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SmartBits

Advanced Multiport Performance Tester/Simulator/Analyzer

SmartLib User Guide

Programming Library Version 3.05

FEBRUARY 1999

Supporting these development environments:

Microsoft Windows Version 3.1
Windows 95
Windows NT
UNIX
Borland C/C++
Microsoft Visual C/C++
GNU C/C++
Microsoft Visual Basic
Borland Delphi
Tcl

NetCom SYSTEMS

P/N 340-0029-002 Rev G

Netcom Systems, Inc.
(818) 700-5100 Phone
(818) 709-7881 FAX

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Chapter 1: Introduction

The SmartLib User Guide contains a *basic overview* of the Smartlib programming library, as well as a complete overview of the original library functions. The newer Message Functions and the test modules (SmartAPI) are included in separate manuals.

This User Guide includes information such as installation instructions, examples, and notes for specific programming languages.

This chapter discusses basic concepts and uses for SmartLib, as well as general information about SmartLib manuals.

SmartLib

SmartLib programming library helps developers create custom test applications for Netcom Systems' SmartCards, SmartBits, and ET-1000.

SmartLib can be used to automate testing, or create applications that test a single, unique network component. It can be used to create simple GUIs for results gathering and analysis, making tests useful for a production line. Or, it can be used to create a complex suite of tests. SmartLib is a powerful programming tool, fueled by the desire to test the cutting edge.

SmartLib programming library supports:

- Ethernet 10 MB, 100 MB, and Gigabit systems,
- Token Ring 4MB and 16 MB systems,
- VG/AnyLan in Ethernet mode,
- ATM technologies including DS1, E1, 25MB, E3, DS3, OC-3c, and OC-12c with Signaling control as well as traffic generation.
- Frame Relay V.35.

SmartLib offers three approaches to test application development.

1. The Original functions (Hardware API) which interfaces with the hardware and firmware of older SmartCards.
2. The Message Functions (Hardware API) which provide a more standardized syntax to interface with the hardware and firmware of newer SmartCards: ATM, Frame Relay, Gigabit, Layer3, Ethernet/Fast Ethernet, and Multi-Layer.
3. The SmartAPI test routines (pre-created test modules) that interface with the Original and Message Functions.

Backward Compatibility

Additional features are constantly being added to Netcom Systems' suite of products. New modules require changes to the library. Every attempt is made to keep updates backwardly compatible so that applications developed for older modules function with minimal modifications.

NOTE: Be sure to check the readme.txt file with each release, as well as the Revisions section of this manual to see what changes affect your programs.

SmartLib Documentation

SmartLib 3.04 documentation now consists of printed manuals as well as manuals in PDF Format located on the CD. For the on-line manuals, look in:

<Your CD>: | Documents | Manuals | SmartLib |

Note that the *SmartLib Training Material* is on the CD in Microsoft PowerPoint format (*.ppt).

To view and print PDF files, you can use one of the Acrobat readers (for UNIX or Windows) located in:

<Your CD>: | Tools |

The SmartLib Manuals

SmartLib User Guide covers the first group of routines (original hardware API functions and parameters). It also discusses SmartLib installation, examples, and notes pertaining to specific programming languages.

Message Functions reference manual contains a thorough overview of the Message Functions (used with newer SmartCards). Basic concepts and parameter break-down are in the front, while the reference material for each parameter is covered in the body of the book.

SmartAPI for Smart Applications presents an overview of the Smart Applications (RFC-1242) Benchmark test series. Topics include basic test concepts, test methodology, and reference material for each function and structure.

SmartAPI for Smart Signaling presents an overview of the Smart Signaling ATM test series. Topics include basic test concepts, test methodology, and reference material for each function and structure.

SmartLib Training Material is a Power Point presentation used by Netcom Systems trainers. Although this material designed for training purposes, it contains useful information, pointers, and examples.

NOTE: Although SmartLib provides interfaces for multiple programming languages, the documentation is including syntax entries are written with C/C++ programming conventions unless otherwise noted.

For more helpful information see the Examples chapter in this manual.

Understanding Prefixes: ET, HT, and HG

In the SmartBits Library, function names are prefixed by either ET, HG, or HT. The ET functions interact with the ET-1000 controller, and are not designed to work with SmartCards. The HT prefix indicates communication to a single SmartCard, while the HG prefix indicates communication to a group of SmartCards.

System Requirements

This version of the programming library has been tested with firmware release 10.06, the most current release of SmartBits/ET-1000 firmware at the time of this writing.

The most current release of Netcom Systems' firmware is available from the Netcom Systems web site. Go to **www.netcomsystems.com** and click the "Support" link.

This release of SmartLib does not function with an HT-40 and passive cards. Do NOT install either this installation or the firmware upgrade if you are using an HT-40 and passive cards.

General Programming Notes

- Source code modules that call SmartLib library routines must include the appropriate header file (`ET1000.H` for “C/C++”, `ET1000.B32` for 32-bit Visual Basic, etc.). Each programming environment has a facility for configuring a list of ‘include subdirectories’. The header file must reside in one of the directories on the 'included subdirectories' list. See the appropriate "developing" section in this manual for more information.

- Applications that call SmartLib functions must link with the appropriate Smartlib library file. Each programming environment has a facility for configuring a list of ‘library subdirectories’. The SmartLib library file must reside in one of the directories on the 'library subdirectory' list. Some programming environments require that this library be manually added to the project. See the appropriate programming section in this manual for more information.

- 16-bit environments must have the compiler switch ‘struct member byte alignment’ set to 1 byte. For 32-bit environments, set the compiler switch ‘struct member byte alignment’ to 4 bytes.

For more specific information about the different programming environments, see Chapter 2 and Chapter 3.

Link Timeout Issues

An Ethernet "Link" between the PC and a SmartBits chassis will timeout after 30 minutes of inactivity. This means that if there is no communication initiated by the PC for 30 minutes, the socket will be closed by the chassis. The timeout feature frees the SmartBits chassis to accept other link attempts should the initial link be lost.

A serial link has no time-out feature.

Creating a Keep-Alive Loop

If you want your link to stay connected after more than 30 minutes of inactivity, you can insert a "Keep-Alive" loop in your application. This code loop issues a command to the SMB chassis at a given interval (for example, 29 minutes). This prevents the link from timing out. Examples of the Stay-Alive loops are given below.

NOTE: For SmartLib 3.03 and *before*, use HTGetHubLEDs in place of ETGetLinkStatus. For SmartLib 3.05 and later, Do NOT useHTGetHubLEDs since it won't keep the link alive with an SMB 6000.

A Simple C Keep-Alive Routine.

This example loops forever. It keeps the link alive by communicating with the SmartBits controller every 29 minutes.

```
while (ETGetLinkStatus() >= 0) {
  /* 29 minutes * 60 seconds/minute * 1000 millis/second
  NSDelay(29*60*1000);
}
```

A TCL Keep-Alive Routine

This keep-alive loop can be called periodically from within an existing loop. This would allow code to continue to run - and would access the chassis only after a specified time of no interaction with the SMB controller.

This Demo runs continuously and activates `proc keepalive` every 20 seconds (so you can see the results). For an actual keep alive program, activate `proc keepalive` every 1200 or 1400 seconds (since there are 1740 seconds in 29 minutes).

```
##########################################################
# timeout.tcl
##########################################################

proc keepalive {} {
   #Access the SMB controller so it doesn't time-out.
   ETGetLinkStatus
   puts ""
   puts "*****************************************"
   puts "*   20 seconds have passed: Access SMB    *"
   puts "*****************************************"
   puts ""
}

# Initialize a beginning time.
set starttime [clock seconds]

 # Loop for 20 seconds.
 while {1 == 1} {

 # Get the current time.
 set nowtime [clock seconds]

 # Test for values - run keepalive if 20 seconds has passed.
 if { [expr $nowtime - $starttime] > 20} {
    keepalive
    # Reset the starttime.
    set starttime [clock seconds]
 } else {
    puts "A one second pause inserted to emulate your program
running"
    after 1000
}
}
```

SmartLib Response to a Broken Link (Time-out)

Usually a link is closed by using the ETUnLink command. Occasionally a link is broken due to network failure, power loss, or chassis time-out, for example. If this occurs while a SmartLib script or application is executing, the next SmartLib command

issued will attempt to elicit a response from the SMB link for 30 seconds before reporting an error.

> NOTE: Prior releases of SmartLib attempted to get a response for a default 5 minutes before assuming a broken link.

You can increase or decrease the *SmartLib* timeout value with the ETSetTimeout command on page 104.

Working with multiple SMB hubs.

SmartCards are mounted in a SmartBits hub (also called a card-cage, or a chassis). In order to control a SmartCard, you must identify which hub it is in, the slot in the hub, and the port on the card you wish to use. At this time, SmartCards have one port so set the port to 0.

Each element is numbered starting from zero. So, to specify the first (and only) port on the third card in the first hub, you would set the values: iHub 0, iSlot 2, and iPort 0.

When you work with multiple hubs, there is a variation on the number system depending on if and how you have linked stacks of hubs. See the diagram below.

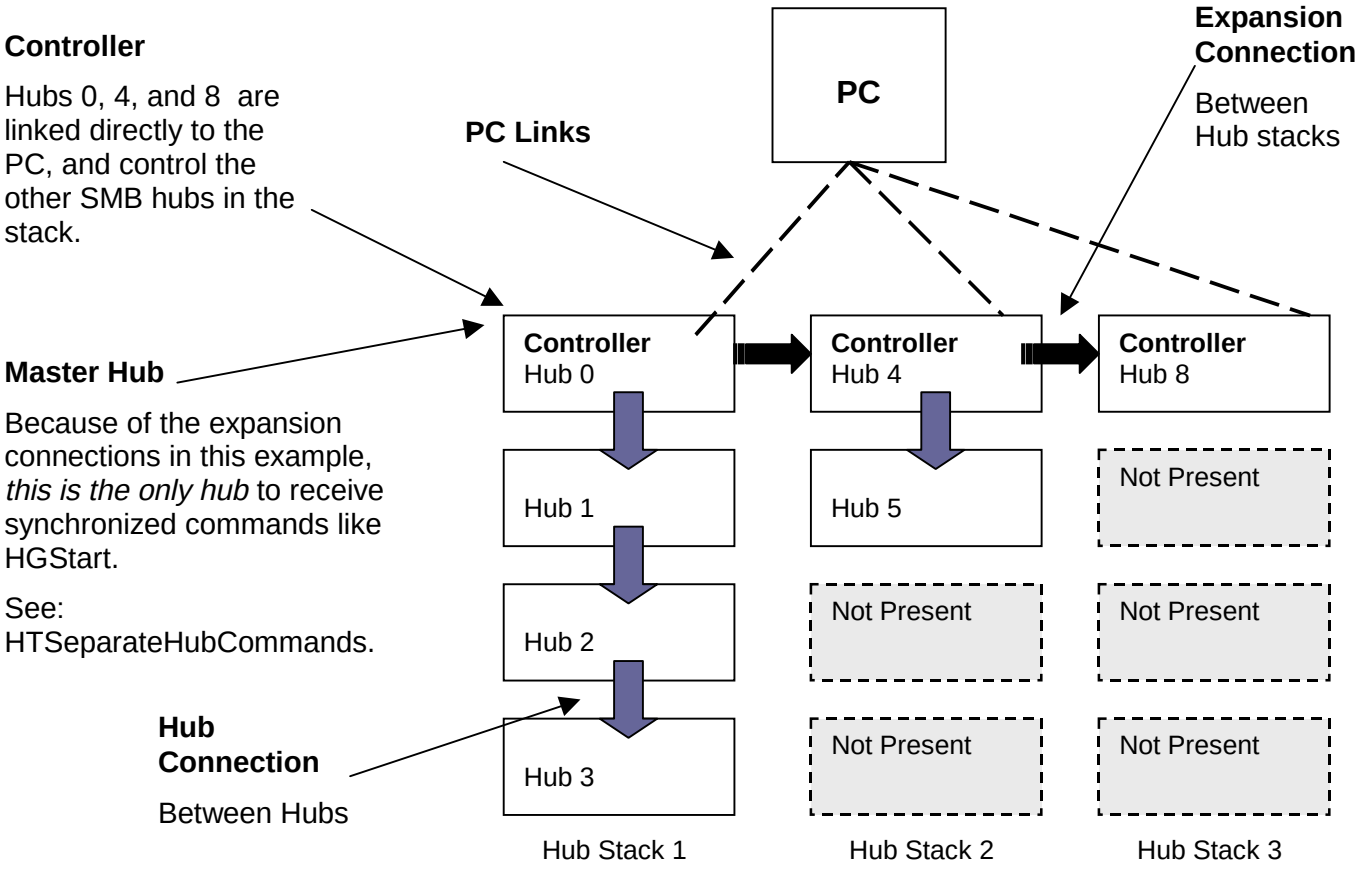


Diagram of three SMB hub stacks linked to a PC.

Each hub stack is comprised of a single link to the PC and up to four hubs connected via the 37 pin hub connections. The hub that is linked to the PC becomes the Controller and acts as the brains for the entire stack (effectively disabling the controllers of the other hubs). There can be a total of eight links to the PC. Whether that is comprised of eight hubs, or eight stacks of hubs is left up to you.

If the controller hubs are SMB 2000s, the stacks of hubs can be connected and *synchronized* via the small Expansion ports in the upper corners of the controlling hubs. They can also be synchronized via GPS connections.

Each controller (i.e., hub linked to the PC) is given a number in increments of four. This is true whether it is connected to other hubs or not. In the diagram example, the first controller hub is 0. It is connected to three subordinate hubs: 1, 2, and 3. The second controller hub is 4 with one subordinate hub, the third controller hub is 8 with no subordinate hubs, and a subsequent controller hub would be 12.

NOTE: Each controller hub ID increments by four whether the previous stack contains four hubs or not.

The Master Hub

When working with synchronized stacks of hubs, each stack has one active controller, but the entire system can have only one master controller. The Master controller is the controller that uses only the OUT expansion slot, and uses no IN expansion slot.

It is important to understand which controllers are slaves and which is the master so that you transmit commands in the proper order.

Troubleshooting and Technical Support

If you have difficulty obtaining desired results when working with the SmartLib Programming Library, consider these pointers:

- Make sure your manual is up-to-date. For the most current documentation, check the Netcom Systems web site at www.netcomsystems.web under "Support".

  NOTE: The part-number in the lower right corner of each manual can help you determine if you have the current version.

- Create your programs one module at a time and test often. The programming language, Tcl, (provided with SmartLib) is particularly useful for this task as it allows you to test a command without compiling. You can send function calls directly from the command line.

If you have SmartLib-specific questions you can call Netcom Systems Technical Support at (818) 885-2152.

Chapter 2:
Programming for MS Windows

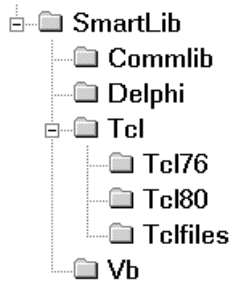
This chapter contains information about programming in the Microsoft Windows environment. It includes installation instructions, directory and file definitions, general SmartLib tips, and information specific to these compilers: C/C++, Tcl, Visual Basic, and Delphi.

Installing SmartLib for MS Windows

AutoPlay for CDs automatically runs the installation script when you put the CD into your PC. If AutoPlay is not enabled, run the *Setup.exe* from the root directory of your CD. follow the step-by-step instructions. SmartLib will be installed in the directory of your choice. The Setup program creates the directory structure illustrated below.

> NOTE: You can specify any directory name. `SmartLib` is the suggested main directory.

Win Directory Structure and Content



The directories contain files grouped together for specific programming languages. Descriptions of the files are documented later in this chapter with the appropriate programming language. The general contents of the folders are listed below.

> NOTE: SmartLib provides multiple program interfaces with header and project files repeated for each program environment.. Complete *source code comments* are in the C/C++ files contained in the **`Commlib`** directory.

- **SmartLib** - (or whichever directory you installed SmartLib into) contains directories which hold program-specific files.

- **Commlib** - contains SmartLib's compiled DLL files for 16 bit and 32 bit Microsoft Windows. It also contains project and header files for C\C++. These files contain functions for the Original functions, the newer Message Functions, *and* the SmartAPI functions.

This directory additionally contains some legacy Visual Basic `*.txt` files used for backward compatibility.

- **Delphi** - contains the source files needed to create SmartLib applications using Delphi programming language. This directory also contains `DEL_TIPS.TXT`, an informative file with information about using SmartLib with Delphi.

- **Tcl** - Contains a `README.TXT` file with important TCL information such has how to install TCL, and locations of DLLs. Also included is the `TCL_TIPS.TXT` file which contains information about programming with SmartLib under TCL.

- **Tcl\Tcl76** - Contains DLLs used when working with SmartLib under TCL 7.6. This directory also contains the executable file needed to install TCL 7.6.

- **Tcl\Tcl80** - Contains DLLs used when working with SmartLib under TCL 8.0.

- **Tcl\TclFiles** - This directory contains the SmartLib's single, complete Tcl header file, `ET1000.TCL`. This file must be "sourced" in your Tcl applications. It also contains `SHOW.TCL`, a Tcl utility used for viewing elements of a structure. Lastly, this directory contains `MISC.TCL`, an important error handler for Tcl.

- **Vb** - Contains SmartLib project and header files for Microsoft Visual Basic. These files include the 16 and 32 bit versions of the Visual Basic programming interface files. This directory also contains `Vb_tips.txt` with information specific to using SmartLib with Visual Basic.

NOTE: Sample code in both TCL and C can be found on the CD under the `SAMPLES` directory. Since the examples cover different information, it's advisable to look at both TCL and C examples.

This set of library functions can be used for development of Microsoft Windows™ based applications on IBM PC and compatibles. SmartLib functions work on a hardware platform capable of supporting MS Windows.

SmartLib functions can be called from any program using the cdecl convention or the FAR PASCAL convention. Microsoft Windows applications capable of calling a Dynamic Link Library can use these functions. This includes applications such as Excel, National Instruments LabView, and Visual Basic. Although a wide variety of applications can use SmartLib functions, your Software Developer's Kit includes four interfaces to the library specifically designed for use with C/C++, Tcl, Visual Basic, and Delphi.

General Windows Programming Notes

The MS Windows link libraries are compiled with the "Large" memory model.

For MS Windows 16 bit applications, create an "import" library. To do this, open a DOS box and go the directory where `etsmbw16.dll` is located. Issue the command, "`implib etsmbw16.lib etsmbw16.dll.`" The library will be created automatically.

Every effort will be made to keep Smartlib compatible with earlier versions. As more functions are added, you may only need to relink your application with the new library. For Microsoft Windows applications using the DLL, relinking may not be necessary.

Developing with C/C++

This section describes the list of files used for programming with C or C++. It also contains some notes about using SmartLib in the C/C++ environment. For additional information, see the "readme" file on your installation diskette.

For “C/C++” program development, ET1000.H should be referenced (included) in your source files. This file provides the function prototypes, defined values, and structure declarations used by the library. You must also link with the SmartLib `*.LIB` files which matches your development environment.

If you develop with Borland's C/C++, compile using `SMBW32BC.LIB`. If you develop using Microsoft's C/C++, compile using `SMBW32VC.LIB`. Applications from either compiler use the same SmartLib *.DLL during run time.

File Descriptions (COMMLIB Directory)

Below is a description of the files installed in the `COMMLIB` directory. These files are predominantly used for developing with C/C++. However, this directory also contains SmartLib's central DLL files, as well as some legacy Visual Basic files.

File Name	File Type
ATMAPI.H	In development for future release.
ATMITEMS.H	Library header file of defines and structure definitions for ATM SmartCards.
ATMITM32.TXT	Visual Basic 5 legacy file, needed only for backward compatibility with earlier Visual Basic/SmartLib applications.
ATMSGAPI.H	Library header file of the Smart API for ATM Signaling tests.
ET1000.H	Library header file of basic defines, structure definitions, and all function prototypes.
ETHITEMS.H	Library header file of defines and structure definitions for the new Ethernet Message Functions.
ETSMBAPI.TXT	Visual Basic 3 legacy file, needed only for backward compatibility with earlier Visual Basic/SmartLib applications.
ETSMBW16.DLL	The dynamic link library for use with 16-bit applications developed for Windows 95 or NT.
ETSMBW32.DLL	The dynamic link library for use with 32-bit applications developed for Windows 95 or NT.
ETSMBW32.TXT	Visual Basic 5 legacy file, needed only for backward compatibility with earlier Visual Basic/SmartLib applications.
ETTYPES.H	Library header file of necessary ETSMB variable types (like U64 for working with 64 bit numbers).
FRAME.H	Library header file for the new, easier, frame-building functions: NSCreateFrame, NSSetPayLoad, HTFrame, NSDeleteFrame, NSCreateFrameAndPayLoad, NSModifyFrame.

FRITEMS.H	Library header file of defines and structure definitions for the Frame Relay SmartCards.
FSTITEMS.H	Library header file of defines and structure definitions for the Fast Ethernet (100 MB) SmartCards.
GIGITEMS.H	Library header file of defines and structure definitions for the Gigabit Ethernet SmartCard.
L3ITEMS.H	Library header file of defines and structure definitions for the Layer3 and Multi-Layer SmartCards.
SMBW32VC.LIB	The Visual C/C++ compatible import library used with the ETSMBW32.DLL for 32-bit applications.
SMBW32BC.LIB	The Borland C/C++ compatible import library used with the ETSMBW32.DLL for 32-bit applications.
STMITEMS.H	Library header file of defines and structure definitions for some common Stream items.
TCPISP.H	In development for future release.
TCPITEMS.H	In development for future release.
TESTAPI.H	Library header file of the Smart API for RFC-1242 and RFC-1944 Tests.
TESTCMMN.H	Library header file of common defines and structure definitions for the Smart APIs.
WANITEMS.H	Library header file of defines and structure definitions common to both Wide Area Network SmartCards (ATM and Frame Relay). This file includes defines such as DSI, EI, and DS3.

Developing with Tcl

Tcl is a flexible programming language, noted for its on-the-fly command-line capabilities. With Tcl, you can test a function call from the text-based command line, with out having to compile a program. This allows you to test the logic of your code, line-by-line.

Tcl programming language (7.6 and 8.0) are included with your SmartLib Software Developer's Kit as well as the SmartLib files needed to develop test applications with Tcl.

> NOTE: for an in-depth discussion of working with the SmartLib TCL interface, see Appendix B on page 190 of this manual .

At this time, the SmartLib documentation uses C/C++ conventions. To understand syntax differences. Compare this simple Tcl example below, with the identical example written for C on page 28.

Example: ET-1000/SMB-1000 -Connecting and Disconnecting

```
source et1000.tcl
set iRsp [ETLink $ETCOM1]
if {$iRsp < 0} then {
      puts "Could not connect to the ET-1000/SMB-1000"
}
set iRsp [ETUnLink]
if {$iRsp < 0} then {
      puts "Could not disconnect from ET-1000/SMB-1000"
}
```

For information about installing Tcl and using SmartLib with Tcl, read the `Readme.txt` file located in the `Tcl` directory.

For an extensive discussion about using SmartLib with Tcl, see *Appendix B Notes on Tcl* or read the `TCL_TIPS.TXT` located in the `Tcl` directory. For extensive TCL examples see the files under <your CD> :\Samples\Tcl\

File Descriptions (Tcl Directory)

Below is a description of the files installed in the `Tcl` directory.

File Name	File Type
README.TXT	Information about installation of TCL as well as setting up your environment to work with SmartLib under TCL.
TCL_TIPS.TXT	Notes and information specific to using SmartLib with Tcl.

File Descriptions (Tcl\Tcl76 Directory)

Below is a description of the files installed in the `Tcl76` directory.

File Name	File Type
TCL76.DLL	Tcl project library, used when creating applications.
TCLSTRUC.DLL	Tcl DLL used for creating structures.
TCLET100.DLL	SmartLib API for Tcl. This file maps Tcl calls to the main `ETSMB*.DLL`.
WIN76P2.EXE	Executable file for installing Tcl 7.6 programming language.

File Descriptions (Tcl/Tcl80 Directory)

Below is a description of the files installed in the `Tcl` directory.

File Name	File Type
TCL80.DLL	Tcl project library, used when creating applications.
TCLSTRUC.DLL	Tcl DLL used for creating structures.
TCLET100.DLL	SmartLib API for Tcl. This file maps Tcl calls to the main `ETSMB*.DLL`.

File Descriptions (Tcl\Tclfiles Directory)

Below is a description of the files installed in the `Tcl\Tclfiles` directory.

File Name	File Type
SAMPLE.TCL	A sample Tcl script.
SHOW.TCL	Tcl Utility used for viewing elements in a structure.
ET1000.TCL	SmartLib header file containing SmartLib defines, structure definitions, and function prototypes.

Developing with Delphi

The Delphi source files have been added to this version of SmartLib. For information about using SmartLib with Delphi, read the `DEL_TIPS.TXT` located in the `DELPHI` directory.

File Descriptions (Delphi Directory)

The necessary interface files needed for using SmartLib with Delphi are located in the `DELPHI` directory. Each *.PAS file corresponds to a C/C++ Header file or ".H" file. For detailed descriptions of these files, see the "File Descriptions (COMMLIB Directory)" section above.

NOTE: The central SmartLib DLL is located in the **`Commlib`** directory.

Developing with Visual Basic

SmartLib Programming Library includes files specifically for the Microsoft Visual Basic environment. Although much of the information that applies to C/C++ is also valid for Visual Basic, exceptions and differences are noted in this section.

Important Differences - VB vs. C/C++

- Because C/C++ is case sensitive and Visual Basic is not, there is a group of parameters that have different names in Visual Basic than they do in C/C++.

  Use the chart below to see which name to use. Remember, only the *names* are different; the functionality is identical.

For C/C++	(SmartLib Previous) - VB	(SmartLib 3.02) - VB
HTSTOP	HTRUN_STOP	Use either name
HTSTEP	HTRUN_STEP	Use either name
HTRUN	HTRUN_RUN	HTRUN_RUN or HTRUN_ VALUE
ETSTOP	ETRUN_STOP	Use either name
ETSTEP	ETRUN_STEP	Use either name
ETRUN	ETRUN_RUN	Use either name

NOTE: The HTRUN name-change applies to the constant parameter only. Do not change the name of the HTRUN function.

- In Visual Basic, integers require the same amount of space whether you use the 16 bit or 32 bit version. However, if you are programming with C/C++, "*int*"

requires a larger memory allocation in the 32 bit version than it does in the 16 bit version.

This means that items that appear in the manual as *int*, are declared as *Long* within SmartLib's header and LIB files for 32 bit Visual Basic.

In addition, Visual Basic does not support unsigned types. In some cases where unsigned types are specified, conversions must be made. An example is a counter result where all thirty-two bits are used to represent a positive number.

- In this version of SmartLib, the parameters for HTVFDStructure have been renamed to more closely match the parameter names used with C/C++.

For C/C++	(SmartLib Previous) - VB	(SmartLib 3.02) - VB
*Data	iPointer	pData
DataCount	iLength	DataCount

File Descriptions Used for Visual Basic

The necessary interface files needed for using SmartLib with Visual Basic are located in the **Vb** directory; with DLLs and legacy files located in the Commlib directory. Each of the *.B16 or *.B32 files corresponds to a C/C++ Header file. For detailed file descriptions, see the "File Descriptions (COMMLIB Directory)" section above. Below is a general list of the files used when developing with Visual Basic.

