1) ○ COM2 ○ COM3 ○ COM4

1. Choose the **COM PORT [1,2,3,4]** that your PC is using.
2. Choose **CONNECT**
3. This opens a dialog box that lets you choose the location of the image file to be placed on the module. After choosing the correct image file it will begin downloading and a progress bar will let you know when the image has finished downloading as is ready to use.

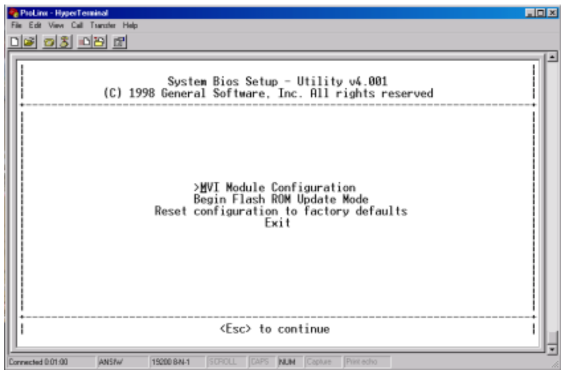
3.5 MVI System BIOS Setup

The BIOS Setup for the MVI products contains module configuration settings and allows for placing the MVI module in a flash update mode. To access the BIOS Setup, attach a null modem cable from the PC COM port to the Status/Debug port on the MVI module. Start Hyper Term with the appropriate communication settings for the Debug port. Press **[CTRL][C]** during the memory test portion in the booting of the module.



```
General Software 80C386-EX Embedded BIOS (tm) Version 4.1
Copyright (C) 1998 General Software, Inc.

Prosoft Technology MVI56 Communications Module
Prosoft Technical Support 01-661-664-7208

MVI BIOS v1.01
Copyright (c) 1999-2000 Online Development, Inc.

00512 KB OK
Hit ^C if you want to run SETUP.



80C386-EX-4.1-0160-0800
```

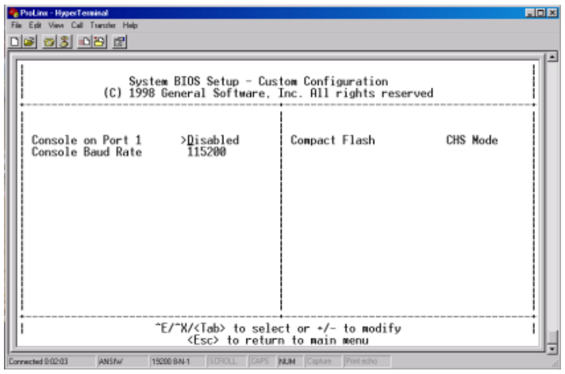
It may be necessary to install the setup jumper in order to access the BIOS Setup. The setup jumper will be necessary if the Console is disabled. The following illustration shows the BIOS Setup screen.



```
                 System Bios Setup - Utility v4.001
       (C) 1998 General Software, Inc. All rights reserved

                    >MVI Module Configuration
                    Begin Flash ROM Update Mode
               Reset configuration to factory defaults
                               Exit

                          <Esc> to continue
```

The MVI module can be placed in a mode where it is waiting to receive a new flash image by selecting the Begin Flash ROM Update Mode option.

Select MVI Module Configuration to set the Console, Console Baud Rate and Compact Flash mode. The Console allows keyboard entry and text output to the debug port. The baud rate of the console port is selected by the Console Baud Rate option. In order to use a Compact Flash disk in the MVI module the Compact Flash option must be set to CHS mode.



```
                System BIOS Setup - Custom Configuration
          (C) 1998 General Software, Inc. All rights reserved

 Console on Port 1      >Disabled        Compact Flash          CHS Mode
 Console Baud Rate       115200

              ^E/^X/<Tab> to select or +/- to modify
                    <Esc> to return to main menu
```

3.6 Transferring Files to and from the Module with HyperTerminal

You can transfer individual files to and from the Compact Flash drive on the ADMNET module using the utilities RY.exe (Receive Ymodem) and SY.exe (Send Ymodem). These two programs work with a terminal client (for example HyperTerminal) on your desktop PC to connect to the module and transfer files.

RY.exe and SY.exe are included in the sample ADM_TOOL.zip file for your hardware platform (inRAx, ProLinx or ProTalk).

Important: The embedded operating system in the ADM/ADMNET module restricts file names to eight "DOS legal" characters or fewer, with a three character extension. For more information on creating filenames in the proper format refer to pages 17 through 20 of the DOS 6-XL Reference manual.

3.6.1 Required Software

In order to send and receive data over the serial port (COM port) on your computer to the module, you must use a communication program (terminal emulator).