File Name	File Type
ETSMBW16.DLL	The dynamic link library for use with 16-bit applications developed for Windows 95 or NT. This file is located in the `Commlib` directory, and installed in your `Windows\System` directory.
ETSMBW32.DLL	The dynamic link library for use with 32-bit applications developed for Windows 95 or NT. This file is located in the `Commlib` directory, and installed in your `Windows\System` directory.
*.B16	Library header files of defines, structure definitions, and function prototypes. These files are used for VB 16 bit.
*.B32	Library header files of defines, structure definitions, and function prototypes. These files are used for VB 32 bit.
ETSMBAPI.TXT	Visual Basic legacy files located in the `Commlib` directory.
ETSMBW32.TXT	Visual Basic legacy files located in the `Commlib` directory.
ATMITM32.TXT	Visual Basic legacy files located in the `Commlib` directory.

To use the SmartLib functions, data structures, and constants, include the appropriate `*.b16` or `*.b32` files in your VB project.

Chapter 3:
Programming for UNIX

SmartLib 3.04 supports both C and TCL (7.6 and 8.0.3) programming environments. It also supplies extensive TCL and C code examples, and the SmartLib manuals in PDF format (both on the CD).

SmartLib tested under UNIX versions listed below:

- SunOS 4.1.4.
- Solaris 2.5.1 - on SPARC architecture.
- Solaris 2.5.1 - on x86 architecture.
- Linux 2.0.0 and above - on x86 architecture.

Installing SmartLib for UNIX

The installation for UNIX is now more automated and flexible. To install SmartLib 3.04 for UNIX, you can run the **`setup.sh`** installation utility and pick the specific files you wish to install.

The CD contains both source code and pre-compiled shared libraries.

> NOTE: These programs must be installed on your system and 993in your PATH *before* you install SmartLib for UNIX: `gcc` (including the standard C++ library), `make`, and `gunzip`.

Step-by-Step UNIX Installation

1. Insert the SmartLib CD-ROM into your CD drive.
2. Mount the CD.
   - ❖ Under Solaris, this is automatic. Your CD will be mounted at /cdrom/netcom.
   - ❖ Under Linux, enter mount -r /dev/cdrom /mnt/cdrom . Your CD will be mounted at /mnt/cdrom.
   - ❖ Under SunOS, use the correct mount command.
3. Change to the directory where the CD is mounted.
4. Run the script **`setup.sh`**. The Setup script will prompt you to answer a number of questions so that your SmartLib installation is customized to your needs. Key concepts to consider when you install are:
   - ❖ Where should SmartLib files be installed?

     Several subdirectories are created depending on which features you elect to install. For system-wide access, it is best to install as root and place SmartLib in /usr/local. If you don't have root access, you can install in your account. (For

example, if your home directory is /export/home/jdoe, enter /export/home/jdoe/smartlib.)

- Do I want precompiled versions of SmartLib, or do I want to compile the source files on my system?

  In most cases use the precompiled versions. They have been tested, and will install much faster. On Linux, however, you may be unable to use the precompiled libraries. If you elect not to install the pre-compiled version of the library, source files are installed instead, and then compiled in your environment during the install process.

  When installing with Linux, libc.so and libn.so may have been renamed so that our installation script cannot find them. To correct this problem create a *symbolic link* (a small pointer file) in the directory where you libc.so.n and libn.so.n reside.

  An example of creating a symbolic link is shown below.

```
ln -s libc.so libc.so.5
ln -s libn.so libn.so.5
```

- Will I write scripts with TCL?

  If so, which version: 7.6. or 8.0? There is also an option to install the TCL programming language (provided on the CD).

Below is part of an example Setup script for a UNIX SmartLib installation:

```
Please enter the installation directory:
/export/home/build/test
Do you want to install the Programming Library? [y/n]
y
Do you want to install the precompiled Programming Library? [y/n]
If not, it will be built from source.
y
Do you want to install Tcl 8.0? [y/n]
If yes, the installed versions will be removed.
Say n if you want to install Tcl 7.6 instead.
y
Do you want to install TclStruct 1.3 (requiring Tcl 7.5 or later)? {y/n]
It is required if you are using the Programming Library with Tcl.
y
Do you want to install the precompiled TclStruct? [y/n]
If not, it will be built from the source files.
y
Do you want to install the Tcl Extension to the Programming Library? [y/n]
y
Do you want to install the precompiled Tcl Extension? [y/n]
If not, it will be built from the source files.
y
----------------------------------------
 Installing Programming Library...
----------------------------------------
----------------------------------------
 Installing Tcl 8.0...
----------------------------------------
```

UNIX Directory Structure and Content

Below is a list of the *possible* directories created during a UNIX installation of SmartLib 3.04.

NOTE: Depending on your selections during installation, a s*ubset* of these directories are loaded on your computer.

Though the directory structure can be expanded, this section gives a general overview of all the top level directories.

- **/bin** - Contains files to run the TCL shell. (`tclsh` is a pointer to the current TCL shell file.)

- **/include** - Contains header files used when coding with SmartLib. (For file definitions, see the Windows "*Developing with C/C++*" in the previous chapter.

  This directory also includes files used for compiling *.so files.

- **/lib** - Contains the compiled *.so files. This directory may include *.so files for TCL if the TCL interface was selected.

- **/lib/tcl8.0** - Contains TCL 8.0.3 programming files, if the 8.0 TCL compiler was installed.

- **/lib/tcl7.6** - Contains TCL 7.6 programming files, if the 7.6 TCL compiler was installed.

- **/man** - If a TCL compiler is installed, numerous TCL topics are added to the /man/* directories.

- **/tmp** - Contains other directories used if source code is compiled on the computer (instead of installing pre-compiled files). Once SmartLib and/or TCL library files are compiled, this directory can be deleted.

- **/tmp/proglib** - contains SmartLib's C source files for compiling the main SmartLib *.os file: `libetsmb.so`. This file supports the Original functions, Message Functions, *and* the SmartAPI functions.

- **tmp/Tcl8.0** - Contains files and subdirectories used for installing TCL 8.0.3.

- **tmp/Tcl7.6** - Contains files and subdirectories used for installing TCL 7.6.

- **tmp/tclstruct** - Contains TCL files used when compiling `libtclstruct.so`. Once compiled, this file is used for working with structures in TCL. It is stored in the /lib directory, and must be included when working with SmartLib in TCL.

- **tmp/tclext** - Contains TCL files used when compiling `tclet100.so`. This file is the TCL interface to the C function calls. Once compiled it is stored in the /lib directory, and must be included when working with SmartLib in TCL.

- **tmp/tcl** - More *temp* files.

Developing with C/C++

For information and file descriptions specific to the SmartLib C/C++ interface, see Developing with C/C++ in the Windows section of this book, on page 9.

Developing with TCL

For information and file descriptions specific to the SmartLib TCL interface, see Developing with C/C++ in the Windows section of this book, on page 9.

NOTE: For extensive TCL and C code examples on the CD under: <Your CD>/Samples.

SmartLib manuals can be found in *.PDF format under <Your CD>/Documents/Manuals/SmartLib.

Chapter 4: Examples

SmartLib 3.04 provides an extensive series of example source code both in C++ and TCL programming languages. These Demos are designed to guide you through the basic tasks with the SmartLib programming library.

Although there are two example groups (C++, and TCL), it is beneficial to look at *both* regardless of your programming environment. The TCL demo scripts contain code that is used both in the field and in training. It contains pertinent comments for every step. The C examples walk you through a series of basic tasks while configuring different SmartCards for Traditional and SmartMetrics traffic.

Example Code Location

The SmartLib Examples are located on the CD in these directories:

<Your CD>

- **Samples**
  - **C**
    - **Layer2**
    - **Layer3**
  - **Tcl**
    - **All Cards**
    - **ATM**
    - **ET1000**
    - **FastCard**
    - **Layer3**
    - **SmartAPI**
    - **TokenRing**

The TCL Demo Scripts:

The TCL Demo scripts are a group of useful, heavily-commented modules which cover key tasks you need to accomplish with SmartLib. This collection of scripts has been created, refined, and used by our Technical Support Specialists. These samples offer practical information, answering actual questions received by Netcom Systems customers.

Although these scripts are written in TCL, they contain information useful to SmartLib programmers working in *any* environment.

These TCL scripts do not contain examples directly related to the SmartAPIs.

AllCards

This group of scripts is a collection of basic, preliminary tasks executed by the SmartLib programming library.

1stlink.tcl	A simple *serial port* link routine between the PC and a Smartbits controller.
Backoff.tcl	Sets the backoff time - how quickly an Ethernet card attempts to transmit after a collision.
cardmod.tcl	Returns the model of the SmartCards. Example of a 2 dimensional array in TCL.
gap2.tcl	Sets the interframe gap, decrementing the gap with each code loop.
Group.tcl	Creates a "Group" of two SmartCards, and then transmits traffic.
GroupCount.tcl	Creates a "Group" of two cards. It then transmits traffic, and retrieves and displays group counter information.
LibVer.tcl	Example of passing strings in TCL. Gets SmartLib version.
misc.tcl	Important error handler for TCL.
multi-link.tcl	Links and unlinks from multiple controllers (stack of chassis). There is a possible stack of four chassis per controller link.
Show.tcl	Utility provided with TCL to display structure elements.
SocketLink.tcl	A simple *Ethernet* link routine between the PC and a Smartbits controller.
Startup.tcl	Sample code to include at the beginning of a TCL script.
vfd.tcl	Creates traffic with VFD 1, 2, and 3. Explains differences between the VFDs.

ATM

This group of scripts works with the ATM SmartCards.

1stATM.tcl	Creates a series of PVC connections, and then transmits data.
ATMDATA.tcl	Gets and displays the configuration data for an ATM card.

ET1000

These examples deal with ET1000 functionality. The ET1000 is the precursor to the SMB1000. It supports two ports and does not have removable SmartCards. These samples include code for an actual ET1000, as well as for ST-64XX cards emulating an ET1000. This functionality can be useful if, for example, you have ST-6410 SmartCards and you want to capture test frames.

ET1000MODE.tcl	Defines frames with VFDs and then transmits traffic. These routines use ST-64XX cards and an SMB chassis to accesses ET-1000 functionality.
ETVFD_CYCLE.TCL	Defines frames with VFDs and then transmits traffic. These routines executes the same functions as ET1000Mode.tcl, except that they control an actual ET1000.
multi.tcl	General overview of the ET1000 capabilities.

FastCard

This group of examples works with the SX-7210 and SX7410 Fast Ethernet SmartCards. These cards support 10/100 Mb traffic. They do not support Histograms and VTEs (i.e., no Signature field).

capture.tcl	Configures a main traffic stream, as well as an alternate stream (e.g., an error stream). It transmits the traffic. It then captures incoming traffic and displays the capture.
gap1.tcl	Sets the interframe gap, transmits traffic, and displays the rate so that user can see the effect of gap change.
mii.tcl	Reads and writes from the MII registers. It changes the baudrate so that the cards auto-negotiate to correct the speed.
misc.tcl	Important error handler used for TCL. This routine provides error messages for anywhere in the script, as opposed to only reporting errors for the last function call.
setspeed.tcl	Uses the HT commands to set speed, mode, and duplex for individual cards and for groups of cards.

Layer3

This group of examples covers creating streams with "Layer3" SmartCards, such as the L3-6710 and the ML-7710.

L3stack.tcl	Configures the SmartCards local IP address, Gateway, etc. This is for background traffic such as PING frames, SNMP frames, etc., in addition to the regular test traffic.
l3min.tcl	This script does the *minimum* configuration of a Layer 3 card, with the exception of setting up the actual traffic streams.
ipstream.tcl	Creates multiple streams using L3_DEFINE_IP_STREAM and L3_DEFINE_MULTI_IP_STREAM (described in the *Message Function* manual).
ipxstream.tcl	Creates multiple IPX streams.
udpstream.tcl	Creates multiple UDP streams.
L3mod_stream_array.tcl	Creates a group of IP streams, and then modifies only the packet length of some of the streams.
L3Trigger.tcl	Illustrates the use of L3_CAPTURE_ALL_TYPE and L3_CAPTURE_TRIGGERS_TYPE.
l3_v2_hist_lat.tcl	Uses L3_HIST_V2_LATENCY and L3_HIST_V2_LATENCY_INFO to capture and display latency information over time intervals.
L3Zero.tcl	Uses L3_DEFINED_STREAM_COUNT_INFO to display the number of streams currently defined on the target card.
L3_STREAM_INFO.tcl	Uses L3_STREAM_INFO to display IP stream data.
L2-L3.tcl	Shows how to switch a SmartCard from "Layer 2" mode to "Layer 3" mode.

SmartAPI

This example work with the SmartLib API.

SmartAPI.tcl	Demonstrates the four SmartAPPs tests: Throughput, Back-to-Back, Packet Loss, and Latency.

Token Ring

This example works with Token Ring SmartCards.

TokenRing.tcl	Sets up transmission perameters and two VFDs on a Token Ring SmartCard

The C Demo Modules:

This next section describes the two C demo modules. Each module is divided into a number of steps. This allows you to see the actions needed for basic testing with the SmartLib programming library.

- **Layer 2** - Provides a basic demonstration of setting up unidirectional traffic between source and destination with the SmartCard in Traditional mode. The card configurations cover each type of SmartCard when set to "Layer 2"/Traditional mode.

  In Traditional mode, the complex Layer2,3, and 4 testing requires more effort than in "Layer 3"/SmartMetrics mode. Traditional mode uses VFDs (Variable Field Definitions) to set up one or more traffic streams. ARP responses and Histogram results are not available.

- **Layer 3** - Provides a basic demonstration of setting up unidirectional traffic between source and destination with SmartCards in SmartMetrics mode. The card configurations cover each type of SmartCard when set to "Layer 3/"SmartMetrics mode. In SmartMetrics mode, a card uses VFDs as well as the more complex VTEs to set up traffic streams. ARP responses and other network interactions are automatic. Relational Histogram results *are* available. Not all card types support SmartMetrics mode.

Basic C Demo Configuration - Steps 1-5

Although the Demos are different, the Demos follow a basic course arranged in Steps. Below is a list of the steps with general descriptions of each.

Example: Code Snippet from demo.cpp (the main routine in the Layer 2 demo).

Note the five Step-procedures called by the routine.

```
Step1_ExamineSystem();                /* Show card types, models and version
                                      information */
Step2_DetermineConnections();         /* Determine connections */

Step3_ResetAndSetupAll();             /* Reset and setup each card */

Step4_Transmit(STAGGERED_START);      /* Transmit packets */
Step5_ShowAllCounters();              /* Show counters */

Step4_Transmit(SYNCHRONIZED_START);   /* Transmit packets */
Step5_ShowAllCounters();              /* Show counters */

/* Terminate our session with SmartBits */
printf("\nPress any key to UnLink and close the window\n");
```

Basic Steps for the C Demos:

Step 1 - Queries the SmartCards to see the kinds of cards present in the chassis.

Step 2 - Pairs cards so that each destination card has a source card.

- For Layer2 and Layer3 demos, the next like card is configured as the destination card. Un-paired cards are not used in the test.
- The cards in the SmartAPI demo are paired according to the test configuration.

Step 3 - Sets cards to a know state and then sends the proper configuration for each card type. Step 3 is the most complex step of this demo series.

Step 4 - Starts the test traffic.

Step 5 - Displays the result information.

Files Contained in Each C Demo

Although each of the C Demo modules contains a slightly different set of files, there are common features throughout. Below is a list of file types you can expect to see.

`Demo*.cpp (or) *Main.cpp` - The central file used to link the computer to the chassis and call the test Steps.

`*Step1*.cpp (through) *Step5*.cpp` - Files which contain code that executes the demo steps. See the "*Basic Steps Explained*" above for Step definitions.

`*Utils*.cpp` - The catch-all file. For example, it contains certain constants, error code, and the routines used for reading from the *.ini files found in Smart Signaling and SmartAPI.

`*.h` - The header file for the specific demo project.

Notes for Specific Demos

This section provides additional notes and tips for working with specific demos. Use it in conjunction with the basic information previously mentioned.

Layer 3

As mentioned earlier, if a SmartCard is in "Layer 3"/SmartMetrics mode, numerous capabilities are available such multiple streams configurable on a per-stream basis, true ARP interaction, and most importantly for this module, Histogram results. Depending on whether you wish to view Latency over Time, Latency per Stream, Sequence Tracking, etc, a different Histogram is enabled on the SmartCard. Note that for the Layer 3 Demo, there is no Step 5 cpp file. This is because you display the results using one of the Histogram modules.

Running the C Demos

To compile and run the C demos:

For MS Windows:

1. Create a 32bit Console Applications Project.
2. Add the source files for the desired demo and the appropriate Netcom Systems library into the project.
3. Compile the demo, and run the program.

For UNIX:

1. Create a makefile that compiles all cpp files, then links them with libetsmb.so to produce an executable.
2. Run the executable.

Additional Examples (in the manual)

Here are a number of previously included examples that appear only in the SmartLib User Guide.

The examples in this section are divided into five categories:

- Error Handling Macros.
- Routines for SmartBits/SmartCards and the ET-1000.
- Routines for SmartBits/SmartCards only.
- Routines for the ET-1000 only.
- Routines that access ET-1000 functionality with 10Mbps SmartCards.

All example routines in this section use the Error Handling Macros (ET_INT and ET_LONG) defined below. Netcom Systems recommends that you use error handling macros such as these to check each call to a SmartLib Programming Library routine. Resulting error messages can then be used to track and troubleshoot problems.

Error Handling Macros

```
// Also assumes that an int iRsp is in scope
#define ET_INT(a)         \
  {                       \
  iRsp = (a);             \
  if (iRsp<0) printf("Error in Command: %d\n",iRsp); \
  }

// Also assumes that a long lRsp is in scope
#define ET_LONG(a)        \
  {                       \
  lRsp = (a);             \
  if (lRsp<0) printf("Error in Command: %ld\n",lRsp);\
  }
```

Routines for SmartBits and the ET-1000

Connecting and disconnecting (SmartBits/ET-1000)

```
int iRsp;
ET_INT(ETLink(ETCOM1));
if (iRsp<0)
  printf("Could not connect to the ET/SMB-1000\n");
ET_INT(ETUnLink());
if (iRsp<0)
  printf("Could not disconnect from the ET/SMB-1000\n");
```

Multiple connect and disconnect (SmartBits/ET-1000)

```
#define MAX_ETSYSTEM  4
int iRsp, iIndex = 0;
int i;
int iPorts[MAX_ETSYSTEM] = {ETCOM1,ETCOM2,ETCOM3,ETCOM4};
for (i = 0; i < MAX_ETSYSTEM; i++)
  {                                //Link to all in list
  ET_INT(ETLink(iPorts[i]));
  if (iRsp<0)
    printf("Connect error to ET/SMB-1000 ETCOM%d\n",
           iPorts[i] + 1 );
  else
    {
    iPorts[iIndex] = iPorts[i];   //update actual ComPort
    iIndex++;                     // for this link
    }
  }
for (i = 0; i< iIndex; i++)
  {
  ETSetCurrentLink( iPorts[ i ] );
  ET_INT(ETUnLink());      //Unlink each connect
  if (iRsp<0)                    //On error,
    printf("Disconnect error from ET/SMB-1000 ETCOM%d\n",
           iPorts[ i ] + 1 );
  }
iIndex = 0;                      //no links now
```

Routines for SmartBits only

Restore all SmartCards to a known state (SmartBits)

To ensure accuracy of test results, it is important to set SmartCards to a known state before running a test. There are numerous types of SmartCards, each with different features and configurations. The reset routine you create will depend on the tests you run and the SmartCards you are working with. The routine below is an example of a *minimal* reset for Ethernet and Token Ring cards.

```
#include "et1000.h"


void ResetSmartBits()
{
int iRsp;
int iSMBPorts[MAX_HUBS][MAX_SLOTS][MAX_PORTS];
int iHub;
int iSlot;
int iPort;
HTVFDStructure htVFD;
HTTriggerStructure htTrig;
int* piData;
piData = (int*)malloc(60*sizeof(int));
memset(piData,0,60*sizeof(int));  //Zero packet content
memset(&htVFD,0,sizeof(htVFD));
memset(&htTrig,0,sizeof(htTrig));
ET_INT(HGSetGroup(NULL));
ET_INT(HTHubSlotPorts(iSMBPorts));
//Set all SmartCards found into a group
for (iHub=0;iHub<MAX_HUBS;iHub++)
for (iSlot=0;iSlot<MAX_SLOTS;iSlot++)
for (iPort=0;iPort<MAX_PORTS;iPort++)
  if (iSMBPorts[iHub][iSlot][iPort]==CT_ACTIVE)
    ET_INT(HGAddtoGroup(iHub,iSlot,iPort));
ET_INT(HGSelectTransmit(HTTRANSMIT_OFF));
ET_INT(HTSelectReceive(-1,-1,-1));
ET_INT(HGDataLength(60));         //Packet length w/o CRC
ET_INT(HGFillPattern(60,piData)); //Packet content
ET_INT(HGTransmitMode(CONTINUOUS_PACKET_MODE));
ET_INT(HGGap(96L));
ET_INT(HGAlign(0));               //Reset any errors
ET_INT(HGDribble(0));
ET_INT(HGCRC(ET_OFF));
htVFD.Configuration = HVFD_NONE;  //Reset VFDs
```

```
ET_INT(HGVFD(HVFD_1,&htVFD));
ET_INT(HGVFD(HVFD_2,&htVFD));
ET_INT(HGVFD(HVFD_3,&htVFD));
ET_INT(HGTrigger(HTTRIGGER_1,HTTRIGGER_OFF,&htTrig));
ET_INT(HGTrigger(HTTRIGGER_2,HTTRIGGER_OFF,&htTrig));
free(piData);                    //Reset triggers
ET_INT(HGSetGroup(NULL));
}
```

Send 100 packets to each of 10 MAC addresses from 1 port (SmartBits)

This routine uses two VFDs. The first, either VFD1 or VFD2, is static and is used as the source MAC address. The second, VFD3, contains ten destination MAC addresses. Ten packets are transmitted using a different destination address from VFD3 for each packet. Once each of the addresses has been used, the routine recycles to the *beginning* of VFD3 and begins the process again until all hundred packets have been transmitted.

```
#include "et1000.h"
void SmartXmt1000to10()
{
int iRsp;
HTVFDStructure htVFD;
int i,j;
int* pi;
int iDest[6] = {1,0,0,0,0,0};     //Source address
ET_INT(HTRun(HTSTOP,0,0,0));      //First, stop sending
memset(&htVFD,0,sizeof(htVFD));   //Setup VFD fields
pi = (int*)malloc(10*6*sizeof(int));
memset(pi,0,10*6*sizeof(int));
//Set source address via static HTVFD field
htVFD.Configuration = HVFD_STATIC;
htVFD.Range = 6;
htVFD.Offset = 48;     //Bit position of source address
htVFD.Data = iDest;
htVFD.DataCount = 0;
ET_INT(HTVFD(HVFD_1,&htVFD,0,0,0));
/*
Set destination addresses to:
000000000001,000000000002,000000000003,000000000004,
000000000005,000000000006,000000000007,000000000008,
000000000009,00000000000a,
*/
for (i=0;i<10;i++)                //Fill integer array
  {                               //with 10 MAC addresses
  for (j=0;j<5;j++)               //Start all at 0, last
    pi[i*5+j] = 0;                //digit increments as
  pi[i*5+5] = i+1;                // shown in comments
  }
htVFD.Configuration = HVFD_ENABLED;
htVFD.Range = 6;                  //Size of MAC address
htVFD.Offset = 0;  //Bit position of destination address
htVFD.Data = pi;
htVFD.DataCount = 10*6;
```

```
ET_INT(HTVFD(HVFD_3,&htVFD,0,0,0));
                                    //Enable the VFD3
ET_INT(HTTransmitMode(SINGLE_BURST_MODE,0,0,0));
                                    //set single burst
ET_INT(HTBurstCount(100L*10L,0,0,0));
                                    //set burst count
ET_INT(HTRun(HTRUN,0,0,0)); //Send 1000 packet (100 per port)
free(pi);
}
```

This procedure uses any previously set up error conditions, packet content (other than MAC addresses), interpacket gap, and packet length.

SmartBits - Measuring Latency

This example transmits a packet from Hub 0 - Slot 0 to Hub 0 - Slot 1. Then it measures the latency time in .1 microsecond units.

```
//////////////////////////////////////////////////////
/////////////// Latency Test using Trig and DFill  //////
//////////////////////////////////////////////////////
void LatencyFrom1To2(void)
{
#define PACKET_SIZE 60
int iRsp;

int    i, j, FillPattern[PACKET_SIZE];
HTLatencyStructure    HTLat1;
HTLatencyStructure    HTLat2;
unsigned long ulResult, ulFirstValue;
for( i=0; i<PACKET_SIZE; i++)
    FillPattern[i] = i;
ET_INT(HGSetGroup( NULL ));        // clear group

// set up one transmitter
ET_INT(HGAddtoGroup( 0, 0, 0 ));
ET_INT(HGDataLength( PACKET_SIZE ));
ET_INT(HGFillPattern( PACKET_SIZE, FillPattern ));

// set up for one packet burst
ET_INT(HGBurstCount( 1 ));
ET_INT(HGTransmitMode( SINGLE_BURST_MODE ));

// Set up latency data
HTLat1.Range   = 12; // use this many of iData array
HTLat1.Offset  = 0;  // start at this may bits
```

```
// put in reverse order so MAC addresses will be correct!
for( i=0, j=11; i<12; i++, j--)
    HTLat1.iData[j] = FillPattern[i];
memset( &HTLat2, 0 , sizeof(HTLat2) );
ET_INT(HTLatency(HT_LATENCY_RXTX,&HTLat1,0,0,0));
ET_INT(HTLatency(HT_LATENCY_RX,  &HTLat1,0,1,0));
HGStop();
HTRun(HTSTOP, 0, 1, 0);
ET_INT(HTClearPort( 0, 0, 0 ));       // clear counters
ET_INT(HTClearPort( 0, 1, 0 ));       // clear counters
HGRun(HTRUN);
do  {
    ET_INT(HTLatency(HT_LATENCY_REPORT,&HTLat1,0,1,0));
    delay(2000);
    ET_INT(HTLatency(HT_LATENCY_REPORT,&HTLat2,0,1,0));
    }while((HTLat1.ulLatency != HTLat2.ulLatency)
            && (HTLat1.ulLatency < 20000000L) );
ulFirstValue = HTLat1.ulLatency;
do  {
        ET_INT(HTLatency(HT_LATENCY_REPORT,&HTLat1,0,0,0));
    delay(2000);
    ET_INT(HTLatency(HT_LATENCY_REPORT,&HTLat2,0,0,0));
    }while((HTLat1.ulLatency != HTLat2.ulLatency)
            && (HTLat1.ulLatency < 20000000L) );
ulResult = ulFirstValue - HTLat1.ulLatency;
printf( "Port 1 latency: %lu\n", ulResult);
ET_INT(HTLatency( HT_LATENCY_OFF, &HTLat1, 0, 0, 0));
ET_INT(HTLatency( HT_LATENCY_OFF, &HTLat1, 0, 1, 0));
HGStop();
}
```

Routines for the ET-1000 only.

Restoring to a known state (ET-1000)

At power-up, the previous state of the ET1000 is restored. A battery backed NVRAM stores the last configuration used. To ensure that the ET1000 is set to a known state prior to running a test, a routine similar to the one below should be used.

```
void ResetET1000()
{
int iRsp;
CollisionStructure cs;
TriggerStructure ts;
VFDStructure* pVS;
pVS = (VFDStructure*)malloc(sizeof(VFDStructure));
memset(&cs,0,sizeof(cs));         //Zero structures used
memset(&ts,0,sizeof(ts));
memset(pVS,0,sizeof(VFDStructure));
ET_INT(ETRun(ETSTOP));
ET_INT(ETTransmitCRC(ETCRC_OFF)); //Reset CRC error state
ET_INT(ETAlignCount(0));
ET_INT(ETDribbleCount(0));
cs.Mode = COLLISION_OFF;          //Reset collision state
ET_INT(ETCollision(&cs));
ts.Range = 0x0008;
ET_INT(ETReceiveTrigger(&ts));    //Reset triggers
ET_INT(ETTransmitTrigger(&ts));
ET_INT(ETVFDParams(pVS));      //Reset VFD
ET_INT(ETVFDRun(ETVFD_DISABLE));
ET_INT(ETBurst(ETBURST_OFF,1L));  //Set burst mode off
free(pVS);
}
```

Transmit 1000 packets with minimum interpacket gap (ET-1000)

Any ETRun(ETRUN) command after this routine will still produce a burst of 1000 packets with 9.6 microsecond gap.

```
void ETBurst1000()
{
int iRsp;
ET_INT(ETSetSel(ETSELA));         //Transmit on Port A
ET_INT(ETGapScale(ETGAP_100NS))   //Use .1µ resolution
ET_INT(ETGap(90L));               //use 90 + 6 .1µsec
```

```
ET_INT(ETBurst(ETBURST_ON,1000L));
ET_INT(ETRun(ETSTEP));
ET_INT(ETRun(ETRUN));
}
```

Capturing packets (ET-1000)

Captures the burst of packets generated by ETBurst1000 above on Port B.

```
void ETCapture()
{
int iRsp;
CaptureStructure cs;
memset(&cs,0,sizeof(CaptureStructure));
cs.Offset = 0;
cs.Range = (unsigned)(1518*8);
cs.Filter = CAPTURE_ALL;
cs.Port = PORT_B;
cs.BufferMode = BUFFER_ONESHOT;
cs.TimeTag = TIME_TAG_OFF;
cs.Mode = CAPTURE_ENTIRE_PACKET;
ET_INT(ETCaptureParams(&cs));
ETBurst1000();
}
```

Routines that access ET-1000 functionality for 10Mbps SmartCards.

Although the early 10Mbps SmartCards contain most of the functionality of their forrunner, the ET-1000, there are a few additional features contained in the ET-1000. These features are:

- Control of the number of preamble bits on transmitted packets.
- A 4KB buffer available for VFD packet data versus 2KB on a SmartCard.
- A 1MB capture buffer for received data.
- Output BNC pulse and clock data
- Jitter control via the Netcom Systems JET-210 jitter simulator
- Control over collisions
- Additional counter for SQE pulses
- Additional Preamble Bits and Gap Bits counters for the last received packet

The later SmartCards contain many of these additional features, but the full ET-1000 feature set can still be accessed by the 10Mbps SmartCards. You can use functions within a routine to generate packets from the *controller* (either SmartBits or the ET-1000), passing the packets *through* the SmartCards.

The following example routines are designed to take advantage of the multi-port capability of the 10Mbs SmartCards, while utilizing the additional features residing controller.

SmartBits Collision Testing using ET-1000

To force a packet collision using the ET-1000 with 10Mbps SmartCards, the ET1000 and SmartBits are set to a known state. Then commands are sent to select the ET1000 transmit and receive functions for a particular port. After the port is set, the Collision function of the ET1000 is employed. This causes the first 100 packets that are received on the selected Hub/Slot/Port of SmartBits to collide.

```
void SMBCollide()
{
int iRsp;
CollisionStructure cs;
memset(&cs,0,sizeof(cs));
ResetET1000();                    //Reset to known states
ResetSmartBits();
ET_INT(HTSelectTransmit(HTTRANSMIT_COL,0,0,0));
                                  //Set transmit from
                                  // ET1000 PortB
ET_INT(HTSelectReceive(0,0,0));   //Set receive from
                                  // ET1000 PortB
ET_INT(ETLNM(ETLNM_OFF));                //Live Network Mode
off
```

```
//Set elements of collision structure
cs.Offset = 32+64;                //32 bits into frame
cs.Duration = 96;                 //Collide for 96 bits
cs.Count = 100;                   //Against 100 packets
cs.Mode = CORP_B;                 //Must use ET1000 PortB
ET_INT(ETCollision(&cs));         //Make it so
}
```

Chapter 5:
Original Function Summary

The table below contains a brief summary of each "Original" functions covered in the SmartLib User Guide 3.04. They are grouped by category. Although there are some new functions in this module of the SmartLib programming library, they do not incorporate the newer methods supported in the Message Functions.

For more information about each of these Original functions, consult Chapter 6 SmartLib Detailed Description.

Category	Function Name	Description
BNC	int ETBNC (int BNCid, int Config)	Defines the mode for all rear panel BNC connectors.
BNC	int ETGetBNC (int BNCid)	Retrieves the configuration of the BNC identified by BNCid
BNC	int ETGetJET210Mode (void)	Returns the current JET-210 mode.
BNC	int ETSetJET210Mode (int Mode)	Enables or disables the JET-210 mode.
Burst	int ETBurst (int Mode, long Count)	Specifies the Burst Mode and Count.
Burst	long ETGetBurstCount (void)	Returns the current Burst Count.
Burst	int ETGetBurstMode (void)	Returns the current Burst Mode.
Capture	int ETCaptureParams (CaptureStructure* CStruct)	Specifies Capture Offset, Range, Port, memory mode and run mode. All parameters must be put into CStruct before calling this function.
Capture	int ETCaptureRun()	Starts or Aborts Capturing, depending on the value of Start. Parameters must be previously set up in ETCaptureParams(...).
Capture	int ETGetCapturePacket (long PI, int* Buffer, int BufferSize)	Dumps the data from a captured packet, referenced by PI, into a memory location pointed to by Buffer. Up to Max characters are returned in Buffer. Buffer is NOT null terminated. Returns number of characters placed in Buffer.

Capture	long ETGetCapturePacketCount (void)	Returns the number of complete packets captured.
Capture	int ETGetCaptureParams (CaptureStructure* CStruct)	Returns current capture parameters in the structure pointed to by CaptureStructure.
Collision	int ETCollision (CollisionStructure* CStruct)	Determines the collision mode, offset, duration and count. All parameters are put into CStruct before calling this function.
Collision	int ETGetCollision (CollisionStructure* CStruct)	Returns the current mode of the collision.
Comm	int ETEnableBackgroundProcessing (int bFlag)	Allows enhanced responsiveness of foreground applications.
Comm	long ETGetBaud (void)	Returns the current baud rate setting.
Comm	int ETGetCurrentLink (void)	Returns the current ET ComPort.
Comm	int ETGetErrorStatus (void)	Returns the error status of the serial link.
Comm	int ETGetLinkFromIndex (int iLink)	Returns the ET ComPort associated with the specified link number in iLink.
Comm	int ETGetLinkStatus (void)	Returns 0 if remote link not established, otherwise, returns the identity of the COM port that has been successfully linked to the attached ET-1000.
Comm	int ETGetTotalLinks (void)	Returns total number of ET-1000 links.
Comm	int ETIsBackgroundProcessing (void)	Returns 1 if the Programming Library is currently executing a function.
Comm	int ETLink (int ComPort)	Establishes a communication link to an ET-1000 using the port specified in ComPort. Baud Rate automatically adjusts to the baud rate of the ET-1000.
Comm	int ETSetBaud (int Baud)	Adjusts the Baud rate of the serial link.
Comm	int ETSetCurrentLink (int ComPort)	Sets the attached ET-1000 link specified in the ComPort as the current link for ET commands in the Programming Library.

Comm	int ETSetCurrentSockLink (char* IPAddr)	Specify which SmartLib Link (SMB to PC) is the current Link. If you have multiple Links, use this command prior to sending "ET" controller-specific commands such as ETGetHardwareVersion. You do not need to used this command prior to sending *SmartCard*-specific commands.
Comm	int ETSetTimeout (unsigned TimeOutValue)	Specifies the time-out value used by the serial port in timing the response from the attached ET-1000.
Comm	int ETUnLink (void)	Unlinks the communication session with the attached ET-1000.
Comm	unsigned ETRemote (int Mode)	Sets the attached ET-1000 in the remote or manual mode.
Control	int ETGetLNM (void)	Returns the current Live Network Mode state of the attached ET-1000.
Control	int ETGetRun (void)	Returns the current run state of the attached ET-1000.
Control	int ETGetSel (void)	Returns the current Sel Setting of the attached ET-1000; A, A/B or B.
Control	int ETGetSwitch (SwitchStructure* SStruct)	Loads SStruct with the front panel switch settings.
Control	int ETLNM (int Mode)	Activates or Deactivates the Live Network Mode in the attached ET-1000.
Control	int ETLoopback (int ABPort, int Status)	Controls whether or not a port (A or B) is looped back on itself.
Control	int ETRun (int RunValue)	Sets the run state of the ET-1000.
Control	int ETSetGPSDelay (ulong ulSeconds)	Determines what the HGRun start time will be if GPS if available. Calculations are based on the estimated time to send a message to the remote hub.
Control	int ETSetSel (int SelValue)	Sets the Sel switch to A, A/B or B.
Control	int ETSetup (int Mode, int SetupId)	Stores the current setup internally in ET-1000 using the reference number in SetupId. Also used to recall setup in ET-1000 referenced by SetupId.

Counters	int ETGetCounters (CountStructure* CStruct)	Gets all counter information and loads them into the structure pointed to by CountStructure.
Counters	int ETMFCounter (int ABPort, int Mode)	Identifies the item to be counted by the Multi-Function counters. Port identifies Port A or Port B.
Counters	int ETReset (void)	Resets all counters and logic on the attached ET-1000.
Data	int ETDataLength (long Count)	Specifies the number of bytes per packet to be used in transmitting data from the ET-1000.
Data	int ETDataPattern (int Pattern)	Defines the background data pattern to transmit.
Data	long ETGetDataLength (void)	Returns the current length of transmitted data packet, in bytes.
Data	int ETGetDataPattern (void)	Returns the identity of the current background transmit data pattern.
Data/VFD	int ETGetVFDRun (void)	Returns the current run state of the VFD.
Data/VFD	int ETVFDParams (VFDStructure* VFDdata)	Sends VFD data to the ET-1000. Structure VFDdata includes a start pattern array, an increment pattern array, the offset value and the range value.
Data/VFD	int ETVFDRun (int Start)	Starts or halts VFD transmission.
Gap	int ETGap (long Count)	Specifies the gap value that is scaled by ETGapScale(...).
Gap	int ETGapScale (int TimeOfGap)	Specifies that either the 100ns gap scale or the 1µs gap scale is to be used in determining the gap time
Gap	long ETGetGap (void)	Returns the gap value currently being transmitted.
Gap	int ETGetGapScale (void)	Returns the current scale being used for the Gap.
General	int ETGetFirmwareVersion (char* Buffer)	Returns the firmware version identifier for the attached ET-1000.
General	int ETGetHardwareVersion (char* Buffer)	Returns the Hardware version identifier for the attached ET-1000.
General	int ETGetLibVersion (char* pszDescription, (char* pszVersion)	Returns the version information for the current rev of the programming library.

General	int ETGetSerialNumber (char* Buffer)	Returns the Serial Number identifier for the attached ET-1000.
General	void* ETReturnAddress (void* pVoid)	Returns the same pointer passed. This is a special function for VisualBasic.
Preamble	int ETGetPreamble (void)	Returns the current preamble count being placed in the transmit stream.
Preamble	int ETPreamble (int Count)	Specifies the preamble bit count.
TError	int ETAlignCount (int Count)	Specifies the number of alignment error bits to insert into the transmit stream.
TError	int ETDribbleCount (int Count)	Specifies the number of dribble bits to insert into the transmit stream.
TError	int ETGetAlignCount (void)	Returns the current alignment error bits being inserted into the transmit data stream.
TError	int ETGetCRCError (void)	Retrieves the current state of CRC error injection.
TError	int ETGetDribbleCount (void)	Returns the current dribble bits being inserted into the transmit data stream.
TError	int ETTransmitCRC (int Active)	Enables or disables transmission of CRC errors.
Trigger	int ETGetReceiveTrigger (TriggerStructure* RStruct)	Fills RStruct with the receive trigger parameters currently being implemented in the attached ET-1000.
Trigger	int ETGetTransmitTrigger (TriggerStructure* TStruct)	Fills TStruct with the transmit trigger parameters currently being implemented in the attached ET-1000.
Trigger	int ETReceiveTrigger (TriggerStructure* RStruct)	Sends the receive trigger parameters to the ET-1000. All trigger information is contained in RStruct.
Trigger	int ETTransmitTrigger (TriggerStructure* TStruct)	Sends the transmit trigger parameters to the ET-1000. All trigger information is contained in TStruct.
SmartBits	int HGAlign(int iBits)	Creates alignment bit errors on transmission.

SmartBits	int HGBurstCount (long lVal)	Sets the amount of packets to be sent in each burst when in a burst mode.
SmartBits	int HGBurstGap (long lVal)	Sets the time gap in between each burst when in a multiburst transmit mode.
SmartBits	int HGBurstGapAndScale (long lVal, int iScale)	Sets the time gap in between each burst when in a multiburst transmit mode, according to the given scale.
SmartBits	int HGClearGroup (void)	Ungroups a number of ports that were previously grouped together with the HGSetGroup or the HGAddtoGroup command.
SmartBits	int HGClearPort (void)	Clears the counters.
SmartBits	int HGCollisionBackoffAggressivenes s (unsigned int uiAggressiveness)	Sets a flag to determine the upper bound for the delay during multiple collisions. This value is a power of 2 of the uiAggressiveness factor.
SmartBits	int HGCRC (int iMode)	Creates CRC errors on transmission.
SmartBits	int HGDataLength (int iLength)	Determines the packet data length on each transmitted packet. Also can be used to produce random data length packets.
SmartBits	int HGDribble (int iBits)	Creates dribbling bit errors on transmission.
SmartBits	int HGFillPattern (int iSize, int* piData)	Defines the fill pattern to be transmitted in the data field of each packet.
SmartBits	int HGDuplexMode (int iMode)	Sets the Duplex Mode of the current group
SmartBits	int HGGap (long lPeriod)	Determines the gap period between transmitted packets on each port of a group of SmartBits ports, and automatically adjusts the gap period to match the hub card being addressed. Also can be used to produce random gap periods.
SmartBits	int HGGapAndScale (long lPeriod, int iScale)	Determines the gap period between transmitted packets on each port of a group of SmartBits ports using the user specified scale. Also can be used to produce random gap periods.

SmartBits	int HGGetCounters (HTCountStructure htCount)	Retrieves counter information from the cards in the current group.
SmartBits	int HGMultiBurst (long lVal)	Sets the amount of bursts to send when in a multiburst transmit mode.
SmartBits	int HGRun (int Mode)	Sets the run mode for each port of a group of SmartCards.
SmartBits	int HGStart (void)	Used to start transmission on a group of SmartBits ports.
SmartBits	int HGStep (void)	Used to send a single packet on each port of a group of SmartBits ports.
SmartBits	int HGStop (void)	Used to stop transmission on each port of a group of SmartBits ports.
SmartBits	int HGTransmitMode (int iMode)	Sets up to send packets in the transmit mode selected.
SmartBits	int HGTrigger (int TrigId, int Config, TriggerStructure* ptsInfo)	Sets up the trigger pattern and mode on each port of a group of SmartBits ports.
SmartBits	int HGVFD (int VFDId, HTVFDStructure* phtvfdInfo)	Sets up the VFD data and operating state on each port of a group of SmartBits ports.
SmartBits	int HGSelectTransmit (int Mode)	Selects the mode for the ET-1000's Port B to transmit using the current group. This command can be used on both SmartCards and Passive Hub Cards.
SmartBits	int HTBurstCount (long lVal, int iHub, int iSlot, int iPort)	Sets the amount of packets to be sent in each burst when in a burst mode.
SmartBits	int HTBurstGap (long lVal, int iHub, int iSlot, int iPort)	Sets the time gap in between each burst when in a multiburst transmit mode.
SmartBits	int HTBurstGapAndScale (long lVal, int iScale, int iHub, int iSlot, int iPort)	Sets the time gap in between each burst when in a multiburst transmit mode, according to the given scale.

SmartBits	int HTTransmitMode (int iMode, int iHub, int iSlot, int iPort)	Sets up to send packets in the transmit mode selected.
SmartBits	int HTDuplexMode (int iMode, int iHub, int iSlot, int iPort)	Sets the Duplex Mode of the selected port
SmartBits Group	int HGAddtoGroup (int iHub, int iSlot, int iPort)	Along with HGSetGroup, this command can be used to add individual hub/slot/port cards to a group.
SmartBits Group	int HGGetGroupCount (void)	Returns the number of ports currently in the configured group.
SmartBits Group	int HGIsPortInGroup (int iPortId)	Used to check if an individual port is currently in the configured group.
SmartBits Group	int HGIsHubSlotPortInGroup (int iHub, int iSlot, int iPort)	Used to check if an individual hub/slot/port is in the currently configured group.
SmartBits Group	int HGRemoveFromGroup (int iHub, int iSlot, int iPort)	Used to remove an individual hub/slot/port cards from a currently configured group.
SmartBits Group	int HGRemovePortIdFromGroup (int iPortId)	Used to remove an individual iPortId from a currently configured group.
SmartBits Group	int HGSetGroup (char* PortIdGroup)	Used to set group ports on a SmartBits for purposes of concurrently configuring, starting, stopping, and stepping the transmission of packets from several ports.
SmartBits Group	int HGSetGroupType (int Index, int *PortIdList)	Used to set group ports on a SmartBits by card type for purposes of concurrently configuring, starting, stopping, and stepping the transmission of packets from several ports.
SmartCard	int HTAlign (int iBits, int iHub, int iSlot, int iPort)	Creates alignment errors on transmission.

SmartCard	int HTClearPort (int iHub, int iSlot, int iPort)	Clears the counters.
SmartCard	int HTCollisionBackoffAggressivenes s (unsigned int uiAggressiveness, int iHub, int iSlot, int iPort)	Sets a flag to determine the upper bound for the delay during multiple collisions. This value is a power of 2 of the uiAggressiveness factor.
SmartCard	int HTCRC (int iMode, int iHub, int iSlot, int iPort)	Creates CRC errors on transmission.
SmartCard	int HTDataLength (int iLength, int iHub, int iSlot, int iPort)	Determines the packet data length on each transmitted packet. This command can also be used to produce random data length packets.
SmartCard	int HTDribble (int iBits, int iHub, int iSlot, int iPort)	Creates dribbling bit errors on transmission.
SmartCard	int HTFillPattern (int iSize, int* piData, int iHub, int iSlot, int iPort)	Defines the fill pattern to be transmitted in the data field of each packet.
SmartCard	long HTFrame (long iFrameID, int iHub, int iSlot, int iPort, unsigned short uiStreamIndex)	Puts specified frame elements into the SmartCard frame buffer.
SmartCard	int HTGap (long lPeriod, int iHub, int iSlot, int iPort)	Determines the gap period between transmitted packets, and automatically adjusts the gap period to match the hub card being addressed. Also can be used to produce random gap periods.
SmartCard	int HTGapAndScale (long lPeriod, int iScale, int iHub, int iSlot, int iPort)	Sets the gap period between transmitted packets based on the desired scale. Also can be used to produce random gap periods.

SmartCard	int HTGetCounters (HTCountStructure* htCount, int iHub, int iSlot, int iPort)	Retrieves counter information from a SmartCard.
SmartCard	int HTGetHWVersion (unsigned long* pulVersion, int iHub, int iSlot, int iPort)	Retrieves Card specific version information from a SmartCard.
SmartCard	int HTGroupStart (int iHub)	Used to simultaneously start transmission in a group of ports of a single SmartBits.
SmartCard	int HTGroupStep (int iHub)	Used to simultaneously send individual packets in a group of ports of a single SmartBits.
SmartCard	int HTGroupStop (int iHub)	Used to simultaneously stop transmission in a group of ports of a single SmartBits.
SmartCard	int HTHubId (char PortTypes[MAX_HUBS][MAX_SLOTS][MAX_PORTS])	Fills an array with the currently connected port types with internal character code.
SmartCard	int HTHubSlotPorts (int iPortTypes[MAX_HUBS][MAX_SLOTS][MAX_PORTS])	Fills an array with the currently connected port types.
SmartCard	int HTLatency (HTLatencyStructure* pHTLat, int iHub, int iSlot, int iPort)	Used to run latency tests on ports in a SmartBits. The HTLatencyStructure data structure contains all information necessary to run the test, results are returned in the ulResults value when checking for latency reports.
SmartCard	int HTLayer3SetAddress (Layer3Address* pLayer3Address, int iHub, int iSlot, int iPort)	Configures the card to send/receive background traffic such as PING, SNMP, etc. This command is not used to set up regular L3 test streams.
SmartCard	int HTMultiBurst (long lVal, int iHub, int iSlot, int iPort)	Sets the amount of bursts to send when in a multiburst transmit mode.
SmartCard	int HTPortProperty (unsigned long* pulProp, int iHub, int iSlot, int iPort)	Identifies the properties of the port at the specified Hub/Slot/Port.

SmartCard	int HTPortType (int iHub, int iSlot, int iPort)	Identifies the card type at the specified Hub/Slot/Port.
SmartCard	int HTRun (int iMode, int iHub, int iSlot, int iPort)	Sets up the run mode.
SmartCard	int HTSelectReceive (int iHub, int iSlot, int iPort)	Selects a single receive port on the SmartBits which is to be routed to the ET-1000's Port B for analysis. Only one port can be selected at a time. This command can be used on both SmartCards and Passive Hub cards.
SmartCard	int HTSelectTransmit (int iMode, int iHub, int iSlot, int iPort)	Selects a port on the SmartBits(s) which is to transmit the ET-1000's Port B signals. This command can be used on both SmartCards and Passive Hub Cards.
SmartCard	int HTSendCommand (int iState)	Causes SmartCard commands to be deferred or executed, according to the State input.
SmartCard	int HTSeparateHubCommands (int iFlag)	Determines how commands are synchronized across multiple hubs, including whether GPS is used or not. Used in conjunction with HGRun, HGStart, HGStop, HGStep, HTSendCommand.
SmartCard	int HTTrigger (int TrigId, int Config, TriggerStructure* ptsInfo, int iHub, int iSlot, int iPort)	Sets up the trigger pattern and mode.
SmartCard	long NSCreateFrame (FrameSpec_Type* framespec)	Automates and simplifies creation of frames with the use of the structure: Framespec.
SmartCard	long NSCreateFrameAndPayload (FrameSpec_Type* framespec, int iPayloadSize, unsigned char* pucPayload)	Uses a single function for simplified creation of frame with a customized payload (fill pattern).

SmartCard	long NSDeleteFrame (long lFrameID)	Deletes single frame prototype specified by the frame ID. Use in conjunction with NSCreateFrame or NSCreateFrameAndPayload.
SmartCard	long NSModifyFrame (long lFrameID, int iIdentifier, unsigned char* pucBytes, int iNumBytes)	Modifies frame components without the need for byte offset. Modifications based on a created frame prototype. A large list of values is defined for iIdentifier parameter.
SmartCard	long NSSetPayLoad (long lFrameID, int iSize, unsigned char* pucPayload)	Used in conjunction with NSCreateFrame; this function configures the customized payload (background pattern).
VG SmartCard	int HTSetVGProperty (VGCardPropertyStructure * pVGPStructure, int iHub, int iSlot, int iPort)	Configures End/Master node, priority mode, and Ethernet/TokenRing operation parameters for the VG SmartCard. VGCardPropertyStructure contains setup information,
VG SmartCard	int HGSetVGProperty (VGCardPropertyStructure * pVGPStructure)	Sets up VG property information of a group of VG SmartCards.
SmartCard 100 Mbps	int HGCollision (CollisionStructure* pCS)	Determines the collision mode, and count. All parameters are put into pCS before calling this function.
SmartCard 100 Mbps	int HGSymbol (int iMode)	Generates invalid waveform data pattern.
SmartCard 100 Mbps	int HTCollision (CollisionStructure* pCS, int iHub, int iSlot, int iPort)	Determines the collision mode, and count. All parameters are put into pCS before calling this function.
SmartCard 100 Mb	int HTFindMIIAddress (unsigned int* puiAddress, unsigned short* puiControlBits, int iHub, int iSlot, int iPort)	Finds the first MII Address on a FastCard transceiver, and fills in the Address and the control register values found.
SmartCard 100 Mb	int HTReadMII (unsigned int uiAddress, unsigned int uiRegister, unsigned short* puiBits, int iHub, int iSlot, int iPort)	Reads a specific MII Address/Register

SmartCard 100 Mbps	int HTSymbol (int iMode, int iHub, int iSlot, int iPort)	Generates invalid waveform data pattern.
TCL	int ETMake2DArray (char* pszArrayName, int iSizeFirstDim, int iSizeSecondDim)	This function creates a virtual 2 dimensional array with the TCL programming language.
TCL	int ETMake3DArray (char* pszArrayName, int iSizeFirstDim, int iSizeSecondDim, int iSizeThirdDim)	This function creates a virtual 3 dimensional array with the TCL programming language.
TokenRing SmartCard	int HGGetEnhancedCounters (EnhancedCounterStructure* pEnCounter)	Retrieves standard counters information and card related counter information from the cards in the current group.
TokenRing SmartCard	int HGSetTokenRingAdvancedContr ol (TokenRingAdvancedStructure* pTRAdvancedStructure)	Configures frames to explore ring operation for a group of TokenRing SmartCards.
TokenRing SmartCard	int HGSetTokenRingErrors (int ErrorTrafficRatio, int iTRErrors)	Configures frames to include errors for a group of TokenRing SmartCards.
TokenRing SmartCard	int HGSetTokenRingLLC (TokenRingLLCStructure* pTRLStructure)	Transmit LLC frames for a group of TokenRing SmartCards. TokenRingLLCStructure data structure contains information to setup LLC frame.
TokenRing SmartCard	int HGSetTokenRingMAC (TokenRingMACStructure* pTRMStructure)	Sets up MAC header for a group of TokenRing SmartCards. TokenRingMACStructure data structure contains information to configure MAC frame.
TokenRing SmartCard	int HGSetTokenRingProperty (TokenRingPropertyStructure* pTRPStructure)	Configures speed, early token release, duplex selection and port/station ring operation mode for a group of TokenRing SmartCards. TokenRingProperty data structure contains setup information.
TokenRing SmartCard	int HGSetTokenRingSrcRouteAddr (int UseSRA, int* piData)	Sets up source route address for a group of TokenRing SmartCards. piData parameter contains source route address.

TokenRing SmartCard	int HTGetEnhancedCounters (EnhancedCounterStructure* pEnCounter, int iHub, int iSlot, int iPort)	Retrieves standard counter and card related counter information from the cards.
TokenRing SmartCard	int HTGetEnhancedStatus (int* piData, int iHub, int iSlot, int iPort)	Retrieves status information from the cards.
TokenRing SmartCard	int HTSetTokenRingAdvancedControl (TokenRingAdvancedStructure* pTRAdvancedStructure, int iHub, int iSlot, int iPort)	Configures frames to explore ring operation for the TokenRing SmartCard.
TokenRing SmartCard	int HTSetTokenRingErrors (int ErrorTrafficRatio, int iTRErrors, int iHub, int iSlot, int iPort)	Configures frames to include errors for the TokenRing SmartCard.
TokenRing SmartCard	int HTSetTokenRingLLC (TokenRingLLCStructure* pTRLStructure, int iHub, int iSlot, int iPort)	Transmit LLC frames for the TokenRing SmartCard. TokenRingLLCStructure data structure contains information to setup LLC frame.
TokenRing SmartCard	int HTSetTokenRingMAC (TokenRingMACStructure* pTRMStructure, int iHub, int iSlot, int iPort)	Sets up MAC header for the TokenRing SmartCard. TokenRingMACStructure data structure contains information to configure MAC frame.
TokenRing SmartCard	int HTSetTokenRingProperty (TokenRingPropertyStructure* pTRPStructure, int iHub, int iSlot, int iPort)	Configures speed, early token release, duplex selection and port/station ring operation mode for the TokenRing SmartCard. TokenRingProperty data structure contains setup information.
TokenRing SmartCard	int HTSetTokenRingSrcRouteAddr (int UseSRA, int* piData, int iHub, int iSlot, int iPort)	Sets up source route address for the TokenRing SmartCard. piData parameter contains source route address.