A simple communication program called HyperTerminal is pre-installed with recent versions of Microsoft Windows operating systems. If you are connecting from a machine running DOS, you must obtain and install a compatible communication program. The following table lists communication programs that have been tested by ProSoft Technology.

DOS	ProComm, as well as several other terminal emulation programs
Windows 3.1	Terminal
Windows 95/98	HyperTerminal
Windows NT/2000/XP	HyperTerminal

The RY and SY programs use the Ymodem file transfer protocol to send (upload) and receive (download) configuration files from your module. If you use a communication program that is not on the list above, please be sure that it supports Ymodem file transfers.

3.6.2 Connecting to the Module

To connect to the module’s Configuration/Debug port:

1 Connect your computer to the module’s port using a null modem cable.
2 Start the communication program on your computer and configure the communication parameters with the following settings:

Baud Rate	19200
Parity	None
Data Bits	8
Stop Bits	1
Software Handshaking	None

3 Open the connection. Send the necessary command to terminate the module’s program.

If there is no response from the module, follow these steps:

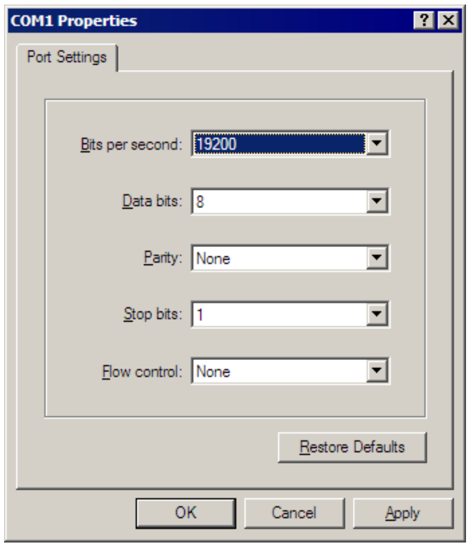
1 Verify that the null modem cable is connected properly between your computer’s serial port and the module. A regular serial cable will not work.
2 Verify that your communication software is using the correct settings for baud rate, parity and handshaking.
3 On computers with more than one serial port, verify that your communication program is connected to the same port that is connected to the module.
4 If you are still not able to establish a connection, you can contact ProSoft Technology Technical Support for further assistance.

3.6.3 Enabling the Console

Before you can use RY and SY from the command prompt, you must enable the console in the ADM module's BIOS.

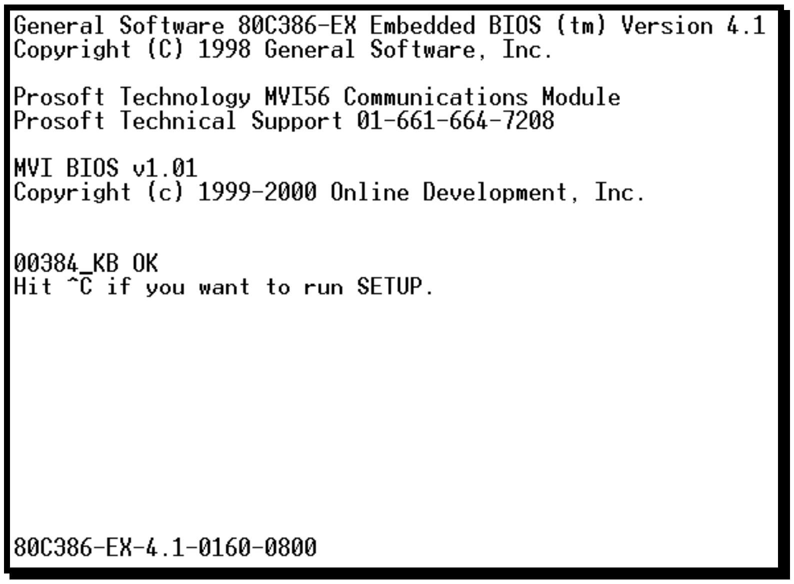
To change BIOS settings

1 Remove the module from the rack and install the Setup jumper.
2 Return the module to the rack.
3 Connect to the module using HyperTerminal at 19,200 bps, and then cycle power to reboot the module.