Chapter 6:
Data Structures

This chapter contains detailed information about a group of structures in the SmartLib programming library. These structures are used in conjunction with specific commands documented in. They can be used with all Ethernet SmartCards as well as with Token Ring SmartCards.

The structures that are *not* contained in this chapter are structures used by the SetStructure and the GetStructure commands. This second group of structures is documented in *Message Functions* manual of this Software Development Kit.

Usage

Some data structures require additional memory allocation.

In most cases, define the structure at the beginning of your function. For example:

```
int SetETCollision(void)
  {
  CollisionStructure Collide;     //Collision structure
  Collide.Offset = 0x20;
  Collide.Duration = 0x36;
  Collide.Count = 14486;
  Collide.Mode = CORP_A;
  ETCollision(&Collide);   //Set it so
  }
```

Some library functions will automatically put information into the structures you declare. In these cases, declare the functions and then call the appropriate library routine. For example:

```
int GetETCollision(void)
  {
  CollisionStructure Collide;     //defines a structure
  ETGetCollision(&Collide);       //which the library fills
  printf("Collision Offset is:   %d\n",Collide.Offset);
  printf("Collision Duration is: %d\n",Collide.Duration);
  }
```

Some library functions require you to put information into the declared data structures before calling them. If this is not done, the library might produce unpredictable results. For example:

```
int BadSetETCollision(void)
  {
  CollisionStructure Collide;     //defines a structure, but
       //contents unspecified
  ETCollision(&Collide);   //call with unintended
       //results
  }
```

CaptureStructure

unsigned **Offset**

Integer value specifying the offset (in bit times) from the first bit after the preamble. Ranges from 0 to 65535 (0x0000 to 0xFFFF). This value is returned as 0 in ETGetCaptureParams if **Mode** is CAPTURE_ENTIRE_PACKET.

unsigned **Range**

Integer value specifying the number of bits to capture within each packet, once the capture criteria have been met. Ranges from 0 to 65535 (0x0000 to 0xFFFF). If Range is larger than the packet size, then capturing on that packet is halted at the end of the packet. This value is returned as 0 in ETGetCaptureParams if **Mode** is CAPTURE_ENTIRE_PACKET.

int **Filter**

Specifies the type of data to capture and filter. The Filter type can be any one or a combination of the following. To get a combination, create an integer by "OR-ing" together criteria from the list. Remember that the range and offset values still apply. Thus when "All Data" is selected, only that data that satisfies the range and offset criteria is actually captured and stored.

CAPTURE_NONE	None (off)
CAPTURE_ANY	Any data on the line
CAPTURE_NOT_GOOD	Non standard Ethernet packets
CAPTURE_GOOD	Packets without error
CAPTURE_ERRS_RXTRIG	Packets with any following errors (same as previous version's "All Data")
CAPTURE_RXTRIG	Specified by Receive Trigger
CAPTURE_CRC	CRC erred packets
CAPTURE_ALIGN	Alignment erred packets
CAPTURE_OVERSIZE	Oversize packets
CAPTURE_UNDERSIZE	Undersize packets
CAPTURE_COLLISION	Collision packets

int **Port**

Identifies the port used in capturing data:

PORT_A	Port A
PORT_B	Port B

int **BufferMode**

Specifies how the capture buffer is to be used:

BUFFER_CONTINUOUS	Continuous capture; when the capture buffer fills up, it continues capturing data, which overwrites the previously captured data.
BUFFER_ONESHOT	One-shot; when the capture buffer fills up, capturing is stopped.

int **TimeTag**

This Value must always be off to get valid capture data. [Use of TIME_TAG_ON will result in unpredictable results]:

TIME_TAG_OFF	Time tagging is disabled

int **Mode**

Determines the capture mode:

CAPTURE_ENTIRE_PACKET	Capture all data
CAPTURE_RANGE	Capture only the portions of packets specified by Range and Offset
CAPTURE_OFF	Off (no capture)

CollisionStructure

unsigned **Offset**

Specifies the offset, in bits, starting from the first bit of the preamble where the collision is to take place. This value is only used when the Collision **Mode** is COLLISION_ADJ, CORP_A or CORP_B. It is ignored when the Collision **Mode** is COLLISION_LONG. Ranges from 0 to 65535 (0x0000 to 0xFFFF). Note that the **Offset** value entered here also pertains to the collisions produced on the SmartBits when it is attached to the ET-1000.

unsigned **Duration**

Specifies the duration in bits that the collision is to be asserted. This value is only used when the Collision **Mode** is COLLISION_ADJ, CORP_A or CORP_B. It is ignored when the Collision **Mode** is COLLISION_LONG. Ranges from 1 to 65535 (0x0000 to 0xFFFF). A duration of 0 is invalid. Note that the **Duration** value entered here also pertains to the collisions produced on the SmartBits when it is attached to the ET-1000.

int **Count**

Specifies the number of consecutive collisions to produce (one in each packet) before the collision goes inactive. This number is limited to the range 0 to 1024. A count of 0 essentially disables the collision counting mechanism, thus producing continuous collisions of the specified type.

int **Mode**

Specifies the collision mode:

COLLISION_OFF	Collision Off
COLLISION_LONG	Long Collision
COLLISION_ADJ	Adjustable Collision (on transmission)
CORP_A	Collision on receive packet, Port A
CORP_B	Collision on receive packet, Port B

CountStructure

unsigned long **ERAEvent**	Event count for CRC errors on Port A
unsigned long **ERARate**	Rate count for CRC errors on Port A
unsigned long **ERBEvent**	Event count for CRC errors on Port B
unsigned long **ERBRate**	Rate count for CRC errors on Port B
unsigned long **TXAEvent**	Event count for transmitted bits on Port A
unsigned long **TXARate**	Rate count for transmitted bits on Port A
unsigned long **TXBEvent**	Event count for transmitted bits on Port B
unsigned long **TXBRate**	Rate count for transmitted bits on Port B
unsigned long **RXAEvent**	Event count for received bits on Port A
unsigned long **RXARate**	Rate count for received bits on Port A
unsigned long **RXBEvent**	Event count for received bits on Port B
unsigned long **RXBRate**	Rate count for received bits on Port B
unsigned long **CXAEvent**	Event count for collisions on Port A
unsigned long **CXARate**	Rate count for collisions on Port A
unsigned long **CXBEvent**	Event count for collision on Port B
unsigned long **CXBRate**	Rate count for collisions on Port B
unsigned long **ALAEvent**	Event count for alignment errors Port A
unsigned long **ALARate**	Rate count for alignment errors Port A
unsigned long **ALBEvent**	Event count for alignment errors Port B
unsigned long **ALBRate**	Rate count for alignment errors Port B
unsigned long **UPAEvent**	Event count for undersize pkts Port A
unsigned long **UPARate**	Rate count for undersize pkts Port A
unsigned long **UPBEvent**	Event count for undersize pkts Port B
unsigned long **UPBRate**	Rate count for undersize pkts Port B
unsigned long **OPAEvent**	Event count for oversize pkts Port A
unsigned long **OPARate**	Rate count for oversize pkts Port A
unsigned long **OPBEvent**	Event count for oversize pkts Port B
unsigned long **OPBRate**	Rate count for oversize pkts Port B
unsigned long **MFAEvent**	Event Multi-Function Count, Port A
unsigned long **MFARate**	Rate Multi-Function Count, Port A
unsigned long **MFBEvent**	Event Multi-Function Count, Port B
unsigned long **MFBRate**	Rate Multi-Function Count, Port B

EnhancedCounterStructure

int iMode

Counter mode control

```
0 Set to Count
1 Set to Rate
```

int **iPortType**

Card type is returned in this member variable

```
CT_ACTIVE           10Mb Ethernet
CT_FASTX            10/100Mb Ethernet
CT_TOKENRING        4/16Mb TokenRing
CT_VG               VG/AnyLan
```

unsigned long **ulMask1**

Bit mask for the Standard counters. The Standard counter type can be any one, (or a combination calculated by performing a bitwise "or") of the applicable constants below:

```
SMB_STD_TXFRAMES     Transmitted Packets
SMB_STD_TXBYTES      Transmitted Bytes
SMB_STD_TXTRIGGER    Transmitted Trigger Packets
SMB_STD_RXFRAMES     Received Packets
SMB_STD_RXBYTES      Received Bytes
SMB_STD_RXTRIGGER    Received Trigger Packets
SMB_STD_ERR_CRC      Checksum Packets
SMB_STD_ERR_ALIGN    Alignment Packets
SMB_STD_ERR_UNDERSIZE   Undersized Packets
SMB_STD_ERR_OVERSIZE Oversized Packets
SMB_STD_ERR_COLLISION   Collision Packets
                     (Get a combination of the above by "OR-
                     ing" together criteria from the above
                     list.)
```

For Example:

```
EnhancedCounterStructure ECSTx;
int iErr = 0;

memset(&ECSTx, 0, sizeof(ECSTx));

ECSTx.ulMask2 = L3_ARP_REQ + L3_ARP_REPLIES;

iErr = HTGetEnhancedCounters(&ECSTx, TxHub, TxSlot, TxPort);
printf (msg, "ECSTx  Arp Requests:  %u\n", CSTx.ulData[39]);
printf (msg, "ECSTx  Arp Replies:   %u\n", CSTx.ulData[41]);
```

unsigned long **ulMask2**

Bit mask for the Additional counters on some of the SmartCards. The Additional counter type can be any one (or a combination calculated by performing a bitwise "or") of the applicable constants below:

TR_MASK	Allowable possible bits.

The following are recognized in ulMask2 for the Token Ring SmartCard:

TR_LATENCY	Latency time in 100ns counts
TR_TOKEN_RT	Rotation time in microseconds. Counters indicated by TR_MAC are derived from Ring Error Monitor MAC frames, others are from direct counts. Consult the TR architectural specification for the definition of these counts.
TR_RXMAC	Received MAC frames. Mac frames are used to manage a ring.
TR_RXABORTFRAMES	Abort Frames. These frames end with an "Abort Delimiter" rather than the normal "End Delimiter." These are frames that the transmitter stopped sending before they were complete.
TR_LINEERRORS	Line errors counter. Line errors occur when the line ceases to have signal for a designated length of time. Typically this is caused by an unplugged wire.
TR_BURSTERRORS	Burst errors counter. Burst Errors are when the line is disconnected for a short time, typically less than 5 bit times.
TR_BADTOKEN	Corrupted tokens. Bad Tokens are when there is garbage instead of tokens (which look like small frames).
TR_PURGEEVENTS	Purge MAC frames detected. The presence of "Purge" MAC frames occurs just before the ring starts working normally.
TR_BEACONEVENTS	Beacon MAC frames detected. Beacons are MAC frames used to determine if the ring is complete. Stations send them if they can't establish a ring.
TR_CLAIMEVENTS	Claim MAC frames detected. Claims are MAC frames used to let stations bid to throw and monitor the token.
TR_INSERTIONS	Request initializations. Request Initialization frames are MAC frames sent as a station joins the ring. They can be used to indicate how often stations join the ring. The MAC type error counts below are taken from "Ring Error Monitor" reporting frames. Stations keep track of errors Internally. Periodically, (or when the counters overflow), they report

the errors to the "Ring Error Monitor." For your convenience, SmartLib tracks these errors. This information, however, will not be as complete at that from a program such as "LAN Manager."

For definitions of the errors below, see the "Architectural Reference" or standards documents.

TR_MAC_LINEERRORS	Isolating line errors.
TR_MAC_INTERNALERRORS	Internal errors.
TR_MAC_BURSTERRORS	Burst errors
TR_MAC_ACERRORS	AMP detects circulating frame
TR_MAC_ABORTTX	Abort delimiter detected
TR_MAC_LOSTFRAME	Incompletely stripped frame
TR_MAC_RXCONGESTED	Receiver congestion
TR_MAC_FRAMECOPIED	Possible duplicate address
TR_MAC_FREQUENCYERROR	Excessive jitter detected
TR_MAC_TOKENERROR	Circulating frames
SMB_VG_MASK	Allowable possible bits

The following are recognized in ulMask2 for the VG SmartCard:

SMB_VG_INV_PKTMARK	Invalid packet marker errors
SMB_VG_ERR_PKT	Errored packets received
SMB_VG_TRANSTRAIN_PKT	Transition into training
SMB_VG_PRIO_PROM_PKT	Priority promoted packets received or transmitted
L3_MASK	Allowable possible bits

The following are used in ulMask2 for Layer 3 SmartCards.

L3_FRAMEERROR	Framing errors. Framing Errors, caused by dribbling, occur when the total number of bits received by the card is not a multiple of 8. On a 10 Mbps card, 1 to 7 additional bits are possible. On a 100 Mbps card, the error is off by 4 bits.
L3_TX_RETRIES	Number of transmit collisions/retries
L3_TX_EXCESSIVE	Number of times a frame needed more than 16 retries. (This is only available for L3-6705 and L3-6710.)
L3_TX_LATE	Number of collisions that occurred more than 64 bytes into a frame. (This is only available for L3-6705 and L3-6710.)
L3_RX_TAGS	Number of number of received frames that have "signature" fields
L3_TX_STACK	Number of frames transmitted from the SmartCard's local stack
L3_RX_STACK	Number of Number of frames received by the SmartCard's local stack
L3_ARP_REQ	Number of ARP request frames originating on the SmartCard
L3_ARP_SEND	Number of ARP reply frames originating on the SmartCard
L3_ARP_REPLIES	Number of ARP request frames received by the SmartCard
L3_PINGREP_SENT	Number of ICMP Ping reply frames sent by the SmartCard
L3_PINGREQ_SENT	Number of ICMP Ping request frames sent by the SmartCard
L3_PINGREQ_RECV	Number of ICMP Ping request frames received by the SmartCard

unsigned long **ulData[64]**

Array of counters returned. ulMask1 and ulMask2 are bit masks that identify the 64 possible counters, with bit 0 of ulMask1 corresponding to ulData[0], bit 1 of ulMask1 corresponding to ulData[1], bit 0 of ulMask2 corresponding to ulData[32] and so on.

FrameSpec

This structure is used in conjunction with NSCreateFrame and NSCreateFrameAndPayload.

---

int **Encap**

The type of frame encapsulation used. In addition to iEncap, this information determines the value of the iSize variable.

ENCAP_ETHERNET	
ENCAP_ATM_PVC	
ENCAP_ATM_SVC_SNAP	
ENCAP_ATM_SVC_LANE802_3	
ENCAP_ATM_SVC_LANE802_5	
ENCAP_ATM_SVC_CLASSICAL_IP	
ENCAP_TOKEN_RING	
ENCAP_BRIDGE_FR	Frame Relay
ENCAP_ROUTE_FR	Frame Relay

---

int **iSize**

Specifies the size of the frame prototype being created. The maximum size is 2K bytes. Set the frame size to be large enough to contain the encapsulation information and protocol header. Any extra space left over will be filled by the iPattern value.

CRC and Preamble are not included in this frame size.

An example size for a frame is:

(Encapsulation w/ 2 bytes for protocol added once protocol is selected) + (protocol) +(optional payload bytes)

---

int **iProtocol**

Specifies what type of protocol header is used. In addition to iEncap, this information determines the value of the iSize variable.

FRAME_PROTOCOL_NULL	No protocol header used. The background-fill pattern pads the frame after the encapsulation bytes.
FRAME_PROTOCOL_IP	
FRAME_PROTOCOL_UDP	
FRAME_PROTOCOL_TCP	
FRAME_PROTOCOL_ARP	
FRAME_PROTOCOL_RARP	
FRAME_PROTOCOL_IPX	
FRAME_PROTOCOL_ICMP	

---

int **iPattern**

The background fill pattern that is added to the frame once the encapsulation bits and the protocol bits have been set. How many bits of pattern are added to the frame is determined by how much of the iSize is used up by the encap and protocol bits.

PAT_0000	Fills extra frame space with 0000000
PAT_1111	Fills extra frame space with 1111111
PAT_AAAA	Fills extra frame space with AAAAA
PAT_5555	Fills extra frame space with 5555555
PAT_F0F0	Fills extra frame space with F0F0F0F
PAT_0F0F	Fills extra frame space with 0F0F0F0F
PAT_FF00	Fills extra frame space with FF00FF00
PAT_00FF	Fills extra frame space with 00FF00FF
PAT_FFFF	Fills extra frame space with FFFFFFF
PAT_INCB	First byte is 0x 00. The value of each byte after, increments by 1 and wraps at 0x FF.
PAT_INCW	First word is 0x 0000. The value of each word after, increments by 1 and wraps at 0x FFFF.
PAT_DECB	First byte is 0x FF. The value of each byte after, decrements by 1 and wraps at 0x FF.
PAT_DECW	First word is 0x FFFF. The value of each word after, decrements by 1 and wraps at 0x 0000.
PAT_CUST	Custom - No pattern is defined, so use NSSetPayload to add a custom pattern, or use NSCreateFrameAndPayload.
PAT_RAND	Randomly generates fill pattern.

HTCountStructure

unsigned long **RcvPkt**	Current number of packets received
unsigned long **TmtPkt**	Current number of packets transmitted
unsigned long **Collision**	Current number of collisions
unsigned long **RcvTrig**	Current number of Trigger received
unsigned long **RcvByte**	Current number of Bytes received
unsigned long **CRC**	Current number of CRC errors received
unsigned long **Align**	Current number of Alignment errors detected
unsigned long **Oversize**	Current number of Oversize errors detected
unsigned long **Undersize**	Current number of Undersize errors detected
unsigned long **RcvPktRate**	Number of received packets per second
unsigned long **TmtPktRate**	Number of transmitted packets per second
unsigned long **CRCRate**	Number of CRC errors received per second
unsigned long **OversizeRate**	Number of Oversize errors received per second
unsigned long **UndersizeRate**	Number of Undersize errors received per second
unsigned long **CollisionRate**	Number of Collisions detected per second
unsigned long **AlignRate**	Number of Alignment errors received per second
unsigned long **RcvTrigRate**	Number of triggers received per second
unsigned long **RcvByteRate**	Number of bytes received per second

HTLatencyStructure

int **Range**

This is the size of the iData array to use, in bytes.

int **Offset**

Offset in bits for the first bit of the iData trigger from the first bit of the transmitted packet.

int **iData[12]**

The actual data that will stop the latency counter.

unsigned long **ulLatency**

Receives the latency value when using HT_LATENCY_REPORT. See function HTLatency for more details.

HTTriggerStructure

unsigned **Offset**	Specifies the number of bit times that pass between the first non-preamble bit and when the trigger word is searched for in the data stream. Ranges from 0 to 65535 (0x0000 to 0xFFFF), where 0 matches the first bit after the preamble.
int **Range**	Specifies the size of the trigger word, in bytes. Ranges from 1 to 6.
int **Pattern**[6]	Array of bytes containing the trigger word. Pattern[0] is the LSByte, Pattern[5] is the MSByte. For triggers 1 & 2, enter the data pattern array *in reverse order*.

HTVFDStructure

int **Configuration**

Determines the capabilities of the VFD being implemented. Select the constant that applies.

Configurations specific to VFD1 and VFD2 are:

HVFD_NONE	VFD off
HVFD_RANDOM	Random pattern
HVFD_INCR	Incrementing pattern
HVFD_DECR	Decrementing pattern
HVFD_STATIC	Static pattern

Configuration options for VFD3 are:

HVFD_NONE	VFD3 off
HVFD_ENABLED	VFD3 on

NOTE: VFD3 operates differently from 1 and 2. It is a large buffer that can be used in segments to create more complex patterns than increment or decrement.

---

int **Range**

Determines the length of the VFD field that will be laid into the frame.

For VFD1 and VFD2:
To specify the length in units of *bytes*, use a positive integer from 1 to 6.

To specify the length in units of *bits*, use a negative integer from -1 to -48. The minus symbol flags the library that the number represents bits instead of bytes. Since 100MB Ethernet cards send traffic in increments of four bits, a range that is not in multiples of four will be rounded up to the nearest nibble for these cards.

For VFD3:
The length of VFD3 is set in bytes. For Gigabit Ethernet cards, the bit length is from 1 to 16384. For all other SmartCards the bit length is from 1 to 2047.

---

int **Offset**

Determines the bit number in the frame where VFD is overlaid. Measurement begins immediately after the preamble. Ranges from 0 to 12,112.

For a 100MB Ethernet SmartCard, values that are not multiples of four are rounded up to the next 4 bit (nibble) increment.

---

int*** Data**

Points to an array of integers which constitute the pattern for the VFD.

NOTE: For Visual Basic, use int***iData** instead of int***Data**.

NOTE For VFD1 and VFD2 only:
Elements values are entered into the array with the most significant bit first.
For example:
iDate[0] 0
iDate[1] 1
iDate[2] 2
iDate[3] 3
iDate[4] 4
iDate[5] 5

Creates the VFD pattern: 543210

---

int **DataCount**

NOTE: This value has a *different use* for VFD1 and 2 than it does for VFD3.

For VFD1 and VFD2:
The **DataCount** is used in conjunction with **Configuration** to limit the number of patterns generated.

DataCount is the Cycle-count (number of different patterns that will be generated before being repeated). If DataCount is set to 0, Cycle-count is disabled.

Example 1:
If Configuration = HVFD_INCR
And if DataCount = 6
Results in six VFD patterns. The initial pattern is used in the first frame. The next five values increment, creating a series of five new patterns. The initial pattern is then used again, and the cycle repeats itself.

Example 2:
If Configuration = HVFD_INCR
And if DataCount = 0
The VFD increments the full value that the Range allows, and then cycles over again.

For VFD3:
The buffer size of the **Data** array. Used in combination with the **Range** to determine how often a pattern is repeated. For example, if the DataCount is 24 and the Range is 6, there will be four six byte patterns before the first is repeated.

Layer3Address

Use this structure with the HTLayer3SetAddress function to set background traffic in addition to the defined test streams (See the Message Functions manual for creation of Layer 3 streams).

unsigned char **szMACAddress[6]**	sets MAC addr of this SmartCard
unsigned char **IP[4]**	sets IP addr of this SmartCard
unsigned char **Netmask[4]**	sets Netmask for this SmartCard
unsigned char **Gateway[4]**	sets Gateway addr for this Card
unsigned char **PingTargetAddress[4]**	the addr PINGs are sent to

int **iControl**

L3_CTRL_ARP_RESPONSES	Enables Tx of ARP frames.
L3_CTRL_PING_RESPONSES	Enables Tx of PING frames.
L3_CTRL_SNMP_OR_RIP_RESPONSES	Enables Tx of SNMP/RIP frames.
	The intervals at which frames are transmitted is determined by paramaters below.

int **iPingTime**	How often (in seconds) a PING frame is transmitted. 0 = no PING frames.
int **iSNMPTime**	How often (in seconds) an SNMP frame is transmitted. 0 = no SNMP frames.
int **iRIPTime**	How often (in seconds) a RIP frame is transmitted. 0 = no RIP frames.
int **iGeneralARPResponse**	Obsolete.

SwitchStructure

unsigned long **Gap**

Current Gap Switch setting

unsigned long **Data**

Current Data Switch setting

unsigned **Disp**

Current Disp Switch setting

unsigned **Mode**

Current Mode Switch setting

int **Run**

Current Run Switch setting: Run = ETRUN when the system is in the RUN state, Run = ETSTEP when the system is in the STEP state, and Run = ETSTOP when the system is in the STOP state.

---

int **Sel**

Current Sel Switch setting: Sel = ETSELA when transmitting out Port A, Sel = ETSELB when transmitting out Port B, and Sel = ETPINGPONG when the system is in the "Ping Pong" mode.

TimeStructure

unsigned **days**

Specifies the day of the month, as read from the ET-1000's internal clock.

unsigned **hours**

Specifies the hours since midnight, as read from the ET-1000's internal clock.

unsigned **minutes**

Specifies the minutes of the current hour, as read from the ET-1000's internal clock.

unsigned **seconds**

Specifies the seconds of the current minute, as read from the ET-1000's internal clock.

unsigned **milliseconds**

Specifies the milliseconds of the current second, as read from the ET-1000's internal clock.

unsigned **microseconds**

Specifies the microseconds of the current second, as read from the ET-1000's internal clock.

TokenRingLLCStructure

int **UseLLC**

Logical Link Control (LLC)

0	No LLC added to MAC frame header.
1	Add LLC to the MAC frame header

int **DSAP**

Destination Service Access Point. Ranges from 0 to 255 (0x00 to 0xFF).

int **SSAP**

Source Service Access Point Ranges from 0 to 255 (0x00 to 0xFF).

int **LLCCommand**

Sets the type of LLC field to be added to the frame header.

0	*TEST* frame set to 'Poll'
1	*SNAP* frame (used to encapsulate an Ethernet frame from the 'type' field)

TokenRingMACStructure

int **UseMAC**

MAC header control. The MAC header consists of AC and FC bytes, followed by MAC destination and source addresses, followed by optional LLC control, followed by optional SourceRouteAddress information. AC and FC are always prepended to frame data.

0	No MAC header prepended to frame data.
1	Prepend a MAC header to the frame data.

int **Stations**

(Reserved - Must be 1 for now**)**

int **MACSrc[6]**

The Source MAC Address

int **MACDest[6]**

The Destination MAC Address

int **FramesPerToken**

The number of frames to be transmitted for each token. Range from 1 to 340 (0x01 to 0x154)

int **FrameControl**

This is the value of the *Frame Control* byte put on the front of each frame. This byte is independent of the fill pattern and any preformed header but may be overwritten by a VFD field. This byte is defined fully in the Token Ring Architectural Specification and should not be altered from the default value of 0x40 (TRFC_DEFAULT) without knowledge of the consequences. There are several other values defined in the header file:

TRFC_DEFAULT	Standard frame
TRFC_PCF_BEACON	Beacon
TRFC_ PCF_CLAIMTOKEN	Claim Token
TRFC_ PCF_RINGPURGE	Ring Purge
TRFC_ PCF_AMP	Active Monitor Present
TRFC_ PCF_SMP	Standby Monitor Present
TRFC_ PCF_DAT	Duplicate Address Test
TRFC_ PCF_RRS	Remove Ring Station

TokenRingPropertyStructure

int **SpeedSetting**

Ring speed

TR_SPEED_4MBITS	4 Mbits/Sec
TR_SPEED_16MBITS	16 Mbits/Sec

int **EarlyTokenRelease**

Allows a station to transmit a token immediately after a frame was sent. This feature only applies to a ring running at 16 Mbits/Sec

TR_TOKEN_DEFAULT	Do not allow
TR_TOKEN_EARLY_RELEASE	Allow

int **DuplexMode**

Half duplex or full duplex

TR_DUPLEX_HALF	TKP Half duplex
TR_DUPLEX_FULL	TXI Full duplex

int **DeviceOrMAUMode**

Configures the TokenRing SmartCard to be a port or a station

TR_MODE_MAU	Port
TR_MODE_DEVICE	Station

TokenRingAdvancedStructure

int **UseHoldingGap**

Token holding gap control.

1	Activate advanced gap control.
0	Do not issue advanced gap control.

int **GapValue**

Time between frames when the token is not released between frames. Range from 1 to 1,600,000, which equals the number of 100 nanosecond periods between frames. The default value is 1.

int **GapScale**

Scale value.

NANO_SCALE	Scale in nanoseconds
MICRO_SCALE	Scale in microseconds
MILLI_SCALE	Scale in milliseconds

int **UseIntermediateFrameBits**

Sets the *Intermediate* frame bit in the *EDEL* field of the frame. This bit is defined in the Token Ring Specification as being used to indicate that another frame is to follow immediately, with no token being released between the frames. (See the Token Ring Architectural Reference.)

1	Set Intermediate frame
0	Clear Intermediate frame

int **UseAC**

Activates a user-specified *Access* Control field in transmitted frames.

1 Set *AC* from *ACdata* field

0 Set *AC* from captured token

---

int **ACdata**

Access Control byte value.
NOTE - Consult the Token Ring Architectural Reference for details of bit fields in this byte. This byte is used to distinguish between tokens and frames and to operate the Token Priority Protocol. Casual setting of bits in this byte will probably cause ring errors.

---

int **AdvancedControl1**

Advanced control byte 1. This byte gives the user control over how the card connects to the ring on startup and how it responds to ring errors.

Bit 3-2: Controls connection on startup

0 No affect (previous settings in NVRAM are used)

1 Connects to the ring on startup (default)

2 Stays off the ring on startup

3 Stays off the ring on startup and allows bit 1 to control the connection.

Bit 1: Connection control

0 Deinserted

1 Inserted

Bit 0: 'Halt on Error' - stops the card from transmitting when a Beacon, Claim or Purge frame is received by the card,

0 Inactive

1 Active

---

int **AdvancedControl2**

Advanced control byte 2.

Bit 4: Internal Loopback

0 Off

1 On

Bit 3: Test Mode (this mode is used to simulate an Active Monitor when running as a Station so that the card can be used standalone to test passive Token Ring components.)

0 Off

1 On

---

unsigned long **AReserved1**

Reserved field

---

unsigned long **AReserved2**

Reserved field

TriggerStructure

unsigned **Offset**

Specifies the number of bit times that pass between the first non-preamble bit and when the trigger word is searched for in the data stream. Ranges from 0 to 65535 (0x0000 to 0xFFFF).

int **Range**

Specifies the size of the trigger word, in bits. Ranges from 1 to 96 (0x0001 to 0x0060)

int **Pattern**[12]

Array of bytes containing the trigger word. Pattern[0] is the LSByte, Pattern[11] is the MSByte. (Lower 8 bits of each element contains trigger information. The upper 8 bits are "don't cares")

VFDStructure

unsigned **Offset**

Specifies the position in the transmit data stream where VFD data begins. Measured in bit times elapsed since the final preamble bit. Ranges from 0 to 65535 (0x0000 to 0xFFFF)

unsigned **Range**

Specifies the size of the VFD word, in bytes. Ranges from 1 to 4095(0x0001 to 0xFFF)

int **Start**[4096]

Contains the VFD Start pattern. Start[0] is the LSByte, Start[4095] is the MSByte.

int **Increment**[4096]

Contains the VFD Increment (decrement) word. Increment[0] is the LSByte, Increment[4095] is the MSByte.

NOTE: Due to the large memory requirements of this structure, it is recommended that you dynamically allocate (and deallocate) memory space for it in your program. For example:

```
main()
  {
  VFDStructure *VFD;       //pointer to a VFD structure
  VFD = (VFDStructure*)malloc(sizeof(VFDStructure));
                   //allocates memory
  VFD->Range = 32;
  VFD->Offset = 8;  //for example:
                   //code to set up the data patterns
  ETVFD(VFD);       //send to ET1000/SMB-1000
  {}                // other code...
  free(VFD);        //deallocates far memory
  }
```

VGCardPropertyStructure

int **EndOrMasterNode**

Allows a **VG SmartCard** to be configured as an End node or a Master node.

```
VG_CFG_END_NODE      End Node
VG_CFG_MASTER        Master Node
```

int **PriorityPromotion**

Priority promotion

```
VG_CFG_NO_PRIO_PROMO No promotion
VG_CFG_PRIORITY_PROMO   Yes
```

int **EtherNetOrTokenRing**

Configures the VG SmartCard to be operated in Ethernet or in TokenRing

```
VG_CFG_ETHERNET      Ethernet
CG_CFG_TOKENRING     TokenRing
```

Chapter 7:
SmartLib Detailed Description

Each of the library functions is described below in detail. The functions are arranged in alphabetical order.

Functions prefixed with “ET” pertain to the ET-1000.

Functions prefixed with “HT” pertain to a single port on a SmartBits, and will require a “Hub Slot Port” designation in the parameter list.

Functions prefixed with “HG” operate on a group of SmartBits Ports as defined by the user in a string passed to the HGSetGroup(PortIdGroup) command. This group of ports can be maintained and modified through use of the following commands:

int HGAddtoGroup(iHub,iSlot,iPort),

int HGRemoveFromGroup(),

int HGRemovePortIdFromGroup(),

int HGIsPortInGroup(),

int HGIsHubSlotPortInGroup(),

int HGGetGroupCount().

See the detailed descriptions below for how to use each command.

NOTE: Some functions may require a lot of time to execute. This is particularly true of the VFD and Capture related functions when passing large amounts of data.

ETAlignCount

Description	Specifies the number of alignment error bits to insert into the transmit stream. This is used to generate alignment errors. If Count is zero, then alignment errors are not introduced into the transmit stream.
Syntax	int ETAlignCount(int Count)
Parameters	*Count* **int** Specifies the number of alignment error bits to introduce into every transmitted packet. Ranges from 0 to 7. Numbers outside this range are invalid and will not have an effect on the alignment error count.
Return Value	The return value is >= 0 if the function executed successfully. The return value is < 0 if the function failed. See Appendix A.
Comments	None

ETBNC

Description	Defines the function associated with the rear panel BNC connectors.
Syntax	int ETBNC(int BNCid, int Config)
Parameters	BNCid **int** Identifies the rear panel BNC connector being addressed. ETBNC_1 = BNC#1 ETBNC_2 = BNC#2 ETBNC_3 = BNC#3 All other values are invalid and will not have an effect on the current BNC mode. *Config* **int** Identifies the specific function associated with the BNC. The following arguments are valid: `ETBNC_INPUT` Input (Hi-Z) `ETBNC_RXEA` Receive enable, Port A `ETBNC_RXEB` Receive enable, Port B `ETBNC_RCKA` Receive Clock, Port A `ETBNC_RCKB` Receive Clock, Port B `ETBNC_RDATA` Receive Data, Port A `ETBNC_RDATB` Receive Data, Port B `ETBNC_TXEA` Transmit Enable, Port A `ETBNC_TXEB` Transmit Enable, Port B `ETBNC_TDAT` Transmit Data `ETBNC_COLLISIONA` Collision, Port A `ETBNC_COLLISIONB` Collision, Port B `ETBNC_CRCA` CRC Error, Port A `ETBNC_CRCB` CRC Error, Port B `ETBNC_UNDRA` Undersize Error, Port A `ETBNC_UNDRB` Undersize Error, Port B `ETBNC_OVRA` Oversize Error, Port A `ETBNC_OVRB` Oversize Error, Port B `ETBNC_ALA` Alignment Error, Port A `ETBNC_ALB` Alignment Error, Port B `ETBNC_TXTRIG` Transmit Trigger `ETBNC_RXTRIG` Receive Trigger `ETBNC_10MHZ` 10 MHz internal clock `ETBNC_10MHZINV` 10 MHz internal clock, inverted `ETBNC_20MHZ` 20 MHz internal clock `ETBNC_20MHZINV` 20 MHz internal clock, inverted `ETBNC_EXTCLK` External Clock input, BNC#3 only `ETBNC_EXTCLKINV` External Clock inverted input, BNC#3 only All other values are invalid and will not have an effect on the current BNC mode
Return Value	The return value is >= 0 if the function executed successfully. The return value is < 0 if the function failed. See Appendix A.

Comments	If the JET-210 mode had previously been active, then the execution of this function for BNCid will place BNCid in the requested mode and the other two BNCid's in the input mode. Conversely, any subsequent execution of the *SetJET210Mode(1)* function will place all three BNCid's in the JET-210 mode. ADVICE: When in doubt, use function *ETGetBNC(...)* to find out specifically what mode the BNC's are in.

ETBurst

Description	Specifies the Burst Mode and the Burst Count
Syntax	int ETBurst(int Mode, long Count)
Parameters	*Mode* **int** Identifies whether or not the Burst Mode is on or off: ETBURST_ON Burst mode ON ETBURST_OFF Burst mode OFF All other values are invalid and will not have an effect on the current burst mode. *Count* **long** Specifies the number of packets to be transmitted during the Burst. Ranges from 1 to 2^{24}-1 (1-16777215) All values outside this range are invalid and will not have an effect on the current burst mode.
Return Value	The return value is >= 0 if the function executed successfully. The return value is < 0 if the function failed. See Appendix A.
Comments	Once the Burst Mode is enabled, the **ETRun** function takes on a different characteristic: "Step" causes the ET-1000 to internally load the Burst Count. "Run" causes the ET-1000 to either transmit the number of packets previously loaded (using "Step") *OR* transmit a single packet if no internal Burst Counts were previously loaded.

ETCaptureParams

Description	Specifies Capture Offset, Range, Filter, Port, Buffer mode, Time-tag and run mode. All parameters must be put into CStruct before calling this function.
Syntax	int ETCaptureParams(CaptureStructure* CStruct)
Parameters	*CStruct* **CaptureStructure*** Points to the CStruct structure that holds all the capture parameters. The structure must be loaded before calling this routine. If CStruct contains values outside appropriate ranges, this function will not execute.
Return Value	The return value is >= 0 if the function executed successfully. The return value is < 0 if the function failed. See Appendix A.
Comments	See **CaptureStructure** definition in **Data Structures** chapter of this manual.

ETCaptureRun

Description	Starts (or restarts) the capture process.
Syntax	int ETCaptureRun(void)
Parameters	None
Return	The return value is >= 0 if the function executed successfully. The return

Value	value is < 0 if the function failed. See Appendix A.
Comments	It is advised that you set up the desired capture parameters with the **ETCaptureParams(CaptureStructure *CStruct)** function before calling this function. Otherwise, the attached ET-1000 will run whatever capture sequence was previously left in it. Use the **ETGetCapturePacketCount** function to monitor the number of packets successfully captured after you initiate the capture process with this command. Use the **ETGetCapturePacket(...)** function to retrieve packets captured. To clear the buffer, you must turn the Capture off and then back on. If a capture is currently in progress when this function is executed, all captured data obtained thus far will be discarded and replaced with new capture information.

ETCollision

Description	Determines the collision mode, offset, duration and count.	
Syntax	int ETCollision(CollisionStructure* CStruct)	
Parameters	*CStruct*	**CollisionStructure*** Holds information pertaining to the collision mode (off, long, adjustable, Port A receive packet or Port B receive packet), the collision offset (in bits), duration (bit-times) and count.
Return Value	The return value is >= 0 if the function executed successfully. The return value is < 0 if the function failed. See Appendix A.	
Comments	See the definition of **CollisionStructure** in the **Data Structures** portion of this manual.	

ETDataLength

Description	Specifies the number of bytes per packet to be used in transmitting data from the ET-1000.	
Syntax	int ETDataLength(long Count)	
Parameters	*Count*	**long** Contains the number of bytes that are to be inserted in each packet. Ranges from 0 to 999,999. Values outside this range are invalid and will not have an effect on the transmitted data length.
Return Value	The return value is >= 0 if the function executed successfully. The return value is < 0 if the function failed. See Appendix A.	
Comments	*Count* does not include the 4 CRC bytes appended to every normal Ethernet packet.	

ETDataPattern

Description	Defines the background data pattern to transmit
Syntax	int ETDataPattern(int Pattern)
Parameters	*Pattern* **int** Determines the type of pattern that is transmitted out Port A and/or Port B. The choices are: `ETDP_ALLZERO` All 0 `ETDP_ALLONE` All 1 `ETDP_RANDOM` Random `ETDP_AAAA` Continuous AAAA(hex) `ETDP_5555` Continuous 5555(hex) `ETDP_F0F0` Continuous F0F0(hex) `ETDP_0F0F` Continuous 0F0F(hex) `ETDP_00FF` Continuous 00FF00FF(hex) `ETDP_FF00` Continuous FF00FF00(hex) `ETDP_0000FFFF` Continuous 0000FFFF0000FFFF(hex) `ETDP_FFFF0000` Continuous FFFF0000FFFF0000(hex) `ETDP_00000000FFFFFFFF` Continuous 00000000FFFFFFFF(hex) `ETDP_FFFFFFFF00000000` Continuous FFFFFFFF00000000(hex) `ETDP_INCR8` Incrementing 8 bit pattern `ETDP_INCR16` Incrementing 16 bit pattern `ETDP_DECR8` Decrementing 8 bit pattern `ETDP_DECR16` Decrementing 16 bit pattern All other values are invalid and will result in no changes to the currently transmitted data pattern
Return Value	The return value is >= 0 if the function executed successfully. The return value is < 0 if the function failed. See Appendix A.
Comments	If VFD is active, then its pattern will be transmitted for the duration and offset specified in the applicable VFDStructure. Any transmitted data outside this envelope will consist of the data pattern specified in this function.

ETDribbleCount

Description	Specifies the number of dribble bits to insert into the transmit stream.
Syntax	int ETDribbleCount(int Count)
Parameters	*Count* **int** Determines the number of dribble bits to insert. Range is 0 to 7. A value of 0 inserts no dribble bits. Any value outside this range is invalid and will result in no changes to the current dribble count.
Return Value	The return value is >= 0 if the function executed successfully. The return value is < 0 if the function failed. See Appendix A.
Comments	None

ETEnableBackgroundProcessing

Description	Allows enhanced responsiveness of foreground applications.
Syntax	int ETEnableBackgroundProcessing(int bFlag)
Parameters	*bFlag* **int** 0 to disallow, 1 to allow.
Return Value	The return value is the previous state of BackgroundProcessing.
Comments	Use this function with extreme care. All commands to the Programming library are executed completely then returned. ETEnableBackgroundProcessing allows for the same process or other processes to proceed while a Programming library function is being executed. A guard flag is enabled around reentrancy in the library, but you could end up in "deadly-embrace" situations. If this function is enabled, while a command in the Programming Library is executing, you are performing operations on the stack. So, do not use WM_TIMER messages, or button press messages to call Programming Library functions if this function is enabled. The code executed when background processing is enabled is below. Note the PeekMessage loop does not process WM_USER+n messages. if (bAllowIdleProcessing) { bIdling = TRUE; while(PeekMessage(&Msg,NULL,WM_NULL,WM_USER-1,PM_REMOVE)) { TranslateMessage(&Msg); DispatchMessage(&Msg); } } bIdling = FALSE;

ETGap

Description	Specifies the inter-packet gap value that is to be transmitted.
Syntax	int ETGap(long Count)
Parameters	*Count* **long** Determines the gap value to be inserted in the transmit stream of both ports. Ranges from 0 to 999,999. Any values outside this range are invalid and result in no changes to the current gap setting.

Return Value	The return value is >= 0 if the function executed successfully. The return value is < 0 if the function failed. See Appendix A.
Comments	The value of *Count* is further scaled by the most recent value left in function **ETGapScale(int TimeOfGap)**. If the scale is set to the "100ns" setting, then the number left in *Count* will produce an inter-packet gap according to the following formula: **GAP = 600+(100****Count***) nanoseconds** If the scale is set to the "1µs" setting, then the number left in *Count* will produce an inter-packet gap according to the following formula: **GAP = 0.6+*Count* microseconds** The **ETGap** and **ETGapScale** functions may appear in any order; however, keep in mind that the attached ET-1000 will execute each instruction in the order in which it is received. Thus, setting the scale before setting the Gap value will result in the sending of two or more consecutive packets with an interim value for the gap. To avoid this problem, stop transmission (**ETRun** function) before changing the Gap parameters, and then re-start transmission when done.

ETGapScale

Description	Specifies that either a 100ns gap scale or a 1µs gap scale is to be used in determining the gap time.
Syntax	int ETGapScale(int TimeOfGap)
Parameters	*TimeOfGap* **int** Determines the scale to be used for setting the gap time: `ETGAP_100NS` `100 nanosecond gap scale` `ETGAP_1US` `1 microsecond gap scale` All other values are invalid and will result in no changes to the gap scale setting.
Return Value	he return value is >= 0 if the function executed successfully. The return value is < 0 if the function failed. See Appendix A.
Comments	See the comment section under function **ETGap(long Count).**

ETGetAlignCount

Description	This function returns the number of alignment error bits currently being inserted into the transmit data stream.
Syntax	int ETGetAlignCount(void)
Parameters	None
Return Value	The return value will range from 0 to 7 -- corresponding to the number of alignment error bits being inserted. If the return value is less than zero, then a failure occurred. See Appendix A.
Comments	To set the number of alignment error bits for transmission, use function **ETAlignCount**.

ETGetBaud

Description	This function is used to obtain the current baud rate settings for the communications port.
Syntax	long ETGetBaud(void)
Parameters	None
Return Value	The return value indicates the baud rate as a long value.
Comments	None

ETGetBNC

Description	Retrieves the configuration of the BNC identified by BNCid.
Syntax	int ETGetBNC(int BNCid)
Parameters	*BNCid* **int** Identifies the BNC connector whose configuration is needed: `ETBNC_1` BNC #1 `ETBNC_2` BNC #2 `ETBNC_3` BNC #3 Any values outside this range are invalid and will return a failure code.
Return Value	The return value corresponds to the most recent command which set the function for the BNC. See **ETBNC** for an identification of these values. (Note that a return value of 99 indicates that the BNCs are in the JET-210 mode.) If the return value is less than zero, then a failure occurred. See Appendix A.
Comments	See function ETBNC to set the configuration for a particular BNC.

ETGetBurstCount

Description	Returns the current Burst Count.
Syntax	int
Parameters	long ETGetBurstCount(void)
Return Value	Returns the current Burst Count, which ranges from 1 to 2^{24}-1. If the return value is less than zero, then a failure occurred. See Appendix A.
Comments	The Burst Mode need not be enabled in order to execute this function. See the **ETBurst** function to establish the burst mode and count.

ETGetBurstMode

Description	Returns the current Burst Mode.
Syntax	int ETGetBurstMode(void)
Parameters	None
Return Value	Returns the current Burst Mode, which ranges from ET_OFF (0) to ET_ON (1). If the return value is less than zero, then a failure code has been returned. See Appendix A.
Comments	See the **ETBurst** function to establish the burst mode and count.

ETGetCapturePacket

Description	Dumps the data from a captured packet into a specified location.	
Syntax	int ETGetCapturePacket(long PI, int far * Buffer, int BufferSize)	
Parameters	*PI*	**long** Identifies the packet whose contents are to be read into *Buffer*. Packet numbers start at zero.
	Buffer	**int*** (far pointer) Points to an area in memory where the packet data is to be placed.
	BufferSize	**int** Determines the maximum number of characters to be put into *Buffer*.
Return Value	The return value specifies the number of characters written into *Buffer* (not counting NULL, if any) if the function executed successfully. It will be a positive number greater than or equal to zero. If the return value is less than zero, then a failure occurred. See Appendix A.	
Comments	To determine the number of packets before actually retrieving them, use ET*GetCapturePacketCount(...).*	

ETGetCapturePacketCount

Description	eturns the number of complete packets captured thus far.
Syntax	long ETGetCapturePacketCount(void)
Parameters	None
Return Value	This function returns a long integer if it executed correctly. The integer indicates the number of packets successfully captured by the attached ET-1000. If the return value is less than zero, then it is a failure code. See Appendix A.
Comments	If in Continuous Capture mode, you must stop capture before getting the CapturePacketCount.

ETGetCaptureParams

Description	Returns the current capture parameters.	
Syntax	int ETGetCaptureParams(CaptureStructure* CStruct)	
Parameters	*CStruct*	**CaptureStructure*** Pointer to the CaptureStructure structure that is to hold the capture parameters.
Return Value	The return value is >= 0 if the function executed successfully. The return value is < 0 if the function failed. See Appendix A.	
Comments	Use function **ETCaptureParams** to define the capture parameters on the attached ET-1000. You need not define the capture parameters before calling this function. The information returned in the CaptureStructure structure represents the current setup on the attached ET-1000. See the definition of **CaptureStructure** in the **Data Structures** portion of this manual.	

ETGetCollision

Description	Returns the current mode of the collision.
Syntax	int ETGetCollision(CollisionStructure* CStruct)
Parameters	*CStruct* **CollisionStructure*** Points to the structure to be filled with information pertaining to the collision setup inside the attached ET-1000.
Return Value	The return value is >= 0 if the function executed successfully. The return value is < 0 if the function failed. See Appendix A.
Comments	See the definition of **CollisionStructure** in the **Data Structures** portion of this manual.

ETGetController

Description	Returns the current type of SMB controller.
Syntax	int ETGetCollision(void)
Parameters	None
Return Value	CONTROLLER_ET1000 CONTROLLER_SMB1000 CONTROLLER_SMB2000 CONTROLLER_SMB200 CONTROLLER_SMB6000
Comments	

ETGetCounters

Description	Retrieves all counter information from the attached ET-1000.
Syntax	int ETGetCounters(CounterStructure* CStruct)
Parameters	*CStruct* **CounterStructure*** Points to the CounterStructure structure which is to hold all the information pertaining to the ET-1000's internal counters.
Return Value	The return value is >= 0 if the function executed successfully. The return value is < 0 if the function failed. See Appendix A.
Comments	See the definition of **CounterStructure** in the **Data Structures** portion of this manual.

ETGetCRCError

Description	This function is used to inquire whether or not CRC errors are currently being transmitted by the attached ET-1000.
Syntax	int ETGetCRCError(void)
Parameters	None

Return Value	This function returns ET_OFF (0) if CRC errors are currently **NOT** being transmitted. A value of ET_ON (1) is returned if CRC errors **ARE** currently being transmitted. A return value less than zero is a failure code. See Appendix A.
Comments	None

ETGetCurrentLink

Description	This function is used to inquire which attached ET-1000s in the Programming Library is the current one.
Syntax	int ETGetCurrentLink(void)
Parameters	None
Return Value	This function returns the ET-1000 ComPort which is associated with "current" ET-1000.
Comments	See ETSetCurrentLink, ETLink.

ETGetDataLength

Description	Returns the current length, in bytes, of the transmitted data packet.
Syntax	long ETGetDataLength(void)
Parameters	None
Return Value	This function returns the length, in bytes, of the attached ET-1000's transmitted data packets. The number does not include the four bytes of CRC. If this function is successful, the returned value will range from 0 to 999,999. A returned value less than zero is a failure code, indicating that the function failed. See Appendix A.
Comments	None

ETGetDataPattern

Description	Returns the identity of the current background transmit data pattern.
Syntax	int ETGetDataPattern(void)
Parameters	None
Return Value	If the function executed successfully, it returns a value corresponding to the current background data pattern. These values have the same meaning as parameter *Pattern* in function **ETDataPattern**. This function returns a failure code if it failed. (Failure codes are less than zero.) See Appendix A.
Comments	None

ETGetDribbleCount

Description	Returns the current number of dribble bits being inserted into the transmit stream of the attached ET-1000.
Syntax	int ETGetDribbleCount(void)
Parameters	None
Return Value	Returns the number of dribble bits being inserted. Ranges from 0 to 7. This function returns a failure code if it failed. (Failure codes are less than zero.) See Appendix A.

Comments	None

ETGetErrorStatus

Description	This function is used to inquire the nature of the most recent failure on the communications port.
Syntax	int ETGetErrorStatus(void)
Parameters	None
Return Value	The return value indicates the failure code of the most recent serial port failure. See Appendix A. If no failures have been detected, this function returns a zero.
Comments	See Appendix A to interpret the return value from this function.

ETGetFirmwareVersion

Description	This function is used to retrieve the current SmartBits firmware version of the attached ET-1000. It is expressed as an eight character array (with a terminating NULL character), which is left in Buffer. Buffer must have enough room for at least 9 characters.
Syntax	int ETGetFirmwareVersion(char* Buffer)
Parameters	*Buffer* **char*** Points to a memory location where the version information is to be placed. **NOTE: *Buffer* must be at least 9 characters long**.
Return Value	The return value is >= 0 if the function executed successfully. The return value is < 0 if there was a failure. See Appendix A.
Comments	The version is returned as a character string, not an integer.

ETGetGap

Description	Returns the gap value currently being transmitted by the attached ET-1000.
Syntax	long ETGetGap(void)
Parameters	None
Return Value	Returns the gap value currently in use by the attached ET-1000. Ranges from 0 to 999,999. This function returns a failure code if it failed. (Failure codes are less than zero.) See Appendix A.
Comments	The correspondence between the gap value and the actual gap time in the ET-1000's transmit stream depends on the current gap scale in use. Use function **ETGetGapScale** to find out what scale is currently in use. -- If the scale is set to the "100ns" setting (ETGAP_100NS), then the physical gap value is expressed as: **GAP = 600+(100*ReturnValue) nanoseconds** -- If the scale is set to the "1µs" setting (ETGAP_1US), then the physical gap value is expressed as: **GAP = 9.6+ReturnValue microseconds**.

ETGetGapScale

Description	Returns the current gap scale in use by the attached ET-1000.
Syntax	int ETGetGapScale(void)
Parameters	None
Return Value	If the function is successful, then the return value is 0 when the ET-1000 gap scale is set to the 1 microsecond scale. The return value is 1 when the gap scale is 100 nanoseconds. This function returns a failure code if it failed. See Appendix A.
Comments	See the comment section of function **ETGetGap**.

ETGetHardwareVersion

Description	This function is used to retrieve the current hardware version of the attached ET-1000. It is expressed as an eight character array (with a terminating NULL character), which is left in Buffer. Buffer must have enough room for at least 9 characters.	
Syntax	int ETGetHardwareVersion(char* Buffer)	
Parameters	*Buffer*	**char*** Points to a memory location where the version information is to be placed. **NOTE: *Buffer* must be at least 9 characters wide**.
Return Value	The return value is >= 0 if the function executed successfully. The return value is < 0 if there was a failure. See Appendix A.	
Comments	The version is returned as a character string, not an integer.	

ETGetLibVersion

Description	This function is used to retrieve the version information for the programming library currently in use by the program making the call. The first string is a text description of the library. The second string is the version number in ASCII.	
Syntax	int ETGetLibVersion(char* pszDescription, char* pszVersion)	
Parameters	*pszDescription*	**char*** Points to a memory location where the library description is to be placed. **NOTE: *Buffer* must be at least 50 characters wide.**
	pszVersion	**char*** Points to a memory location where the version information is to be placed. **NOTE: *Buffer* must be at least 20 characters wide.**
Return Value	The return value is >= 0 if the function executed successfully. The return value is < 0 if there was a failure. See Appendix A.	
Comments	The version is returned as a character string, not an integer.	

ETGetLinkFromIndex

Description	Returns the ET-1000 ComPort.	
Syntax	int ETGetLinkFromIndex(int iLink)	
Parameters	*iLink*	**int** Specifies which ET-1000 connection. A value of 1 meaning the first ET-1000 connection to the Programming Library.
Return Value	This function returns the ET-1000 ComPort which is associated with the specified ETLink attempt. The return value is < 0 if there was a failure. See Appendix A.	
Comments	See ETSetCurrentLink.	

ETGetLinkStatus

Description	Indicates the current status of the link between the PC and the attached ET-1000.
Syntax	int ETGetLinkStatus(void)
Parameters	None
Return Value	Returns the identity of the COM port if the link is established. Returns a failure code if the function failed. See Appendix A.
Comments	Use this function to determine whether or not there is a communication link established with an attached ET-1000. If the link has already been established and then is abruptly broken (due to a physical break in the connecting device or cable) this function will return a 0.