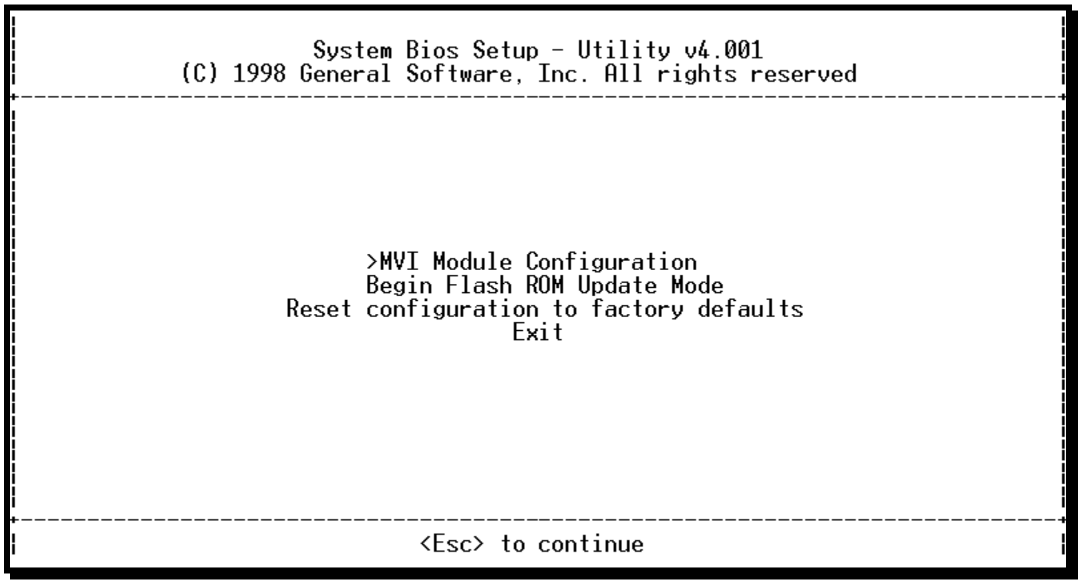


Bits per second: 19200
Data bits: 8
Parity: None
Stop bits: 1
Flow control: None

4 During the memory check portion of the module's boot sequence, press **[Ctrl][C]** to enter the BIOS configuration menu.

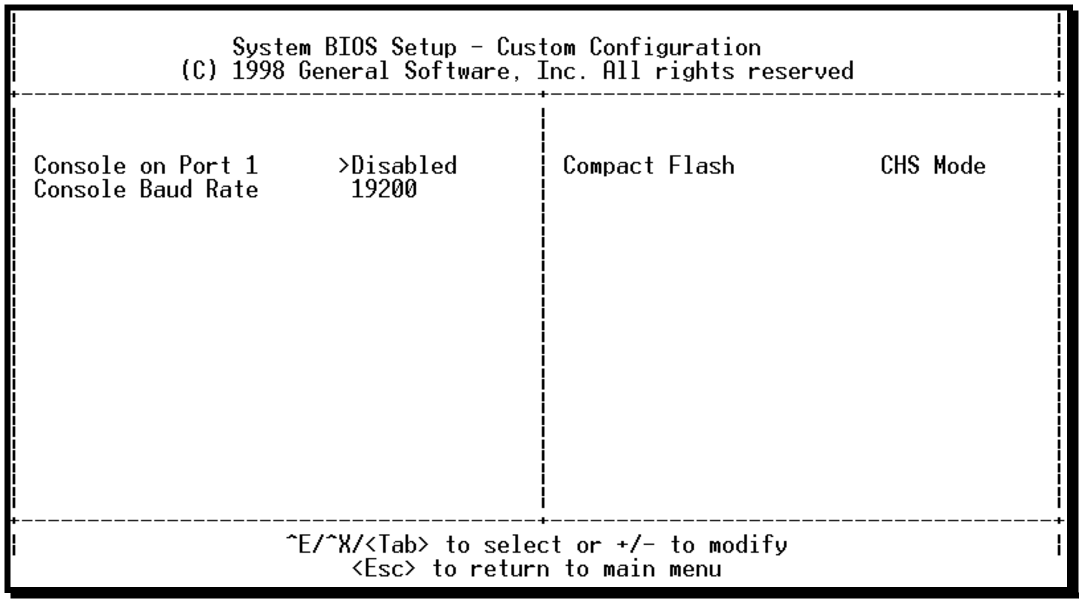


```
General Software 80C386-EX Embedded BIOS (tm) Version 4.1
Copyright (C) 1998 General Software, Inc.

Prosoft Technology MVI56 Communications Module
Prosoft Technical Support 01-661-664-7208

MVI BIOS v1.01
Copyright (c) 1999-2000 Online Development, Inc.


00384_KB OK
Hit ^C if you want to run SETUP.









80C386-EX-4.1-0160-0800
```



```
                    System Bios Setup - Utility v4.001
            (C) 1998 General Software, Inc. All rights reserved
+--------------------------------------------------------------------------+







                        >MVI Module Configuration
                        Begin Flash ROM Update Mode
                  Reset configuration to factory defaults
                                   Exit








+--------------------------------------------------------------------------+
                              <Esc> to continue
```

5 Press **[Enter]** to enter the MVI-ADMNET module Configuration menu.



```
                 System BIOS Setup - Custom Configuration
          (C) 1998 General Software, Inc. All rights reserved

 Console on Port 1      >Disabled      Compact Flash          CHS Mode
 Console Baud Rate       19200

                  ^E/^X/<Tab> to select or +/- to modify
                       <Esc> to return to main menu
```

6 On the BIOS configuration menu, use the **[Tab]** key to navigate through the menu options, and then use the **[+]** key to toggle the choices.