ETGetJET210Mode

Description	Returns the current ET-1000 JET210 mode.
Syntax	int ETGetJET210Mode(void)
Parameters	None
Return Value	`ET_OFF` `JET-210 mode disabled` `ET_ON` `JET-210 mode enabled` Returns a failure code if the function failed. See Appendix A.
Comments	None

ETGetLNM

Description	Returns the current Live Network Mode status of the attached ET-1000.
Syntax	int ETGetLNM(void)
Parameters	None
Return Value	The return value is either ETLNM_ON to indicate that the attached ET-1000's Live Network Mode is active, or ETLNM_OFF to indicate that the attached ET-1000's Live Network Mode is inactive. If the return value is neither of these, then an error condition has been detected. The return value will be less than zero in this case, indicating the failure code. See Appendix A.
Comments	Live Network Mode is currently only available for the ET-1000's Port A.

ETGetPreamble

Description	Returns the current number of preamble bits being inserted into the transmit stream by the attached ET-1000.
Syntax	int ETGetPreamble(void)
Parameters	None
Return Value	Returns the number of preamble bits being used. Ranges from 10 to 128. A return value less than 0 indicates a failure. See Appendix A.
Comments	None

ETGetReceiveTrigger

Description	Returns with the receive trigger parameters currently being implemented by the attached ET-1000.
Syntax	int ETGetReceiveTrigger(TriggerStructure* RStruct)
Parameters	*RStruct* **TriggerStructure*** Points to a TriggerStructure structure which is to contain the trigger parameters
Return Value	The return value is >= 0 if the function executed successfully. The return value is < 0 if there was a failure. See Appendix A.
Comments	See the definition of **TriggerStructure** in the **Data Structures** portion of this manual.

ETGetRun

Description	Returns the current run state of the attached ET-1000.
Syntax	int ETGetRun(void)
Parameters	None
Return Value	The return value depends on the run state: `ETSTOP` "Stop" mode `ETSTEP` "Step" mode `ETRUN` "Run" mode A return value less than 0 indicates a failure. See Appendix A.
Comments	

ETGetSel

Description	Returns the current Select state of the attached ET-1000.
Syntax	int ETGetSel(void)
Parameters	None
Return Value	Return value depends on the current Select state: `ETSELA` `Transmit on A, receive on B` `ETSELB` `Transmit on B, receive on A` `ETPINGPONG` `Ping Pong mode` Return value is less than zero if the function failed. See Appendix A.
Comments	

ETGetSerialNumber

Description	This function is used to retrieve the current serial number of the attached ET-1000. It is expressed as an eight character array (with a terminating NULL character), which is left in Buffer. Buffer must have enough room for at least 9 characters.
Syntax	int ETGetSerialNumber(char* Buffer)
Parameters	*Buffer* **char*** Points to a memory location where the serial number is to be placed. **NOTE: *Buffer* must be at least 9 characters wide**.
Return Value	The return value is >= 0 if the function executed successfully. The return value is < 0 if there was a failure. See Appendix A.
Comments	The serial number is returned as a character string, not an integer.

ETGetSwitch

Description	Reads the front panel settings of the attached ET-1000 and returns the settings.
Syntax	int ETGetSwitch(SwitchStructure* SStruct)
Parameters	*SStruct* **SwitchStructure*** Points to a SwitchStructure structure that is to be loaded with information pertaining to the attached ET-1000's front panel switch settings.
Return Value	Return value is >= 0 if the function executed successfully. Return value is < 0 if the function failed. See Appendix A.
Comments	See **SwitchStructure definition** in **Data Structures** portion of this manual.

ETGetTotalLinks

Description	Returns total ET-1000 connections.
Syntax	int ETGetTotalLinks(void)
Parameters	None
Return Value	This function returns the total ET-1000 system connected to Programming Library. A value of 2 meaning there are two ET-1000 connected.
Comments	See ETSetCurrentLink.

ETGetTransmitTrigger

Description	Returns with the transmit trigger parameters currently being implemented by the attached ET-1000.
Syntax	int ETGetTransmitTrigger(TriggerStructure* TStruct)
Parameters	*TStruct* **TriggerStructure*** Points to a TriggerStructure structure which is to contain the trigger parameters
Return Value	The return value is >= 0 if the function executed successfully. A failure code, which is less than zero, is returned if this function failed to execute. See Appendix A.
Comments	See the definition of **TriggerStructure** in the **Data Structures** portion of this manual.

ETGetVFDRun

Description	This function returns the current run state of the VFD pattern on the attached ET-1000.
Syntax	int ETGetVFDRun(void)
Parameters	None
Return Value	Return value depends on the VFD run state: ET_OFF VFD NOT being transmitted ET_ON VFD being transmitted A failure code, which is less than zero, is returned if this function failed to execute. See Appendix A.
Comments	None

ETIsBackgroundProcessing

Description	Determine if the Programming Library is currently executing a function.
Syntax	int ETIsBackgroundProcessing(void)
Parameters	None
Return Value	The return value is >0 if true, 0 if false. A failure code, which is less than zero, is returned if the function failed. See Appendix A.T
Comments	This returns the state of the guard flag used to control reentrancy in the Programming Library.

ETLink

Description	Forges a communication link between the PC and the attached ET-1000.
Syntax	int ETLink(int ComPort)
Parameters	*ComPort* **int** Determines the COM port to be used to run the remote link to the attached ET-1000: `ETCOM1` Serial COM port 1 `ETCOM2` Serial COM port 2 `ETCOM2` Serial COM port 3 `ETCOM4` Serial COM port 4 Any *ComPort* values outside this range are discarded and will have no effect on the link status.
Return Value	The return value is less than or equal to 0 if the function failed to establish a link with the attached ET-1000.
Comments	This function must execute successfully before any communication between the host PC and the remote ET-1000 can take place. While executing this function, the PC will search for the Baud rate at which the attached ET-1000 responds. It may take a while (up to 30 seconds) for this function to execute, as it must seek out and search several Baud rates before deciding whether or not the attached ET-1000 is responding correctly.

ETLNM

Description	Activates or de-activates Live Network Mode.
Syntax	int ETLNM(int Type)
Parameters	*Type* **int** Determines the state of the live network mode: `ETLNM_ON` `Live Network Mode ON` `ETLNM_OFF` `Live Network Mode OFF`
Return Value	The return value is >= 0 if the function executed successfully. A failure code, which is less than zero, is returned if this function failed to execute. See Appendix A.
Comments	ive Network Mode is currently available only on Port A of the attached ET-1000.

ETLoopback

Description	Activates or de-activates internal loopback of the specified Port.
Syntax	int ETLoopback(int Port, int Status)
Parameters	*Port* **int** Determines the ET-1000 port for activation or deactivation of the internal loopback: `LOOP_PORT_A` `Loopback on Port A` `LOOP_PORT_B` `Loopback on Port B` Any other values are invalid and will have no effect on the attached ET-1000. *Status* **int** Determines the loopback status of *Port*: `ETLOOPBACK_ON` `Loopback the port` `ETLOOPBACK_OFF` `Do not loopback the port`
Return Value	The return value is >= 0 if the function executed successfully. A failure code, which is less than zero, is returned if this function failed to execute. See Appendix A.
Comments	None

ETMake2DArray

Description	This function creates virtual 2 dimensional arrays with the TCL programming language.
Syntax	int ETMake2DArray (char* pszArrayName, int iSizeFirstDim, int iSizeSecondDim)
Parameters	*pszArrayName* **char*** A pointer to the name of the virtual array created with TCL. Use pszArrayName for any functions that require 2D arrays. *iSizeFirstDim* **int** Specifies the number of elements in the first dimension of the array. *iSizeSecondDim* **int** Specifies the number of elements in the second dimension of the array.
Return Value	The return value is >= 0 if the function executed successfully. A failure code, which is less than zero, is returned if this function failed to execute. See Appendix A.
Comments	This is a TCL work-around, only found in ET1000.TCL. This TCL utility function can be used, for example, with HTCardModels where the first array is MAX_HUBS and the second array is MAX_SLOTS. For more information, see Tcl_tips.txt in your SmartLib installation.

ETMake3DArray

Description	This function creates virtual 3 dimensional arrays with the TCL programming language.
Syntax	int ETMake3DArray (char* pszArrayName, int iSizeFirstDim, int iSizeSecondDim, int iSizeThirdDim)
Parameters	*pszArrayName* **char*** A pointer to the name of the virtual array created with TCL. Use pszArrayName for any functions that require 3D arrays. *iSizeFirstDim* **int** Specifies the number of elements in the first dimension of the array. *iSizeSecondDim* **int** Specifies the number of elements in the second dimension of the array. *iSizeThirdDim* **int** Specifies the number of elements in the third dimension of the array.
Return Value	The return value is >= 0 if the function executed successfully. A failure code, which is less than zero, is returned if this function failed to execute. See Appendix A.
Comments	This is a TCL work-around, only found in ET1000.TCL. This TCL utility function can be used, for example, with HTFrame where the first array is iHub, the second is iSlot, and the third is iPort. For more information, see Tcl_tips.txt in your SmartLib installation.

ETMFCounter

Description	This function establishes the item to be counted by the associated Multi-Function counter.
Syntax	int ETMFCounter(int Port, int Mode)
Parameters	*Port* **int** Determines the ET-1000 port whose associated Multi-Function counter is to be re-assigned: MFPORT_A ET-1000 Port A MFPORT_B ET-1000 Port B All other values are invalid and will not have any effect on the ET-1000. *Mode* **int** Identifies the item to be counted by the Port's Multi-Function counter. Values are: `ETMF_PACKET_LENGTH Packet Length` `ETMF_RXTRIG_COUNT Receive Trigger Count` `ETMF_TXTRIB_COUNT Transmit Trigger Count` `ETMF_TIME_ROUNDTRIPTime from Port to Port` `ETMF_TIME_PORT2PORTTime from Port to other Port` `ETMF_RXTRIG_RATE Receive Trigger Rate` `ETMF_TXTRIG_RATE Transmit Trigger Rate` `ETMF_PREAMBLE_COUNTNumber of preamble bits in Port` `ETMF_GAP_TIME Packet Gap Time in Port` `ETMF_SQE_COUNT SQE count in Port` `ETMF_TOTAL_LENGTH Total packet length in Port` All other values are invalid and will not have any effect on the ET-1000.
Return Value	The return value is >= 0 if the function executed successfully. A failure code, which is less than zero, is returned if the function failed. See Appendix A.
Comments	None

ETPreamble

Description	This function is used to set the preamble bit count that is to be transmitted by the attached ET-1000.
Syntax	int ETPreamble(int Count)
Parameters	*Count* **int** Specifies the number of preamble bits to be inserted into the transmit stream of the attached ET-1000. Ranges anywhere from 10 to 128. Any values outside this range are invalid and will have no effect on the attached ET-1000.
Return Value	The return value is >= 0 if the function executed successfully. A failure code, which is less than zero, is returned if the function failed. See Appendix A.
Comments	None

ETReceiveTrigger

Description	This function is used to set up the receive trigger on the attached ET-1000.
Syntax	int ETReceiveTrigger(TriggerStructure* RStruct)
Parameters	*RStruct* **TriggerStructure*** Points to a TriggerStructure structure that contains all the trigger information necessary to set up the receive trigger on the attached ET-1000.
Return Value	The return value is >= 0 if the function executed successfully. A failure code, which is less than zero, is returned if the function failed. See Appendix A.
Comments	ee the definition of **TriggerStructure** in the **Data Structures** portion of this manual.

ETRemote

Description	This function is used to set the attached ET-1000 in either the local or remote mode.
Syntax	unsigned ETRemote(int Mode)
Parameters	*Mode* **int** Determines the mode in which the attached ET-1000 operates: `ETLOCALMODE` `Local Mode` `ETREMOTEMODE` `Remote Mode` All other values are invalid and will have no effect on the attached ET-1000.
Return Value	The return value is >= 0 if the function executed successfully. A failure code, which is less than zero, is returned if the function failed. See Appendix A.
Comments	Once the attached ET-1000 is placed in the local mode, it will no longer respond to instructions sent to it by the PC -- except, of course, the instruction generated by ETRemote. This function will typically be used to place the attached ET-1000 in local mode so that it responds to user input from its front panel. (In remote mode, all front panel functions, except DISPLAY and RESET are inoperative.)

ETReset

Description	Resets all counters on the attached ET-1000.
Syntax	int TReset(void)
Parameters	None
Return Value	The return value is >= 0 if the function executed successfully. A failure code, which is less than zero, is returned if the function failed. See Appendix A.
Comments	This function essentially emulates the activation of the attached ET-1000's front panel RESET switch.

ETReturnAddress

Description	Returns the same void pointer passed.
Syntax	void * ETReturnAddress(void *)
Parameters	*p* **void*** Standard pointer.
Return Value	avoid * (32 bit value, which in Visual Basic is a long)
Comments	Visual Basic does not have a pointer type, yet can pass arguments by reference. The HTVFD structure includes a pointer. This function is a workaround to allow a long to be used as a pointer for the HTVFDStructure. This is seen in the example snippet in the VFD bug fix above.

ETRun

Description	This function sets the run state on the attached ET-1000.
Syntax	int ETRun(int RunValue)
Parameters	*RunValue* **int** Determines the run state to be executed on the attached ET-1000: ETSTOP Halts transmission ETSTEP Sends a single packet ETRUN Sends continuous packets All other values are invalid and will have no effect on the attached ET-1000.
Return Value	The return value is >= 0 if the function executed successfully. A failure code, which is less than zero, is returned if the function failed. See Appendix A.
Comments	The result of executing this function differs somewhat when the attached ET-1000 is in the BURST mode. See function **ETBurst** for a complete description.

ETSetBaud

Description	Adjusts the Baud rate of the ET-1000's serial link.
Syntax	int ETSetBaud(int Baud)
Parameters	*Baud* **int** Determines the Baud rate at which the attached ET-1000 operates: `ETBAUD2400` 2400 Baud `ETBAUD4800` 4800 Baud `ETBAUD9600` 9600 Baud `ETBAUD19200` 19.2 kBaud `ETBAUD38400` 38.4 kBaud All other values are invalid and will have no effect on the attached ET-1000.
Return Value	The return value is >= 0 if the function executed successfully. A failure code, which is less than zero, is returned if the function failed. See Appendix A.
Comments	Once the Baud rate of the attached ET-1000 has been changed, it will no longer be able to communicate with the PC. After executing this function, you should break and re-establish the link using the **ETUnLink** and **ETLink** functions. (The ETLink function automatically finds the Baud rate at which the attached ET-1000 is currently operating.) ADVICE: If problems occur while trying to link at a different baud rate, place the ET-1000 in the local mode by pressing its RESET switch. Then activate mode A4 and SET the baud rate as appropriate.

ETSetCurrentLink

Description	Specify which SmartLib Link (SMB to PC) is the current Link. If you have multiple Links, use this command prior to sending "ET" controller-specific commands such as ETGetHardwareVersion. You do not need to used this command prior to sending *SmartCard*-specific commands.
Syntax	int ETSetCurrentLink(int ComPort)
Parameters	*ComPort* **int** Specified the attached ET-1000 with *ComPort* to be used in SmartLib for related ET commands: `ETCOM1` Serial COM port 1 `ETCOM2` Serial COM port 2 `ETCOM2` Serial COM port 3 `ETCOM4` Serial COM port 4 Any *ComPort* values outside this range are discarded and will have no effect on the link status.
Return Value	The return value is >= 0 if the function executed successfully. A failure code, which is less than zero, is returned if the function failed. See Appendix A.

Comments	Instead of changing ET related commands, to include another parameter to specify which ET-1000 system in the Programming Library functions in order to support multiple ET-1000 connections, use ETSetCurrentLink to specify “Current” ET-1000 for the related ET commands.

ETSetCurrentSockLink

Description	Specify which SmartLib Link (SMB to PC) is the current Link. If you have multiple Links, use this command prior to sending "ET" controller-specific commands such as ETGetHardwareVersion. You do not need to used this command prior to sending *SmartCard*-specific commands.	
Syntax	int ETSetCurrentSockLink(char* IPAddr)	
Parameters	*IPAddr*	**char*** Specifies the IP address of the SMB controller you want to send a command to.
Return Value	The return value is >= 0 if the function executed successfully. A failure code, which is less than zero, is returned if the function failed. See Appendix A.	
Comments		

ETSetJET210Mode

Description	To set up the attached ET-1000 to operate with or without a JET-210 (Jitter Simulator) attached.	
Syntax	int ETSetJET210Mode(int Mode)	
Parameters	*Mode*	**int** Sets the JET-210 mode of the attached ET-1000:
	ET_OFF	Disable the JET-210 mode
	ET_ON	Enable the JET-210 mode
		All other values are invalid and will not work on ET-1000.
Return Value	The return value is >= 0 if the function executed successfully. A failure code, which is less than zero, is returned if the function failed. See Appendix A.	
Comments	Since the JET-210 Jitter Simulator assumes control over the three rear panel BNC connectors on the attached ET-1000, the BNC functions will be pre-empted. Use the **ETBNC** function to re-establish BNC functionality after disabling the JET-210 mode. Disabling the JET-210 mode with this function effectively puts the three BNC connectors into Input mode.	

ETSetGPSDelay

Description	Determines the actual start time communicated to a remote hub by

	HGRun, and HGStart, HGStop, and HGStep when GPS is available. Calculations are based on the estimated time to send a message to the remote hub. The default delay used by HGRun, and HGStart, HGStop, and HGStep for GPS synchronized starts is 20 seconds plus an additional 10 seconds for each hub. Use this function to change the default start time if: * There is not enough time for the remote host to receive the message. This can cause the local hubs to start before the remote hubs receive the command. * The default delay is unnecessarily long.
Syntax	int ETSetGPSDelay(ulong ulSeconds)
Parameters	*ulSeconds* **ulong** Determines the delay added to the current time so that local and remote hubs can start synchronously.
Return Value	The return value is >= 0 if the function executed successfully. A failure code, which is less than zero, is returned if the function failed. See Appendix A.
Comments	This command is only used by HGRun, HGStart, HGStop, and HGStep when GPS is available.

ETSetSel

Description	This function determines the transmission function associated with Port A and Port B of the attached ET-1000.
Syntax	int ETSetSel(int SelValue)
Parameters	*SelValue* **int** Determines mode associated with the ET-1000 ports: ETSELA Transmit on A, receive on B ETSELB Transmit on B, receive on A ETPINGPONG "Ping Pong" mode All other values are invalid and will not work on the ET-1000
Return Value	The return value is >= 0 if the function executed successfully. A failure code, which is less than zero, is returned if the function failed. See Appendix A.
Comments	None

ETSetTimeout

Description	This function how long SmartLib will wait for a response from the SMB controller before timing out. The default timeout value is 5 seconds.
Syntax	int ETSetTimeout(unsigned TimeOutValue)
Parameters	*TimeOutValue* **unsigned int** Determines the time-out value, in milliseconds. Ranges from 1 to 2,147,483,647 milliseconds (0x7FFFFFFF).
Return Value	The return value is >= 0 if the function executed successfully. A failure code, which is less than zero, is returned if the function failed. See Appendix A.
Comments	Passing a value of 0 will set the timeout to approximately 24 days, effectively disabling timeout for most purposes.

ETSetup

Description	Stores and recalls the current setup internally in the attached ET-1000.
Syntax	int ETSetup(int Mode, int SetupId)
Parameters	*Mode* **int** Determines the mode of the setup function: `ETSTORESETUP` `store the current setup` `ETRECALLSETUP` `recall a stored setup` All other values are invalid and will have no effect on the ET-1000. *SetupId* **int** Identifies the specific setup to store or recall. For recall, this value ranges from 0 to 8; whereas 0 is the "factory default" setup. (It cannot be changed.) You are allowed to store setups 1 to 8. Any values outside these ranges are invalid and will have no effect on the ET-1000.
Return Value	The return value is >= 0 if the function executed successfully. A failure code, which is less than zero, is returned if the function failed. See Appendix A.
Comments	The setups referenced in this function refer to setups that are stored internally within the attached ET-1000. There are no library functions available for storing and recalling setups from the PC's disk. **NOTE**: Recalling a previous setup in the ET-1000 will probably result in the loss of the communication link. After executing this function, your application program should unlink itself from the attached ET-1000 and then re-link. Use the following procedure: 1. Issue the ETUnLink command 2. Wait 4 seconds. This allows the ET-1000's serial port to settle after the recall operation. 3. Re-link using the ETLink(...) function. You may find that a re-link will result in a different Baud rate than before. Use the ETSetBaud(...) function if you wish to re-establish the link at a particular Baud rate. (Note that after issuing ETSetBaud, you must again UnLink and then Link.)

ETSocketLink

Description	This function is used to connect to a SmartBits system over an IP socket connection. First use the serial connection to configure the SmartBits chassis with an appropriate IP address.
Syntax	int ETSocketLink(char* hostname, int port)
Parameters	*hostname* **char*** Specified the IP address of the SmartBits system to attempt to link to. *port* **int** The user specified port number of IP device to which we want to link. Default value should place this at 16385.
Return Value	The return value is >= 0 if the function executed successfully. A failure code, which is less than zero, is returned if the function failed. See Appendix A.
Comments	The IP address of a SmartBits device may be changed using the serial port interface. Use a terminal emulation program such as "Terminal" to connect the PC to the chassis. Once connected to SmartBits, transmit the command `ipaddr` to view the current IP address. Transmit `ipaddr` (new address) to set the new IP address. For example: `ipaddr 129.186.145.5`

ETTransmitCRC

Description	Enables or disables transmission of CRC errors on the attached ET-1000.
Syntax	int ETTransmitCRC(int Active)
Parameters	*Active* **int** Determines the state of the CRC error insertion on the attached ET-1000: `ETCRC_ON` Enable CRC transmission `ETCRC_OFF` Disable CRC transmission All other values are invalid and will not have an effect on the attached ET-1000.
Return Value	The return value is >= 0 if the function executed successfully. A failure code, which is less than zero, is returned if the function failed. See Appendix A.
Comments	None

ETTransmitTrigger

Description	This function is used to set up the transmit trigger on the attached ET-1000.
Syntax	int ETTransmitTrigger(TriggerStructure* TStruct)
Parameters	*TStruct* **TriggerStructure*** Points to a TriggerStructure structure that contains all the trigger information necessary to set up the transmit trigger on the attached ET-1000.
Return Value	The return value is >= 0 if the function executed successfully. A failure code, which is less than zero, is returned if the function failed. See Appendix A.
Comments	See the definition of **TriggerStructure** in the **Data Structures** portion of this manual.

ETUnLink

Description	This function causes the communication link between the PC and the attached ET-1000 to be broken. The allocated COM port will be freed up for other applications to use.
Syntax	int ETUnLink(void)
Parameters	None
Return Value	The return value is >= 0 if the function executed successfully. A failure code, which is less than zero, is returned if the function failed. See Appendix A.
Comments	It is highly recommended that this function be performed as part of shutting down the ET-1000 application. This guarantees that DOS will recognize the allocated COM port as having been freed from any application, and is thus available. Also, the execution of this function automatically puts the attached ET-1000 in the manual mode.

ETVFDParams

Description	This function sends VFD information to the attached ET-1000.
Syntax	int ETVFDParams(VFDStruct* VFDdata)
Parameters	*VFDdata* **VFDStruct*** Points to a VFDStruct structure which contains all the VFD information required to implement a VFD pattern on the attached ET-1000.
Return Value	The return value is >= 0 if the function executed successfully. A failure code, which is less than zero, is returned if the function failed. See Appendix A.
Comments	Depending on the size of the **Range** parameter of *VFDdata*, this function may take some time to download its information to the attached ET-1000. See the definition of **VFDStruct** in the **Data Structures** portion of this manual.

ETVFDRun

Description	This function starts or halts the transmission of VFD data from the attached ET-1000.
Syntax	int ETVFDRun(int Start)
Parameters	*Start* **int** Determines the state of the VFD transmission: `ETVFD_ENABLE` `Enable VFD transmission` `ETVFD_DISABLE` `Disable VFD transmission` All other values are invalid and will not have an effect on the attached ET-1000.
Return Value	The return value is >= 0 if the function executed successfully. A failure code, which is less than zero, is returned if the function failed. See Appendix A.
Comments	VFD information must first be sent to the attached ET-1000 using the **ETVFDParams** function. Once the **ETVFDParams** function has set up the VFD parameters, VFD transmission may be enabled and disabled numerous times without the need to execute **ETVFDParams** again -- as long as the VFD data doesn't need to be changed. If **ETVFDParams** is not executed before this function, the attached ET-1000 will implement whatever VFD information it contains. NOTE: Sometimes the ET-1000 will power-up with VFD active and running. Use **ETGetVFDRun** to determine whether or not this is so, and then use **ETVFDRun(...)** to place the ET-1000 in a known state.

HGAddtoGroup

Description	Along with HGSetGroup, this command can be used to add individual hub/slot/port cards to a group.	
Syntax	int HGAddtoGroup (int iHub, int iSlot, int iPort)	
Parameters	*iHub*	**int** Identifies the hub where the SmartCard is located. The range is 0 (first hub) through N(number of hubs) -1. Remember to subtract one since the hub identification starts at 0. Important: See *Working with Multiple Hubs* in Chapt 1.
	iSlot	**int** Identifies the slot where the SmartCard is located. Ranges from 0 (first slot in *Hub*) to 19 (last card in *Hub*).
	iPort	**int** Identifies the SmartCard port. On the current SmartCards, i*Port* is always 0.
Return Value	The return value is >= 0 if the function executed successfully. A failure code, which is less than zero, is returned if the function failed. See Appendix A.	
Comments	Currently, this command should be used in Hub/Slot/Port ascending order. Example: `HGSetGroup(NULL);` `HGAddtoGroup(0,0,0);` `HGAddtoGroup(0,1,0);` This will add the first two cards in the first hub to a group.	

HGAlign

Description	Create alignment errors on the previously selected group. This function is valid for SmartCards only.	
Syntax	int HGAlign(int iBits)	
Parameters	*iBits*	**int** Sets the number of extra alignment bits to transmit. Valid range is 0 to 7. Setting this value to 0 disables generation of packets with alignment bit errors.
Return Value	The return value is >= 0 if the function executed successfully. A failure code, which is less than zero, is returned if the function failed. See Appendix A.	
Comments	None	

HGBurstCount

Description	Sets the number of packets transmitted in a single burst from all ports associated with the PortIdGroup defined by the HGSetGroup(PortIdGroup) command.
Syntax	int HGBurstCount(long lVal)
Parameters	*lVal* **long** Specifies the burst count. Ranges anywhere from 1 to 16,777,215.
Return Value	The return value is >= 0 if the function executed successfully. A failure code, which is less than zero, is returned if the function failed. See Appendix A.
Comments	This instruction does not cause a burst of packets to be sent. Use **HGTransmitMode,** or **HTTransmitMode** to select a burst mode, and then use **HGRun, HGStart, HGStep, HTGroupStart, HTGroupStep,** or **HTRun** to actually start the transmission of the burst.

HGBurstGap

Description	Sets up the time gap between bursts of packets from all ports associated with the PortIdGroup defined by the HGSetGroup(PortIdGroup) command.
Syntax	int HGBurstGap(long lVal)
Parameters	*lVal* **long** Specifies the inter-burst gap in tenths of a microsecond. Ranges anywhere from 1 to 16 million.
Return Value	The return value is >= 0 if the function executed successfully. A failure code, which is less than zero, is returned if the function failed. See Appendix A.
Comments	This instruction is only applied if **HGTransmitMode**, or **HTTransmitMode** has selected one of the MULTI_BURST_MODE, or CONTINUOUS_BURST mode selections. Use **HGRun, HGStart, HTGroupStart,** and **HTRun** to actually start the transmission of the bursts.

HGBurstGapAndScale

Description	Sets up the time gap between bursts of packets, at the given scale from all ports associated with the PortIdGroup defined by the HGSetGroup(PortIdGroup) command.
Syntax	int HGBurstGapAndScale(long lVal, int iScale)
Parameters	*lVal* **long** Specifies the inter-burst gap value. Legal values range anywhere from the lowest gap possible on the group being addressed up to a maximum of 1.6 sec. *iScale* **int** Specifies the scale of the gap value according to following: `NANO_SCALE = nanoseconds scale` `MICRO_SCALE = microseconds scale` MILLI_SCALE = milliseconds scale.
Return Value	The return value is >= 0 if the function executed successfully. A failure code, which is less than zero, is returned if the function failed. See Appendix A.
Comments	This instruction is only applied if **HGTransmitMode**, or **HTTransmitMode** has selected one of the MULTI_BURST_MODE, or CONTINUOUS_BURST mode selections. Use **HGRun, HGStart, HTGroupStart,** and **HTRun** to start the transmission of the bursts.

HGClearGroup

Description	Ungroups a number of ports that were previously grouped together with the HGSetGroup command.
Syntax	int HGClearGroup(void)
Parameters	None
Return Value	The return value is >= 0 if the function executed successfully. A failure code, which is less than zero, is returned if the function failed. See Appendix A.
Comments	Since there can only be one group defined at a time, HGClearGroup needs no arguments.

HGClearPort

Description	This command is used to clear internal counters from all ports associated with the PortIdGroup defined by the previous HGSetGroup(PortIdGroup) command.
Syntax	int HGClearPort(void)
Parameters	None
Return Value	The return value is >= 0 if the function executed successfully. A failure code, which is less than zero, is returned if the function failed. See Appendix A.
Comments	This command is used on SmartCards. For Passive Hub cards, use the **HGClear** command.

HGCollision

Description	Determines the collision mode, and count for the 100 Mbits Fast SmartCard.
Syntax	int HGCollision(CollisionStructure* CStruct)
Parameters	*CStruct* **CollisionStructure*** Holds information pertaining to the collision mode (off, on), and count.
Return Value	The return value is >= 0 if the function executed successfully. The return value is < 0 if the function failed. See Appendix A.
Comments	See the definition of **CollisionStructure** in the **Data Structures** portion of this manual. The offset and length fields are not used for 100 Mbits SmartCard.

HGCollisionBackoffAggressiveness

Description	Determines the wait factor for backing off from multiple collisions only on SmartCards in a previously selected group.
Syntax	int HGCollisionBackoffAggressiveness(unsigned int uiAggressiveness)
Parameters	*uiAggressiveness* **unsigned int** Set the backoff factor. The amount of time actually delayed follows as powers of two using this factor.
Return Value	The return value is >= 0 if the function executed successfully. A failure code, which is less than zero, is returned if the function failed. See Appendix A.
Comments	None

HGCRC

Description	Create packets with CRC errors on the previously selected group. This function is valid for SmartCards only.
Syntax	int HGCRC(int iMode)
Parameters	*iMode* **int** Set the error facility on or off. Valid flags: ET_ON and ET_OFF
Return Value	The return value is >= 0 if the function executed successfully. A failure code, which is less than zero, is returned if the function failed. See Appendix A.
Comments	None

HGDataLength

Description	This command is used to specify the length of the data field in the packets being transmitted by the SmartBits ports associated with the PortIdGroup defined by the previous HGSetGroup(PortIdGroup) command.. Applies only to SmartCards. A random packet size can also be selected.
Syntax	int HGDataLength(int iLength)
Parameters	*iLength* **int** Specifies the length of the packets that are to be transmitted on the addressed port. The length is specified in bytes, and it includes everything between the preamble and the CRC. The actual transmitted packet will be extended four bytes for the CRC. Length can range from 1 to 8191. A Length of 0 will cause random packet sizes to be transmitted.
Return Value	he return value is >= 0 if the function executed successfully. A failure code, which is less than zero, is returned if the function failed. See Appendix A.
Comments	None

HGDribble

Description	Create dribbling bit errors on the previously selected group. This function is valid for SmartCards only.
Syntax	int HGDribble(int iBits)
Parameters	*iBits* **int** Sets the number of dribbling bits to transmit. Valid range is 0 to 7. Setting this value to 0 disables generation of packets with dribbling bit errors.
Return Value	The return value is >= 0 if the function executed successfully. A failure code, which is less than zero, is returned if the function failed. See Appendix A.
Comments	None

HGDuplexMode

Description	Indicates whether to set full duplex or half duplex mode for all ports associated with the PortIdGroup defined by the previous HGSetGroup(PortIdGroup) command.
Syntax	int HGDuplexMode(int iMode)
Parameters	*iMode* **int** Sets the Duplex mode where iMode should be one of the following: `FULLDUPLEX_MODE` `Full duplex mode on` `HALFDUPLEX_MODE` `Half duplex mode on`
Return Value	The return value is >= 0 if the function executed successfully. A failure code, which is less than zero, is returned if the function failed. See Appendix A.
Comments	None

HGFillPattern

Description	Specifies the data pattern that is to be transmitted from all ports associated with the PortIdGroup defined by the previous HGSetGroup(PortIdGroup) command. This command applies only to SmartCards. Any VFD data will overwrite this pattern.
Syntax	int HGFillPattern(int iSize, int* piData)
Parameters	*iSize* **int** Identifies the size, in bytes, of the fill pattern contained in the Data array. Size may range from 60 to 2044. A value of 0 (zero) will cause a random data pattern to be generated. *piData* **int*** Points to the array which contains the data pattern to be transmitted. A value of NULL will cause a random data pattern to be generated.
Return Value	The return value is >= 0 if the function executed successfully. A failure code, which is less than zero, is returned if the function failed. See Appendix A.
Comments	None

HGGap

Description	Specifies the inter-packet gap that is to be transmitted from all ports associated with the PortIdGroup defined by the previous HGSetGroup(PortIdGroup) command. Also allows random gaps to be transmitted. This command applies only to SmartCards.
Syntax	int HGGap(long lPeriod)
Parameters	*lPeriod* **long** On 10Mbit cards, this value equals the number of tenths of microseconds between transmitted packets. On 100Mbit cards, this value equals the number of tens of nanoseconds between transmitted packets. In either case, lPeriod may range from 10 (=1us) to 1,600,000. A value of 0 (long) will cause a random gap to be generated. For example, if lPeriod = 96, for 10Mbit cards, the Gap will be 96*0.1us = 9.6us, and for 100Mbit cards, the Gap will be 96*10ns = 960ns. In both cases, the cards get the minimum legal interpacket gap. For TokenRing cards at 4Mbit, the minimum legal "Gap" is 250ns, and for TokenRing cards at 16Mbits, the minimum legal "Gap" is 65ns.
Return Value	The return value is >= 0 if the function executed successfully. A failure code, which is less than zero, is returned if the function failed. See Appendix A.
Comments	None

HGGapAndScale

Description	Specifies the inter-packet gap that is to be transmitted on the addressed port. Also allows random gaps to be transmitted. Applies only to SmartCards.
Syntax	int HGGapAndScale(long lPeriod, int iScale)
Parameters	*lPeriod* **long** Identifies the number of "scaled" units to be between transmitted packets. Period may range from 1 to 1,600,000,000. A value of 0 (long) will cause a random gap to be generated. *iScale* **int** Determines the scale for the lPeriod parameter based on: `1 lPeriod is in nanoseconds` `2 lPeriod is in microseconds,` `3 lPeriod is in milliseconds.`
Return Value	The return value is >= 0 if the function executed successfully. A failure code, which is less than zero, is returned if the function failed. See Appendix A.
Comments	None

HGGetCounters

Description	Retrieves counters from all ports in the group defined by the previous HGSetGroup/HGAddtoGroup command. This information is placed into the HTCountStructures pointed to in the input argument. This command applies only to SmartCards.
Syntax	int HGGetCounters(HTCountStructure* phtCountStruct)
Parameters	*phtCountStruct* **HTCountStructure*** A pointer to the first element of an array of counter structures in which count information is to be placed. See section 5 of this document for a description of the HTCountStructure structure.
Return Value	The return value is >= 0 if the function executed successfully. A failure code, which is less than zero, is returned if the function failed. See Appendix A.
Comments	It is assumed that the calling function has declared the HTCountStructure array and reserved sufficient memory for it.

HGGetEnhancedCounters

Description	Retrieves standard counters and card related counters from all ports in the group defined by the previous HGSetGroup/HGAddtoGroup commands. This information is placed into the EnhancedCounterStructure pointed to in the input argument. Applies to SmartCards and TokenRing SmartCard.
Syntax	int HGGetEnhancedCounters(EnhancedCountStructure* pEnCounter)
Parameters	*pEnCounter* **EnhancedCounterStructure*** A pointer to the first element of an array of counter structures in which count information is to be placed. See section 5 for a description of the EnhancedCountStructure structure.
Return Value	The return value is >= 0 if the function executed successfully. A failure code, which is less than zero, is returned if the function failed. See Appendix A.
Comments	It is assumed that the calling function has declared the EnhancedCountStructure array and reserved sufficient memory for it.

HGGetGroupCount

Description	Returns the number of ports currently configured in the group.
Syntax	int HGGetGroupCount(void)
Parameters	None
Return Value	Returns the number of ports currently configured in the group. The return value is >= 0 if the function executed successfully. A failure code, which is less than zero, is returned if the function failed. See Appendix A.
Comments	

HGGetLEDs

Description	Determine the state of the LEDs on ports in the currently defined group.
Syntax	int HGGetLEDs(int* piLEDs)
Parameters	piLEDs **int*** a pointer to an integer array of at least the number of cards in the group size that receives the LED states of all SmartCards in the current group.
Return Value	The return value is >= 0 if the function executed successfully. A failure code, which is less than zero, is returned if the function failed. See Appendix A.
Comments	Behavior of this function is undefined if the port group contains passive cards.

HGIsPortInGroup

Description	Returns whether the specified port is currently configured in the group.	
Syntax	int HGIsPortInGroup(int iPortId)	
Parameters	iPortId	**int** the counting ordinal ID of the port in the test bay whose inclusion in the group is to be checked.
Return Value	Returns a positive (non-zero) number if TRUE, zero if FALSE. The return value is >= 0 if the function executed successfully. A failure code, which is less than zero, is returned if the function failed. See Appendix A.	
Comments	None	

HGIsHubSlotPortInGroup

Description	Returns whether the specified port is currently configured in the group.	
Syntax	int HGIsHubSlotPortInGroup(int Hub, int Slot, int Port)	
Parameters	*iHub*	**int** Identifies the hub where the SmartCard is located. The range is 0 (first hub) through N(number of hubs) -1. Remember to subtract one since the hub identification starts at 0. Important: See *Working with Multiple Hubs* in Chapt 1.
	iSlot	**int** Identifies the slot where the SmartCard is located. Ranges from 0 (first slot in *Hub*) to 19 (last card in *Hub*).
	iPort	**int** Identifies the SmartCard port. (On the current SmartCard, *Port* is always 0.)
Return Value	Returns a positive (non-zero) number if TRUE, zero if FALSE. The return value is >= 0 if the function executed successfully. A failure code, which is less than zero, is returned if the function failed. See Appendix A.	
Comments	None	

HGMultiBurstCount

Description	Sets up the number of bursts for transmitting out a SmartCard while in MULTI_BURST_MODE.	
Syntax	int HGMultiBurstCount(long lVal)	
Parameters	*lVal*	**long** Specifies the burst count. Ranges anywhere from 1 to 16,777,215.
Return Value	The return value is >= 0 if the function executed successfully. A failure code, which is less than zero, is returned if the function failed. See Appendix A.	
Comments	This instruction is only applied if **HGTransmitMode,** or **HTTransmitMode** has selected MULTI_BURST_MODE. Use **HGRun, HGStart, HTGroupStart**, and **HTRun** to start the transmission of the bursts.	

HGRemoveFromGroup

Description	Along with HGSetGroup, this command can be used to remove individual hub/slot/port designations from a currently configured group.	
Syntax	int HGRemoveFromGroup (int iHub, int iSlot, int iPort)	
Parameters	*iHub*	**int** Identifies the hub where the SmartCard is located. The range is 0 (first hub) through N(number of hubs) -1. Remember to subtract one since the hub identification starts at 0. Important: See *Working with Multiple Hubs* in Chapt 1.
	iSlot	**int** Identifies the slot where the SmartCard is located. Ranges from 0 (first slot in *Hub*) to 19 (last card in *Hub*).
	iPort	**int** Identifies the SmartCard port. On the current SmartCards, i*Port* is always 0
Return Value	The return value is >= 0 if the function executed successfully. A failure code, which is less than zero, is returned if the function failed. See Appendix A.	
Comments	None	

HGRemovePortIdFromGroup

Description	This command can be used to remove individual hub/slot/port designations from a currently configured group which has been set up using HGSetGroup.
Syntax	int HGRemovePortIdFromGroup (int iPortId)
Parameters	*iPortId* **int** Identifies the port which is to be removed from the currently configured group. The value used for the iPortId is determined from the ordinal counting number of existing ports in the test bay.
Return Value	The return value is >= 0 if the function executed successfully. A failure code, which is less than zero, is returned if the function failed. See Appendix A.
Comments	The first hub in the daisy chain from the control section would contain the first set of ports to be identified. The port in the left-most (lowest numbered) slot in the first hub is identified as iPortId=1, the next port in the sequence going left to right across the slots, would be identified as iPortId=2, and so on until all existing ports in the first hub have been identified. Any empty slots are skipped over for the purposes of assigning PortId numbers. The next hub in the daisy chain connection (at the back of the test bay) would then continue with the next counting number as the iPortId identifier. Example 1: Assume you have a 4 hub test bay with 20 ports in each hub. Then the ports in the first hub are identified left to right as ports 1 through 20. The second hub ports are identified left to right as ports 21 through 40. The third hub ports are identified left to right as ports 41 through 60. And the fourth hub ports are identified left to right as ports 61 through 80. Example 2: Assume you have a four hub test bay with 7 ports in the first hub, 4 ports in the second hub, no ports in the third hub and 3 ports in the fourth hub. The first hub ports are identified left to right as ports 1 through 7. The second hub ports are identified left to right as ports 8 through 11. The third hub is skipped over as any other empty slots are and the counting continues at the next port, which happens to be in the fourth hub. The ports in the fourth hub are then identified left to right as ports 12 through 15.

HGResetPort

Description	Resets the SmartCards defined in the current group to a default condition with all errors off.
Syntax	int HGResetPort(int iResetType)
Parameters	*iResetType* **int** Identifies the run mode of the board. Legal modes can be conveyed using the following constants: `RESET_FULL` Reset all card parameters including hardware interface parameters (e.g. Token Ring Speed) `RESET_PARTIAL` Reset all card parameters except hardware interface parameters (e.g. Token Ring Speed)
Return Value	The return value is >= 0 if the function executed successfully. A failure code, which is less than zero, is returned if the function failed. See Appendix A.
Comments	This command is not implemented on the ATM and WAN(FR) SmartCards at this time.

HGRun

Description	Sets up the run state for all ports associated with the PortIdGroup defined by the previous HGSetGroup(PortIdGroup) command. The port can be set up to transmit a series of packets ("RUN" state), transmit a single packet ("STEP" state) or stop transmission altogether ("STOP" state). If the Burst mode has been set up to transmit a burst of packets (using the **HTTransmit** command), then transitioning from "STOP" to "RUN" will cause the specified number of packets to be transmitted. This command applies only to SmartCards. This command works in conjunction with HTSeparateHubCommands. If no setting is specified, the default used for HGRun is HUB_DEFAULT_ACTION.
Syntax	int HGRun(int iMode)
Parameters	*iMode* **int** Identifies the run mode of the board. Legal modes can be conveyed using the following constants: `HTRUN` `HTRUN_VALUE` Transmit continuously or send a burst of packets. **Use HTRun_Value for Visual Basic.** `HTSTEP` Transmit a single packet. `HTSTOP` Halt transmission of packets altogether.
Return Value	The return value is >= 0 if the function executed successfully. A failure code, which is less than zero, is returned if the function failed. See Appendix A.
Comments	Because VisualBasic does not distinguish by case, this value has been put in the ETSMBAPI.TXT file: `HTRUN_VALUE` Transmit continuously or send a burst of packets.

HGSelectTransmit

Description	Enables the PortB transmission of the ET-1000 to be transmitted to the ports in the currently defined group. Transmission mode is determined by *iMode*. This function is valid for both Passive and SmartCards.
Syntax	int HGSelectTransmit(int iMode)
Parameters	*iMode* **int** Determines the function of the Port: `HTTRANSMIT_OFF` `Transmitter is turned off` `HTTRANSMIT_STD` `Transmitter transmits standard packets` `HTTRANSMIT_COL` `Transmitter transmits collision packets` All other values are invalid and will not have an effect on the SmartBits.
Return Value	The return value is >= 0 if the function executed successfully. A failure code, which is less than zero, is returned if the function failed. See Appendix A.
Comments	This function assumes that at least one SmartBits is attached to the ET-1000. It will be ignored by the ET-1000 if there is not an SmartBits present.

HGSetGroup

Description	Groups an number of SmartBits ports. These ports may then be manipulated as a group using the any of the SmartLib "HG" commands.
Syntax	int HGSetGroup(char* pszPortIdGroup)
Parameters	*pszPortIdGroup* **char*** A NULL terminated ASCII character string with a maximum of 512 characters. This string defines which ports are members of the active group. Although a port is usually specified by identifying the iHub, iSlot, and iPort, group members are identified by a single number. This number is the actual sequence number of the port - with numbers starting at the Master controller. The pszPortIdGroup numbers: * Start at 1 (as opposed to 0). * Do not count blank slots as part of the sequence. * Do not account for the hub number. So, for example, if you had four different hubs with one card each, you could include them all in the group with these values: "1,2,3,4" Ports may be separated by commas and/or spaces. Any number of commas or blank spaces may be inserted between the port numbers, as long as the overall length of the string doesn't exceed 512. Dashes may also be used to identify the group. For example: "1-100, 105, 256" groups the first one hundred ports as well as the hundred and fifth, and the two hundred and fifty-sixth port. You can group ports in ascending or descending order so that "4 - 1" is a valid value. Port numbers are asigned from left to right, top to bottom, first link to last link. To clear an old group selection, use HGClearGroup. You can also pass NULL as the PortIdGroup.
Return Value	The return value is >= 0 if the function executed successfully. A failure code, which is less than zero, is returned if the function failed. See Appendix A.
Comments	Only one group can exist at a time. All "HG" commands will act upon the last PortIdGroup defined by HGSetGroup(PortIdGroup). Groups may be defined and redefined at any time. See also HGAddtoGroup. The first hub in the daisy chain from the control section would contain the first set of ports to be identified. The port in the left-most (lowest numbered) slot in the first hub is identified as iPortId=1, the next port in the sequence going left to right across the slots, would be identified as iPortId=2, and so on until all existing ports in the first hub have been identified. Any empty slots are skipped over for the purposes of assigning PortId numbers. The next hub in the stack would then continue with the

	next counting number as the iPortId identifier.

HGSetGroupType

Description	Reserves a group of ports by card types within a SmartBits configuration. These ports may then be manipulated simultaneously with one another (as a group) using the any of the "HG" commands defined herein.
Syntax	int HGSetGroupType(int Index, int* pPortIdList)
Parameters	*Index* **int** Size of card type array. The default setting is CT_MAX_CARD_TYPE. A value of -1 will select all types of cards, a value of 0 will clear the group selection. *pPortIdList* **int*** An array of integers which describes the ports that are to be grouped. pPortIdList[0] is designates CT_ACTIVE (10 MB Ethernet) card types to be included in the group. PPortIdList[1] is for CT_PASSIVE card types, pPortIdList[2] is for CT_FASTX card types, and so on for each of the CT_xxx card types. For each value of pPortIdList[]: 0 means do not select this card type, 1 means to include this card type in the group. *For example:* *Index = 8, and {0, 0, 1, 1, 0, 0, 0, 1} will select all the FAST, TOKENRING, and GIGABIT cards.* To clear an old group selection, pass 0 in the Index.
Return Value	The return value is >= 0 if the function executed successfully. A failure code, which is less than zero, is returned if the function failed. See Appendix A.
Comments	Only one group can exist at any time for the "HG" commands. Groups can cross hub boundaries. Groups may be defined and redefined at any time. All "HG" commands will act upon the last PortIdList defined by HGSetGroupType(Index, PortIdList). This command can be used to reset a group previously set by HGSetGroup command.

HGSetSpeed

Description	Sets selected speed for all ports associated with the PortIdGroup defined by the previous HGSetGroup(PortIdGroup) command.. The speed selected must be appropriate to the addressed SmartCard type.
Syntax	int HGSetSpeed(int iSpeed)
Parameters	*iSpeed* **int** Determines the speed of the Port: `SPEED_10MHZ` Sets a 10 MB capable SmartCard to a 10 MHZ Signaling rate `SPEED_100MHZ` Sets a 100 MB capable SmartCard to a 100 MHZ Signaling rate `SPEED_4MHZ` Sets a 4 MB capable SmartCard to a 4 MHZ Signaling rate `SPEED_16MHZ` Sets a 16 MB capable SmartCard to a 16 MHZ Signaling rate `SPEED_155MHZ` Sets a 155 MB capable SmartCard to a 155 MHZ Signaling rate `SPEED_25MHZ` Sets a 25 MB capable SmartCard to a 25 MHZ Signaling rate
Return Value	The return value is >= 0 if the function executed successfully. A failure code, which is less than zero, is returned if the function failed. See Appendix A.
Comments	None

HGSetTokenRingAdvancedControl

Description	Generates specialized frames for all ports associated with the PortIdGroup defined by the previous HGSetGroup(PortIdGroup) command. This command only works for TokenRing SmartCard.
Syntax	int HGSetTokenRingAdvancedControl(TokenRingAdvancedStructure *pTRAdvancedStructure)
Parameters	*pTRAdvancedStructure* TokenRingAdvancedStructure* Points to a TokenRingAdvancedStructure (see page 70) which contains all the information required to transmit special control frames.
Return Value	The return value is >= 0 if the function executed successfully. A failure code, which is less than zero, is returned if the function failed. See Appendix A.
Comments	This command will cause ring operation to fail if not used with full knowledge of the Token Ring Architectural Specification.

HGSetTokenRingErrors

Description	Simultaneously generates error frame traffic for all ports associated with the PortIdGroup defined by the previous HGSetGroup(PortIdGroup) command. This command only works for TokenRing SmartCard.
Syntax	int HGSetTokenRingErrors(int ErrorTrafficRatio, int iTRErrors)
Parameters	*ErrorTraficRatio* **int** Specifies the error traffic ratio in tenths of percent. Ranges anywhere from 0 to 1000. A value of 0 will turn off error generation. *iTRErrors* **int** Specifies the type of frame errors to generate. Value can be a combined OR of the following defines: `TR_ERR_FCS` FCS errors `TR_ERR_FRAME_COPY` Frame copy errors `TR_ERR_FRAME_BIT` Frame Bit errors `TR_ERR_FRAME_FS` FS Frame errors `TR_ERR_ABORT_DELIMITER` Abort delimiter errors `TR_ERR_BURST` Burst errors
Return Value	The return value is >= 0 if the function executed successfully. A failure code, which is less than zero, is returned if the function failed. See Appendix A.
Comments	The number in the ratio is nominally in tenths of a percent. However, as it is rationalized to a count the precision will be poor at large percentage values.

HGSetTokenRingLLC

Description	Simultaneously configures an LLC frame for all ports associated with the PortIdGroup defined by the previous HGSetGroup(PortIdGroup) command. This command only works for TokenRing SmartCards.
Syntax	int HGSetTokenRingLLC(TokenRingLLCStructure *pTRLStructure)
Parameters	*pTRLStructure* **TokenRingLLCStructure*** Points to a TokenRingLLCStructure which contains all the information required to preform LLC Type 1 frames.
Return Value	The return value is >= 0 if the function executed successfully. A failure code, which is less than zero, is returned if the function failed. See Appendix A.
Comments	TokenRing MAC header also has to be defined for this command to take effect.

HGSetTokenRingMAC

Description	Simultaneously configures a TokenRing MAC header for all ports associated with the PortIdGroup defined by the previous HGSetGroup(PortIdGroup) command. This command only works for TokenRing SmartCard.
Syntax	int HGSetTokenRingMAC(TokenRingMACStructure *pTRMStructure)
Parameters	*pTRMStructure* **TokenRingMACStructure*** Points to a TokenRingMACStructure (see page 69) which defines a preformed MAC header.
Return Value	The return value is >= 0 if the function executed successfully. A failure code, which is less than zero, is returned if the function failed. See Appendix A.
Comments	None

HGSetTokenRingProperty

Description	Simultaneously configures ring operation characteristics for all ports associated with the PortIdGroup defined by the previous HGSetGroup(PortIdGroup) command. This command only works for TokenRing SmartCard.
Syntax	int HGSetTokenRingProperty(TokenRingPropertyStructure *pTRPStructure)
Parameters	*pTRPStructure* **TokenRingPropertyStructure*** Points to a TokenRingPropertyStructure (see page 70) which contains all the information required to configure ring operation.
Return Value	The return value is >= 0 if the function executed successfully. A failure code, which is less than zero, is returned if the function failed. See Appendix A.
Comments	This command defines card properties which are retained in non-volatile storage. These parameters should not be altered on a live ring as they will probably cause ring malfunction (usually Beaconing by other stations which might cause them to close down pending a hard reset).

HGSetTokenRingSrcRouteAddr

Description	Simultaneously configures a Source Route Address(SRA) for all ports associated with the PortIdGroup defined by the previous HGSetGroup(PortIdGroup) command. This command only works for TokenRing SmartCard.
Syntax	int HGSetTokenRingSrcRouteAddr(int UseSRA, int *piData)
Parameters	*UseSRA* **int** specifies whether an SRA field will be included in a TokenRing frame. `0` `No SRA defined` `1` `Use SRA defined in piData parameter.` *piData* **int *** Points to an array of int which contains the Source Route Address information. The maximum length of this array is 32 and the length information is encoded in the lower 5 bits of the first byte of SRA.
Return Value	The return value is >= 0 if the function executed successfully. A failure code, which is less than zero, is returned if the function failed. See Appendix A.
Comments	his field is part of a pre-formed header and so the MAC header has to be active for it to be active. The data in this field will be parsed by the card to determine the size of the source routing field to use and the maximum frame size to transmit. (See the Token Ring Architectural Reference for details of how to code this field.)

HGSetVGProperty

Description	Simultaneously configures VG SmartCards operation characteristics for all ports associated with the PortIdGroup defined by the previous HGSetGroup(PortIdGroup) command.
Syntax	int HGSetVGProperty(VGCardPropertyStructure *pVGPStructure)
Parameters	*pVGPStructure* **VGCardPropertyStructure*** Points to a VGCardPropertyStructure (see the section on Data Structures) which contains all the information required to configure VG Cards.
Return Value	The return value is >= 0 if the function executed successfully. A failure code, which is less than zero, is returned if the function failed. See Appendix A.
Comments	None

HGStart

Description	Simultaneously starts transmission of packets from all ports associated with the PortIdGroup defined by previous HGSetGroup(PortIdGroup) command.
Syntax	int HGStart(void)
Parameters	None
Return Value	The return value is >= 0 if the function executed successfully. A failure code, which is less than zero, is returned if the function failed. See Appendix A.
Comments	This command works in conjunction with HTSeparateHubCommands. If no setting is specified, the default used for HGStart is HUB_DEFAULT_ACTION.