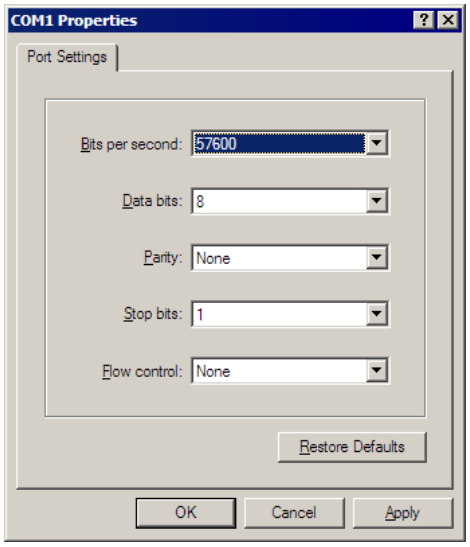
The options to change are:

- Console on Port 1: change to Enabled
- Console Baud Rate: change to 57600

7 Press **[Esc]** to return to the Main Menu.
8 Press **[Esc]** again to apply your changes and reboot the module.
9 Remove the module from the rack and disable the Setup jumper.

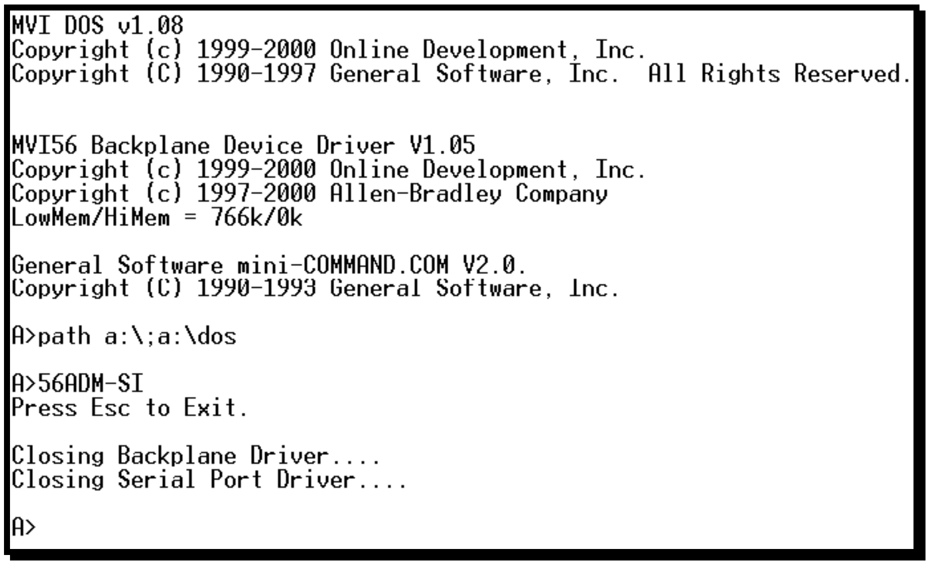
To communicate with the module in Console mode

1 Change the connection settings in HyperTerminal from 19200 to 57600, and then reconnect to the module.



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

2 Press **[Esc]** to exit the program and return to the command prompt.



```
MVI DOS v1.08
Copyright (c) 1999-2000 Online Development, Inc.
Copyright (C) 1990-1997 General Software, Inc.  All Rights Reserved.


MVI56 Backplane Device Driver V1.05
Copyright (c) 1999-2000 Online Development, Inc.
Copyright (c) 1997-2000 Allen-Bradley Company
LowMem/HiMem = 766k/0k

General Software mini-COMMAND.COM V2.0.
Copyright (C) 1990-1993 General Software, Inc.

A>path a:\;a:\dos

A>56ADM-SI
Press Esc to Exit.

Closing Backplane Driver....
Closing Serial Port Driver....

A>
```

Important: The autoexec.bat in the image file must allow the application to exit to a DOS prompt.

3.6.4 Installing RY.exe and SY.exe

To install RY.exe and SY.exe on the module, remove the Compact Flash card from the module, and then use a Compact Flash card reader on your PC to copy the files to the root directory of the Compact Flash card. When you reinsert the Compact Flash card in the module, use the following syntax to send or receive files.

```
C:\RY
```

or

```
C:\SY "filename.ext"
```

The filename and path must be in quotes.

Important: You cannot copy files directly to the A:\ drive on the module. To update files on the A drive, you must create a new ROM image (page 37) and download the image to the module using MVIFlashUpdate. (page 39) The following procedures show how to send and receive files from the module's Compact Flash card (drive C:\).

3.6.5 Downloading Files From a PC to the ADM Module

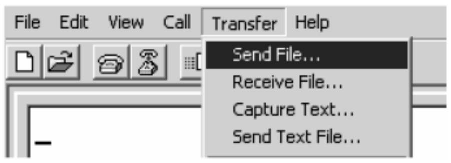
In order to download files to the module, the ADM module's running program must be interrupted. To transfer files to the module, run the RY.EXE program which uses the YModem protocol.

1 In HyperTerminal, connect to the module at 57600 baud and type the command to halt the program (for example **[Esc]** or **[Ctrl][C]**; your application must be written to allow itself to exit to the command prompt on request).

2 At the command prompt, type

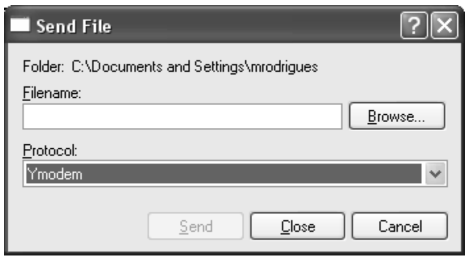
```
C:\RY
```

3 In HyperTerminal, open the Transfer menu, and then choose Send File.



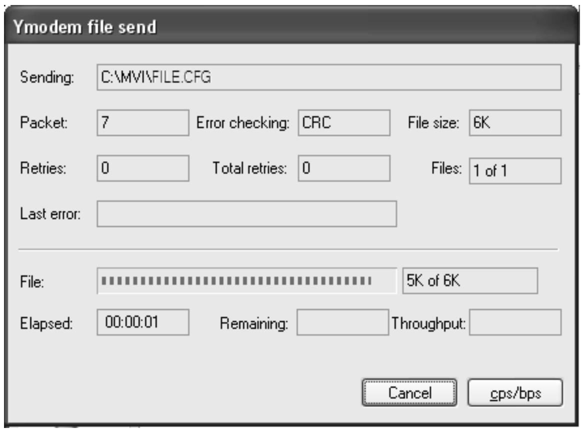
4 Click the Browse button to navigate to the folder and file to send to the module.

5 Chose Ymodem from the Protocol dropdown list, and then click Send.



Folder: C:\Documents and Settings\mrodrigues
Filename:
Protocol: Ymodem

6 The Ymodem File Send dialog box shows the file transfer size and remaining time.


Ymodem file send

Sending:	C:\MVI\FILE.CFG				
Packet:	7	Error checking:	CRC	File size:	6K
Retries:	0	Total retries:	0	Files:	1 of 1
Last error:					
File:			5K of 6K		
Elapsed:	00:00:01	Remaining:		Throughput:	

When the file has been transferred to the module, the dialog box will indicate that the transfer is complete.

3.6.6 Uploading files from the ADM module to a PC

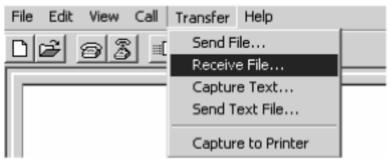
In order to upload files from the module, the ADM module's running program must be interrupted. You must run the SY.EXE program which uses the YModem protocol.

1 In HyperTerminal, connect to the module at 57600 baud and type the command to halt the program (for example **[Esc]** or **[Ctrl][C]**; your application must be written to allow itself to exit to the command prompt on request).

2 At the command prompt, type

```
C:\SY "filename.ext"
```

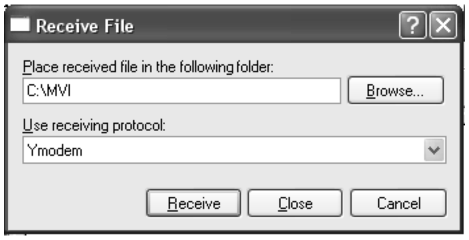
The filename and path must be in quotes.



3 From the **Transfer** menu in HyperTerminal, select **Receive File**. This action opens the Receive File dialog box.

4 Use the Browse button to choose a folder on your computer to save the file,

5 Select Ymodem as the receiving protocol, and then click the Receive button.



Place received file in the following folder: C:\MVI

Use receiving protocol: Ymodem

When the file has been transferred to your PC, the dialog box will indicate that the transfer is complete.

3.7 Installing and Configuring the Module

This chapter describes how to install and configure the module to work with your application. The configuration process consists of the following steps.

1 Use to identify the module to the processor and add the module to a project.

Note: The software must be in "offline" mode to add the module to a project.

2 Modify the example ladder logic to meet the needs of your application, and copy the ladder logic to the processor. Example ladder logic files are provided on the CD-ROM.

Note: If you are installing this module in an existing application, you can copy the necessary elements from the example ladder logic into your application.

The rest of this chapter describes these steps in more detail.

Note for MVI94: Configuration information for the MVI94-ADM module is stored in the module's Flash ROM. This provides permanent storage of the information. The user configures the module using a text file and then using the terminal emulation software provided with the module to download it to the module's Flash ROM. The file contains the configuration for the Flex backplane data transfer, master port and the command list. This file is downloaded to the module for each application.
Note for MVI69: Configuration information for the MVI69-ADM module is stored in the module's EEPROM. This provides permanent storage of the information. The user configures the module using a text file and then using the terminal emulation software provided with the module to download it to the module's EEPROM. The file contains the configuration for the virtual database, backplane data transfer, and serial port. This file is downloaded to the module for each application.

3.7.1 Using Side-Connect (Requires Side-Connect Adapter) (MVI71)

If the side-connect interface is used, the file SC_DATA.TXT on the Compact Flash Disk must contain the correct configuration file number. To set the configuration file number for your application, run the setdnpsc.exe program. Install the module in the rack and turn on the power

1 Install the module in the rack and turn on the power.
2 Connect the serial cable to the module's debug/configuration port
3 To exit the program, **[Esc],** followed by **[Y].** The program will exit and remain at the operating system prompt.
4 Run the setdnpsc.exe program with a command line argument of the file number to use for the configuration file. For example, to select N10: as the configuration file, enter the following:

```
SETDNPSC 10
```

The program will build the SC_DATA.TXT on the Compact Flash Disk (C: drive in the root directory).

Next, define the data files for the application. If the block transfer interface is used, define the data files to hold the configuration, status, and user data. Enter the module's configuration in the user data files. Enter the ladder logic to handle the blocks transferred between the module and the PLC. Download the program to the PLC and test the program with the module.

If the side-connect interface is used, no ladder logic is required for data transfer. The user data files to interface with the module must reside in contiguous order in the processor. The first file to be used by the interface is the configuration file. This is the file number set in the SC_DATA.TXT file using the SETDNPSC.EXE program. The following table lists the files used by the side-connect interface:

File Number	Example	Size	Description
Cfg File	N10	300	Configuration/Control/Status File
Cfg File+1	N11	to 1000	Port 1 commands 0 to 99
Cfg File+2	N12	to 1000	Port 2 commands 0 to 99
Cfg File+5	N15	to 1000	Data transferred from the module to the processor.
			Other files for read data.
Cfg File+5+n	N16	to 1000	Data transferred from the processor to the module.
Cfg File +5+n+m			Other files for write data.

n is the number of read data files minus one. Each file contains up to 1000 words.

m is the number of write data files minus one. Each file contains up to 1000 words.

Even if both files are not required for a port's commands, they are still reserved and should only be used for that purpose. The read and write data contained in the last set of files possess the data transferred between the module and the processor. The number of files required for each depends on the number of registers configured for each operation. Two examples follow:

Example of 240 words of read and write data (cfg file=10)

Data Files	Description
N15:0 to 239	Read Data
N16:0 to 239	Write Data

Example of 2300 read and 3500 write data registers (cfg file=10)

Data Files	Description
N15:0 to 999	Read data words 0 to 999
N16:0 to 999	Read data words 1000 to 1999
N17:0 to 299	Read data words 2000 to 2299
N18:0 to 999	Write data words 0 to 999
N19:0 to 999	Write data words 1000 to 1999
N20:0 to 999	Write data words 2000 to 2999
N21:0 to 499	Write data words 3000 to 3499

Special care must be taken when defining the files for the side-connect interface. Because the module directly interacts with the PLC processor and its memory, any errors in the configuration may cause the processor to fault and it may even lose its configuration program. After defining the files and populating them with the correct data, download the program to the processor, and place the processor in Run mode. If everything is configured properly, the module should start its normal operation.

If all the configuration parameters are set correctly, the module's application LED (OK LED) should remain off and the backplane activity LED (BP ACT) should blink rapidly. Refer to the Diagnostics and Troubleshooting of this manual if you encounter errors. Attach a terminal to Port 1 on the module and look at the status of the module using the Configuration/Debug Menu in the module.

4 Understanding the MVI-ADMNET API

In This Chapter

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

Applications for the MVI 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 MVI 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 MVI 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++.

Important: The sample code and libraries in the 1756-MVI-Samples folder are not compatible with, and are not supported for, the Digital Mars compiler.

4.1.4 Multi-threading 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* and *cipapi* libraries have been tested and are thread-safe for use in multi-threaded applications.
- *MVIbp* and *MVIsp* libraries are safe to use in multi-threaded applications with the following precautions: If you call the same *MVIbp* or *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 *MVIbp* or *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 developed for the MVI ADM module must be stored on the module’s Flash ROM disk in order to be executed.

4.3 Theory of Operation

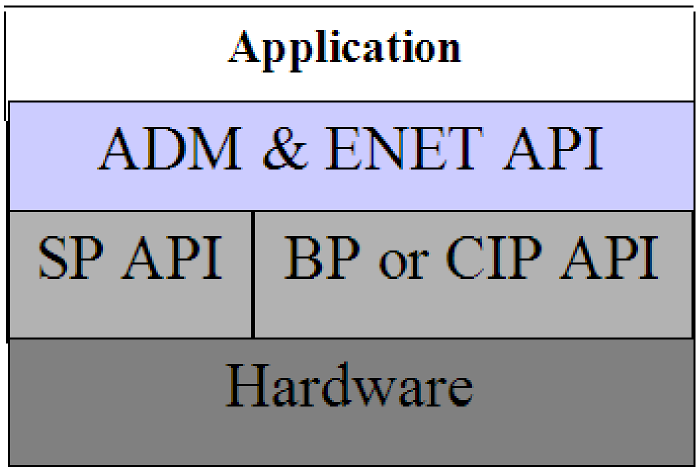
4.3.1 ADM API

The ADMNET API is one component of the MVI ADM API Suite. The ADMNET API provides a simple module-level interface that is portable between members of the MVI 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 MVI 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 MVI 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.
	ADM_init_UDP_buffer	Attaches a user supplied buffer to the UDP socket for storing the received messages. Since the buffer is user supplied, the user can adjust the size to suit the application.
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.
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.
	ADM_receive_buffered_UDP_sk	This function is used to receive messages when ADM_init_UDP_buffer is used. Received messages will be placed in the buffer pointed to by holdRecPtr. The parameter readLen will be updated with the length of the received message. The client's IP address will be placed in fromIP.
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 68)

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. Returns SK_TIMEOUT if no connection is made within 30 seconds.

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);
}
```

ADM_init_UDP_buffer

```
Syntax
int ADM_init_UDP_buffer(char *skName, char **buffer, int maxLength);
```

Parameters

skName	Name of the socket that has been initialized and used to receive data
buffer	Pointer to a buffer to hold received messages
maxlength	Maximum length of each message in the buffer

Description

ADM_init_UDP_buffer attaches a user supplied buffer to the UDP socket for storing the received messages. Since the buffer is user supplied, the user can adjust the size to suit the application.

Return Value

SK_SUCCESS	Buffer has been attached to UDP socket successfully.
SK_NOT_FOUND	Socket could not be found.
SK_CANNOT_ALLOCATE_MEMORY	API cannot allocate memory.

Example

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

#define BIG_BUFFER_SIZE_CYCLIC   32767  /* each rx buff is 1500 bytes of
data and 12 bytes header for buffer = 12 buffers */

char far bigbuff0[BIG_BUFFER_SIZE_CYCLIC];   //buffer to store received
UDP datagrams

if(ADM_init_UDP_buffer(sockName1, (char**)&bigbuff0[0],
BIG_BUFFER_SIZE_CYCLIC))
{
       printf("\nCould not enable large buffers for server!\n");
       sock_close(sockName1);
       return;
}
printf("listen for datagrams\n");
```

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 65)

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 65)

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 72)

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 73)

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 70)

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);
}
```

ADM_receive_buffered_UDP_sk

```
Syntax
int ADM_receive_buffered_UDP_sk(char *skName, char *holdRecPtr, int
*readLen, char *fromIP, int nBlock);
```

Parameters	
skName	Name of the socket that has been initialized and used to receive messages
holdRecPtr	Pointer to a buffer to hold data that will be received by the API
readLen	Length of data received by the API
fromIP	Character array to hold client IP address
nBlock	Function will block on receive if nBlock > 0. If nBlock is 0, the function will return

Description

This function is used to receive messages when ADM_init_UDP_buffer is used. Received messages will be placed in the buffer pointed to by holdRecPtr. The parameter readLen will be updated with the length of the received message. The client's IP address will be placed in fromIP.

Return Value	
SK_SUCCESS	Message received if nBlock is non-zero. If nBlock is 0 then this denotes a successful receive check which will result in a received message if a message was available..
SK_NOT_FOUND	Socket could not be found.
SK_SOCKET_CLOSE	Socket is closed

Example

```
char sockName1[] = "ReceiveSocket";
char data[1024];
int length;
char fromIP[64];
unsigned long recvVal[10];

length = MAX_MESSAGE;
err = ADM_receive_buffered_UDP_sk(sockName1, data, &length, fromIP, 1);
if(length > 0)
{
       recvVal[index++] = *(unsigned long *)data;
}
if(err < 0)
{
       printf("got error\n");
}
```

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.
	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.

Function Category	Function Name	Description
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 96)

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. *IPort* is an option parameter. Most of the time, *IPort* 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 86)

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 86)

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 86)

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. *IPort* is an option parameter. Most of the time, *IPort* 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 86)

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 80)

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 98)

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 97)

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 100)

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 99)

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 102)

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 101)

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 104)

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 103)

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 106)

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 105)

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 70)

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 109)

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 108)

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 Support, Service & Warranty

In This Chapter

7.1 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.*

Internet	Web Site: www.prosoft-technology.com/support E-mail address: support@prosoft-technology.com
Asia Pacific (location in Malaysia)	Tel: +603.7724.2080, E-mail: asiapc@prosoft-technology.com Languages spoken include: Chinese, English
Asia Pacific (location in China)	Tel: +86.21.5187.7337 x888, E-mail: asiapc@prosoft-technology.com Languages spoken include: Chinese, English
Europe (location in Toulouse, France)	Tel: +33 (0) 5.34.36.87.20, E-mail: support.EMEA@prosoft-technology.com Languages spoken include: French, English
Europe (location in Dubai, UAE)	Tel: +971-4-214-6911, E-mail: mea@prosoft-technology.com Languages spoken include: English, Hindi
North America (location in California)	Tel: +1.661.716.5100, E-mail: support@prosoft-technology.com Languages spoken include: English, Spanish
Latin America (Oficina Regional)	Tel: +1-281-2989109, E-Mail: latinam@prosoft-technology.com Languages spoken include: Spanish, English
Latin America (location in Puebla, Mexico)	Tel: +52-222-3-99-6565, E-mail: soporte@prosoft-technology.com Languages spoken include: Spanish
Brasil (location in Sao Paulo)	Tel: +55-11-5083-3776, E-mail: brasil@prosoft-technology.com Languages spoken include: Portuguese, English

7.2 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.

Documentation is subject to change without notice.

Glossary of Terms

A

API

Application Program Interface

B

Backplane

Refers to the electrical interface, or bus, to which modules connect when inserted into the rack. The module communicates with the control processor(s) through the processor backplane.

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

CIP

Control and Information Protocol. This is the messaging protocol used for communications over the ControlLogix backplane. Refer to the ControlNet Specification for information.

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.

Controller

The PLC or other controlling processor that communicates with the module directly over the backplane or via a network or remote I/O adapter.

D

DLL

Dynamic Linked Library

E

Embedded I/O

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

ExplicitMsg

An asynchronous message sent for information purposes to a node from the scanner.

H

HSC

High Speed Counter

I

Input Image

Refers to a contiguous block of data that is written by the module application and read by the controller. The input image is read by the controller once each scan. Also referred to as the input file.

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.

Local I/O

Refers to any I/O contained on the CPC base unit or mezzanine board.

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.

MVI Suite

The MVI suite consists of line products for the following platforms:

- Flex I/O
- ControlLogix
- SLC
- PLC

- CompactLogix

MVI46

MVI46 is sold by ProSoft Technology under the MVI46-ADM product name.

MVI56

MVI56 is sold by ProSoft Technology under the MVI56-ADM product name.

MVI69

MVI69 is sold by ProSoft Technology under the MVI69-ADM product name.

MVI71

MVI71 is sold by ProSoft Technology under the MVI71-ADM product name.

MVI94

MVI94 and MVI94AV are the same modules. The MVI94AV is now sold by ProSoft Technology under the MVI94-ADM product name

O

Originator

A client that establishes a connection path to a target.

Output Image

Table of output data sent to nodes on the network.

P

Producer

A source of data.

PTO

Pulse Train Output

PTQ Suite

The PTQ suite consists of line products for Schneider Electronics platforms: Quantum (ProTalk)

S

Scanner

A DeviceNet node that scans nodes on the network to update outputs and inputs.

Side-connect

Refers to the electronic interface or connector on the side of the PLC-5, to which modules connect directly through the PLC using a connector that provides a fast communication path between the - module and the PLC-5.

T

Target

The end-node to which a connection is established by an originator.

Thread

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

W

Word

16-bit value

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