HGStep

Description	Simultaneously causes the transmission of a single packet or burst from all ports associated with the PortIdGroup defined by the previous HGSetGroup(PortIdGroup) command.
Syntax	int HGStep(void)
Parameters	None
Return Value	The return value is >= 0 if the function executed successfully. A failure code, which is less than zero, is returned if the function failed. See Appendix A.
Comments	This command works in conjunction with HTSeparateHubCommands. If no setting is specified, the default used for HGStep is HUB_DEFAULT_ACTION.

HGStop

Description	Simultaneously halts the transmission of packets from all ports associated with the PortIdGroup defined by the previous HGSetGroup(PortIdGroup) command.
Syntax	int GStop(void)
Parameters	None
Return Value	he return value is >= 0 if the function executed successfully. A failure code, which is less than zero, is returned if the function failed. See Appendix A.
Comments	This command works in conjunction with HTSeparateHubCommands. If no setting is specified, the default used for HGStop is HUB_DEFAULT_ACTION.

HGSymbol

Description	Generates symbol error for the 100 Mbits SmartCard. The group of ports can be set up to transmit a series of packets which generates invalid wave form data pattern. This command applies only to 100 Mbits SmartCards.
Syntax	int HGSymbol(int Mode)
Parameters	*Mode* int Identifies the symbol mode of the board. Legal modes can be conveyed using the following constants: `SYMBOL_OFF` Turn off symbol errors `SYMBOL_ON` Turn on symbol errors
Return Value	The return value is >= 0 if the function executed successfully. A failure code, which is less than zero, is returned if the function failed. See Appendix A.
Comments	None

HGTransmitMode

Description	Indicates how to control the transmission of packets when running for all ports associated with the PortIdGroup defined by the previous HGSetGroup(PortIdGroup) command.
Syntax	int HGTransmitMode(int iMode)
Parameters	*iMode* **int** Indicates the mode of operation when transmitting packets according to the following defined values: `CONTINUOUS_PACKET_MODE` Sets port to transmit single packets continuously. `SINGLE_BURST_MODE` Sets port to transmit a single burst of packets, and then stop. `MULTI_BURST_MODE` Sets port to transmit multiple bursts of packets, indicated by the HxMultiBurstCount command, with each burst being separated by the amount specified in the HxBurstGap command, and then stop. `CONTINUOUS_BURST_MODE` Sets port to continuously send bursts of packets with each burst being separated by the amount specified in the HxBurstGap command. `ECHO_MODE` Sets port to transmit a single packet upon receiving a Receive Trigger event.
Return Value	The return value is >= 0 if the function executed successfully. A failure code, which is less than zero, is returned if the function failed. See Appendix A.
Comments	None

HGTrigger

Description	Sets up the triggering mechanism from all ports associated with the PortIdGroup defined by the previous HGSetGroup(PortIdGroup) command. HTTrigger specifies the trigger number (1 or 2), the operational configuration, trigger pattern range, trigger pattern offset and trigger pattern data. This function applies only to SmartCards.
Syntax	int HGTrigger(int iTrigId, int iConfig, HTTriggerStructure* phtTStruct)
Parameters	*iTrigId* **int** Identifies the trigger source. There are two possible triggers on each SmartCard. They are identified as follows: `HTTRIGGER_1` Trigger 1 `HTTRIGGER_2` Trigger 2 *iConfig* **int** There are three possible types of configurations for the triggers on the SmartCards: `HTTRIGGER_OFF` disables the triggering mechanism for TrigId `HTTRIGGER_ON` enables the triggering mechanism for TrigId `HTTRIGGER_DEPENDENT` enables the triggering mechanism for TrigId after the other trigger has triggered. *phtTStruct* **HTTriggerStructure*** A structure containing the trigger pattern, offsets and ranges. Note that the maximum range is 6 bytes. Though the range is specified in bytes, the specified number is rounded up to the nearest byte multiple. i.e.; the SmartCards can only trigger on patterns that are a length that is a multiple of 8 bits. The offset ranges from 1 to 12,112 bits (specified in bits). See section 5 of this document for more information on the **HTTriggerStructure**.
Return Value	The return value is >= 0 if the function executed successfully. A failure code, which is less than zero, is returned if the function failed. See Appendix A.
Comments	It is possible to misconfigure triggers when using **HTTRIGGER_DEPENDENT**. A TrigId set to **HTTRIGGER_DEPENDENT** is to be active after the other TrigId trigger has occurred. So, if trigger 2 is set to be dependent on trigger 1: A properly configured trigger dependent combination would be: `HGTrigger(HTTRIGGER_1,HTTRIGGER_ON,&TStruct)` `HGTrigger(HTTRIGGER_2,HTTRIGGER_DEPENDENT,&TStruct)` A misconfigured trigger combination would be: `HGTrigger(HTTRIGGER_1,HTTRIGGER_OFF,&TStruct)` `HGTrigger(HTTRIGGER_2,HTTRIGGER_DEPENDENT,&TStruct)` Here, trigger 2 will never fire because trigger 1 is off.

HGVFD

Description	Sends VFD information to all ports in the group defined by the previous HGSetGroup(PortIdGroup) command. Applies only to SmartCards.
Syntax	int HGVFD(int VFDId, HTVFDStructure* HStruct)
Parameters	*VFDId* **int** Identifies the VFD pattern being addressed. There are a total of three VFD patterns. They are identified as shown below: `HVFD_1` `VFD Pattern 1` `HVFD_2` `VFD Pattern 2` `HVFD_3` `VFD Pattern 3` *HStruct* **HTVFDStructure*** Structure holds VFD information used with a SmartCard (VFD Configuration, Range, Offset and Pattern).
Return Value	The return value is >= 0 if the function executed successfully. A failure code, which is less than zero, is returned if the function failed. See Appendix A.
Comments	None

HTAlign

Description	Create alignment errors on the selected Hub/Slot/Port. This function is valid for SmartCards only.
Syntax	int HTAlign(int iBits, int iHub, int iSlot, int iPort)
Parameters	*iBits* **int** Sets the number of extra alignment bits to transmit. Valid range is 0 to 7. Setting this value to 0 disables generation of packets with alignment bit errors. *iHub* **int** Identifies the hub where the SmartCard is located. The range is 0 (first hub) through N(number of hubs) -1. Remember to subtract one since the hub identification starts at 0. Important: See *Working with Multiple Hubs* in Chapt 1. *iSlot* **int** Identifies the slot where the SmartCard is located. Ranges from 0 (first slot in iHub) to 19 (last card in *Hub*). *iPort* **int** Identifies the SmartCard port. With current cards, i*Port* is always 0.
Return Value	The return value is >= 0 if the function executed successfully. A failure code, which is less than zero, is returned if the function failed. See Appendix A.
Comments	None

HTBurstCount

Description	Sets the number of packets to transmit in a single burst from a SmartCard.
Syntax	int HTBurstCount(long lVal, iHub, iSlot, iPort)
Parameters	*lVal* **long** Specifies the burst count. Ranges from 1 to 16,777,215. *iHub* **int** Identifies the hub where the SmartCard is located. The range is 0 (first hub) through N(number of hubs) -1. Remember to subtract one since the hub identification starts at 0. Important: See *Working with Multiple Hubs* in Chapt 1. *iSlot* **int** Identifies the slot where the SmartCard is located. Ranges from 0 (first slot in *Hub*) to 19 (last card in *Hub*). *iPort* **int** Identifies the SmartCard port. On current cards, *Port* is always 0.
Return Value	The return value is >= 0 if the function executed successfully. A failure code, which is less than zero, is returned if the function failed. See Appendix A.
Comments	This instruction does not cause a burst of packets to be sent. Use **HGTransmitMode,** or **HTTransmitMode** to select a burst mode, and then use **HGRun, HGStart, HGStep, HTGroupStart, HTGroupStep,** or **HTRun** to actually start the transmission of the burst.

HTBurstGap

Description	Sets up the time gap between bursts of packets from a SmartCard.
Syntax	int HTBurstGap(long lVal, iHub, iSlot, iPort)
Parameters	*lVal* **long** Specifies the inter-burst gap in tenths of a microsecond. Ranges anywhere from 1 to 16,777,215. *iHub* **int** Identifies the hub where the SmartCard is located. The range is 0 (first hub) through N(number of hubs) -1. Remember to subtract one since the hub identification starts at 0. Important: See *Working with Multiple Hubs* in Chapt 1. *iSlot* **int** Identifies the slot where the SmartCard is located. Ranges from 0 (first slot in *Hub*) to 19 (last card in *Hub*). *iPort* **int** Identifies the SmartCard port. On current cards, *Port* is always 0.
Return Value	he return value is >= 0 if the function executed successfully. A failure code, which is less than zero, is returned if the function failed. See Appendix A.
Comments	This instruction is only applied if **HGTransmitMode**, or **HTTransmitMode** has selected one of the MULTI_BURST_MODE, or CONTINUOUS_BURST mode selections. Use **HGRun, HGStart, HTGroupStart,** and **HTRun** to actually start the transmission of the bursts.

HTBurstGapAndScale

Description	Sets up the time gap between bursts of packets, at the given scale from a SmartCard.
Syntax	int TBurstGapAndScale(long lVal, int iScale, iHub, iSlot, iPort)
Parameters	*lVal* **long** Specifies the inter-burst gap value. Legal values range anywhere from the lowest gap possible on the card being addressed up to a maximum of 1.6 sec. *iScale* **int** Specifies the scale of the gap value according to following: `NANO_SCALE = nanoseconds scale` `MICRO_SCALE = microseconds scale` `MILLI_SCALE = milliseconds scale.` *iHub* *iHub* **int** Identifies the hub where the SmartCard is located. The range is 0 (first hub) through N(number of hubs) -1. Remember to subtract one since the hub identification starts at 0. Important: See *Working with Multiple Hubs* in Chapt 1. *iSlot* **int** Identifies the slot where the SmartCard is located. Ranges from 0 (first slot in *Hub*) to 19 (last card in *Hub*). *iPort* **int** Identifies the SmartCard port. (On the current SmartCards, *Port* is always 0.)
Return Value	The return value is >= 0 if the function executed successfully. A failure code, which is less than zero, is returned if the function failed. See Appendix A.
Comments	This instruction is only applied if **HGTransmitMode,** or **HTTransmitMode** has selected one of the MULTI_BURST_MODE, or CONTINUOUS_BURST mode selections. Use **HGRun, HGStart, HTGroupStart,** and **HTRun** to actually start the transmission of the bursts.

HTCardModels

Description	Retrieves an array of integers which corresponds to the card model written at the top of the SmartCard front panel.
Syntax	int HTCardModels(int iCardModels[MAX_HUBS][MAX_SLOTS])
Parameters	*iCardModels* **int** On return, this array will be filled with CM_ values where the hub and slot indices of the array refer to an iCardModel entry which correspond to the model of the SmartCard actually plugged into the SmartBits chassis. The returned values will be one of the following: CM_UNKOWN CM_NOT_PRESENT CM_SE_6205 CM_SC_6305 CM_ST_6405 CM_ST_6410 CM_SX_7205 CM_SX_7405 CM_SX_7410 CM_TR_8405 CM_VG_7605 CM_L3_6705 CM_AT_9025 CM_AT_9155 CM_AS_9155 CM_GX_1405 CM_WN_3405 CM_AT_9015 CM_AT_9020 CM_AT_9034 CM_AT_9045 CM_AT_9622 CM_L3_6710 CM_SX_7210 CM_ML_7710
Return Value	The return value is >= 0 if the function executed successfully. A failure code, which is less than zero, is returned if the function failed. See Appendix A.
Comments	None

HTClearPort

Description	This command is used to clear internal counters in a SmartCards port.
Syntax	int HTClearPort(int iHub, int iSlot, int iPort)
Parameters	*iHub* **int** Identifies the hub where the SmartCard is located. The range is 0 (first hub) through N(number of hubs) -1. Remember to subtract one since the hub identification starts at 0. Important: See *Working with Multiple Hubs* in Chapt 1. *iSlot* **int** Identifies the slot where the SmartCard is located. Ranges from 0 (first slot in *Hub*) to 19 (last card in *Hub*). *iPort* **int** Identifies the SmartCard port. (On the current SmartCards, *Port* is always 0.)
Return Value	The return value is >= 0 if the function executed successfully. A failure code, which is less than zero, is returned if the function failed. See Appendix A.
Comments	None

HTCollision

Description	etermines the collision mode, and count for the 100 Mbits Fast SmartCard.
Syntax	int HTCollision(CollisionStructure* CStruct, int iHub, int iSlot, int iPort)
Parameters	*CStruct* **CollisionStructure*** Holds information pertaining to the collision mode (off, on), and count. *iHub* **int** Identifies the hub where the SmartCard is located. The range is 0 (first hub) through N(number of hubs) -1. Remember to subtract one since the hub identification starts at 0. Important: See *Working with Multiple Hubs* in Chapt 1. *iSlot* **int** Identifies the slot where the SmartCard is located. Ranges from 0 (first slot in *Hub*) to 19 (last card in *Hub*). *iPort* **int** Identifies SmartCard port. On current cards, *Port* is always 0.
Return Value	The return value is >= 0 if the function executed successfully. The return value is < 0 if the function failed. See Appendix A.
Comments	See the definition of **CollisionStructure** in the **Data Structures** portion of this manual. The offset and length fields are not used for 100 Mbits SmartCard.

HTCollisionBackoffAggressiveness

Description	Determines the wait factor for backing off from multiple collisions.
Syntax	int HTCollisionBackoffAggressiveness(unsigned int uiAggressiveness, int iHub, int iSlot, int iPort)
Parameters	*uiAggressiveness* **unsigned int** Set the backoff factor. The amount of time actually delayed follows as powers of two using this factor. *iHub* **int** Identifies the hub where the SmartCard is located. The range is 0 (first hub) through N(number of hubs) -1. Remember to subtract one since the hub identification starts at 0. Important: See *Working with Multiple Hubs* in Chapt 1. *iSlot* **int** Identifies the slot where the SmartCard is located. Ranges from 0 (first slot in *Hub*) to 19 (last card in *Hub*). *iPort* **int** Identifies the SmartCard port. On the current SmartCards, i*Port* is always 0.
Return Value	The return value is >= 0 if the function executed successfully. A failure code, which is less than zero, is returned if the function failed. See Appendix A.
Comments	None

HTCRC

Description	Create packets with CRC errors on the selected Hub/Slot/Port. This function is valid for SmartCards only.
Syntax	int HTCRC(int iMode, int iHub, int iSlot, int iPort)
Parameters	*iMode* **int** Set the error facility on or off. Valid flags: ET_ON and ET_OFF *iHub* **int** Identifies the hub where the SmartCard is located. The range is 0 (first hub) through N(number of hubs) -1. Remember to subtract one since the hub identification starts at 0. Important: See *Working with Multiple Hubs* in Chapt 1. *iSlot* **int** Identifies the slot where the SmartCard is located. Ranges from 0 (first slot in *Hub*) to 19 (last card in *Hub*). *iPort* **int** Identifies SmartCard port. On current cards, i*Port* is always 0.
Return Value	The return value is >= 0 if the function executed successfully. A failure code, which is less than zero, is returned if the function failed. See Appendix A.
Comments	(Not used by the TokenRing SmartCard)

HTDataLength

Description	This command is used to specify the length of the data field in the packets being transmitted by the specified SmartBits port. This command applies only to SmartCards. A random packet size can also be selected.
Syntax	int HTDataLength(int iLength, int iHub, int iSlot, int iPort)
Parameters	*iLength* int Specifies the length of the packets that are to be transmitted on the addressed port. The length is specified in bytes, and it includes everything between the preamble and the CRC. The actual transmitted packet will be extended four bytes for the CRC. Length can range from 1 to 8191. A Length of 0 will cause random packet sizes to be transmitted. *iHub* **int** Identifies the hub where the SmartCard is located. The range is 0 (first hub) through N(number of hubs) -1. Remember to subtract one since the hub identification starts at 0. Important: See *Working with Multiple Hubs* in Chapt 1. *iSlot* int Identifies the slot where the SmartCard is located. Ranges from 0 (first slot in *Hub*) to 19 (last card in *Hub*). *iPort* int Identifies the SmartCard port. (On the current SmartCards, *Port* is always 0.)
Return Value	The return value is >= 0 if the function executed successfully. A failure code, which is less than zero, is returned if the function failed. See Appendix A.
Comments	None

HTDribble

Description	Create dribbling bit errors on the selected Hub/Slot/Port.	
Syntax	int HTDribble(int iBits, int iHub, int iSlot, int iPort)	
Parameters	*iBits*	**int** Sets the number of dribbling bits to transmit. Valid range is 0 to 7. Setting this value to 0 disables generation of packets with dribbling bit errors.
	iHub	**int** Identifies the hub where the SmartCard is located. The range is 0 (first hub) through N(number of hubs) -1. Remember to subtract one since the hub identification starts at 0. Important: See *Working with Multiple Hubs* in Chapt 1.
	iSlot	**int** Identifies the slot where the SmartCard is located. Ranges from 0 (first slot in *Hub*) to 19 (last card in *Hub*).
	iPort	**int** Identifies the SmartCard port. On the current SmartCards, i*Port* is always 0.
Return Value	The return value is >= 0 if the function executed successfully. A failure code, which is less than zero, is returned if the function failed. See Appendix A.	
Comments	None	

HTDuplexMode

Description	Indicates whether to set full duplex or half duplex mode for the hub/slot/port indicated.
Syntax	int HTDuplexMode(int iMode, int iHub, int iSlot, int iPort)
Parameters	*iMode* **int** Sets the Duplex mode where iMode should be one of the following: `FULLDUPLEX_MODE` `Full duplex mode on` `HALFDUPLEX_MODE` `Half duplex mode on` *iHub* **int** Identifies the hub where the SmartCard is located. The range is 0 (first hub) through N(number of hubs) -1. Remember to subtract one since the hub identification starts at 0. Important: See *Working with Multiple Hubs* in Chapt 1. *iSlot* **int** Identifies the slot where the SmartCard is located. Ranges from 0 (first slot in *Hub*) to 19 (last card in *Hub*). *iPort* **int** Identifies the SmartCard port. On the current SmartCards, i*Port* is always 0.
Return Value	The return value is >= 0 if the function executed successfully. A failure code, which is less than zero, is returned if the function failed. See Appendix A.
Comments	(Not used by the TokenRing SmartCard)

HTFillPattern

Description	Specifies the background fill pattern that is laid into the frame. This pattern is written over by other fields such as VFDs and Signature fields. If the Fill Pattern is not specified, the default is all 0s.	
Syntax	int HTFillPattern(int iSize, int* piData, int iHub, int iSlot, int iPort)	
Parameters	*iSize*	**int** Identifies the size, in bytes, of the fill pattern contained in the Data array. Size may range from 60 to 2044. A value of 0 (zero) will cause a random data pattern to be generated.
	piData	**int*** Points to the array which contains the data pattern to be transmitted. A value of NULL will cause a random data pattern to be generated.
	iHub	**int** Identifies the hub where the SmartCard is located. The range is 0 (first hub) through N(number of hubs) -1. Remember to subtract one since the hub identification starts at 0. Important: See *Working with Multiple Hubs* in Chapt 1.
	iSlot	**int** Identifies the slot where the SmartCard is located. Ranges from 0 (first slot in *Hub*) to 19 (last card in *Hub*).
	iPort	**int** Identifies the SmartCard port. (On the current SmartCards, *Port* is always 0.)
Return Value	The return value is >= 0 if the function executed successfully. A failure code, which is less than zero, is returned if the function failed. See Appendix A.	
Comments	A random data pattern will be generated if either the iSize parameter is 0, or the piData array pointer parameter in NULL.	

HTFindMIIAddress

Description	This function will find the first MII PHY address which appears to have a legal device present. This command applies only to 100 Mb SmartCards.	
Syntax	int HTFindMIIAddress(unsigned int* puiAddress, unsigned short* puiControl Bits, int Hub, int Slot, int Port)	
Parameters	*puiAddress*	**unsigned int*** Specific address found is returned here.
	puiControlBits	**unsigned short*** Control register bits read are returned here.
	iHub	**int** Identifies the hub where the SmartCard is located. The range is 0 (first hub) through N(number of hubs) -1. Remember to subtract one since the hub identification starts at 0. Important: See *Working with Multiple Hubs* in Chapt 1.
	iSlot	**int** Identifies the slot where the SmartCard is located. Ranges from 0 (first slot in *iHub*) to 19 (last card in *Hub*).
	iPort	**int** Identifies the SmartCard port. (On the current SmartCards, *Port* is always 0.)
Return Value	The return value is >= 0 if the function executed successfully. A failure code, which is less than zero, is returned if the function failed. See Appendix A.	
Comments	Of the 32 possible addresses on an MII transceiver, this command will find the lowest address which returns a legal control register value.	

HTFrame

Description	Puts specified frame elements into the SmartCard frame buffer. Use HTFrame in conjunction with NSCreateFrame, NSModifyFrame, and NSCreateFrameAndPayload.	
Syntax	long HTFrame (long iFrameID, int iHub, int iSlot, int iPort, unsigned short uiStreamIndex)	
Parameters	*lFrameID*	**long** The FrameID number is unique for each frame created with NSCreateFrame. It is returned when a frame is created, and is used to identify the specified frame "blueprint". This number does not change when NSModifyFrame is used.
	iHub	**int** Identifies the hub where the SmartCard is located. The range is 0 (first hub) through N(number of hubs) -1. Remember to subtract one since the hub identification starts at 0. Important: See *Working with Multiple Hubs* in Chapt 1.
	iSlot	**int** Identifies the slot where the SmartCard is located. Ranges from 0 (first slot in *Hub*) to 19 (last card in *Hub*).
	iPort	**int** Identifies the SmartCard port. (On the current SmartCards, *Port* is always 0.)
	uiStreamIndex	**unsigned short** This uiStreamIndex has a value of 0 (not used), unless you are working with ATM. Because of the complexity of an ATM stream setup, each ATM stream must be indexed. ATM streams include traffic information as well as frame content. See ATM_STREAM in the Message Functions manual for more information. Since NSCreateFrame functions are intended for "layer 2" mode, VTEs and Signature fields are not part of these frames.
Return Value	The return value is >= 0 if the function executed successfully. A negative value is returned if the function fails. See Appendix A.	
Comments	A related function is NSDeleteFrame.	

HTGap

Description	pecifies the inter-packet gap that is to be transmitted on the addressed port. Also allows random gaps to be transmitted. This command applies only to SmartCards.	
Syntax	int HTGap(long lPeriod, int iHub, int iSlot, int iPort)	
Parameters	*lPeriod*	**long** On 10Mbit cards, this value equals the number of tenths of microseconds between transmitted packets in bit time. On 100Mbit SmartCards, this value equals the number of tens of nanoseconds between transmitted packets. In either case, lPeriod may range from 10 to 1,600,000. A value of 0 (long) will cause a random gap to be generated. For example, if lPeriod = 96, for 10Mbit cards, the Gap will be 96*0.1us = 9.6us, and for 100Mbit cards, the Gap will be 96*10ns = 960ns. In both cases, the cards get the minimum legal interpacket gap.
	iHub	**int** Identifies the hub where the SmartCard is located. The range is 0 (first hub) through N(number of hubs) -1. Remember to subtract one since the hub identification starts at 0. Important: See *Working with Multiple Hubs* in Chapt 1.
	iSlot	**int** Identifies the slot where the SmartCard is located. Ranges from 0 (first slot in *Hub*) to 19 (last card in *Hub*).
	iPort	**int** Identifies the SmartCard port. (On the current SmartCards, *Port* is always 0.)
Return Value	The return value is >= 0 if the function executed successfully. A failure code, which is less than zero, is returned if the function failed. See Appendix A.	
Comments	None	

HTGapAndScale

Description	Specifies the inter-packet gap (based on a selected time unit "scale") to be transmitted from the specified port. Also allows random gaps to be transmitted. This command applies only to SmartCards.
Syntax	int HTGapAndScale(long lPeriod, int iScale, int iHub, int iSlot, int iPort)
Parameters	*lPeriod* **long** Identifies the number of time units between transmitted packets. Period may range from 1 to 1,600,000,000. A value of 0 (long) will cause a random gap to be generated. *iScale* **int** Determines the size of the unit (scale) for the lPeriod parameter based on the following: `NANO_SCALE = nanoseconds scale` `MICRO_SCALE = microseconds scale` `MILLI_SCALE = milliseconds scale.` *iHub* **int** Identifies the hub where the SmartCard is located. The range is 0 (first hub) through N(number of hubs) -1. Remember to subtract one since the hub identification starts at 0. Important: See *Working with Multiple Hubs* in Chapt 1. *iSlot* **int** Identifies the slot where the SmartCard is located. Ranges from 0 (first slot in *Hub*) to 19 (last card in *Hub*). *iPort* **int** Identifies the SmartCard port. (On the current SmartCards, *Port* is always 0.)
Return Value	The return value is >= 0 if the function executed successfully. A failure code, which is less than zero, is returned if the function failed. See Appendix A.
Comments	Gap is set according to the valid increments of the network topography. For example, if a 100 Mbps Ethernet network is being tested, the gap is set in increments of 40 ns. Whether nanoseconds, microseconds, or milliseconds is selected, SmartLib divides the increment (in this case, 40 ns) into the desired gap setting, and drops the remainder.

HTGetCardModel

Description	Retrieves a character string which matches the card model written at the top of the SmartCard front panel.
Syntax	int HTGetCardModel(char* pszCardModel, int iHub, int iSlot, int iPort)
Parameters	*pszCardModelt* **char*** A pointer to a character array into which the Card Model identifier will be written. The card model identifier is the front panel label on the SmartCard (e.g. L3-6710, ML-7710, AT-9622, etc). *iHub* **int** Identifies the hub where the SmartCard is located. The range is 0 (first hub) through N(number of hubs) -1. Remember to subtract one since the hub identification starts at 0. Important: See *Working with Multiple Hubs* in Chapt 1. *iSlot* **int** Identifies the slot where the SmartCard is located. Ranges from 0 (first slot in *Hub*) to 19 (last card in *Hub*). *iPort* **int** Identifies the SmartCard port. On current cards, *Port* is always 0.
Return Value	Upon success, the return value is the correct CM_ integer value for the SmartCard addressed. Valid values are: `CM_NOT_PRESENT` `CM_SE_6205` `CM_SC_6305` `CM_ST_6405` `CM_ST_6410` `CM_SX_7205` `CM_SX_7405` `CM_SX_7410` `CM_TR_8405` `CM_VG_7605` `CM_L3_6705` `CM_AT_9025` `CM_AT_9155` `CM_AS_9155` `CM_GX_1405` `CM_WN_3405` `CM_AT_9015` `CM_AT_9020` `CM_AT_9034` `CM_AT_9045` `CM_AT_9622` `CM_L3_6710` `CM_SX_7210` `CM_ML_7710` A failure code, which is less than zero, is returned if the function failed. See Appendix A.
Comments	None

HTGetCounters

Description	Retrieves information from all the counters within the addressed SmartBits port. This information is placed into the HTCountStructure pointed to in the input argument. This command applies only to SmartCards.	
Syntax	int HTGetCounters(HTCountStructure* phtHStruct, int iHub, int iSlot, int iPort)	
Parameters	*phtHStruct*	**HTCountStructure*** A pointer to the structure in which count information is to be placed. See section 5 of this document for a description of the HTCountStructure structure.
	iHub	**int** Identifies the hub where the SmartCard is located. The range is 0 (first hub) through N(number of hubs) -1. Remember to subtract one since the hub identification starts at 0. Important: See *Working with Multiple Hubs* in Chapt 1.
	iSlot	**int** Identifies the slot where the SmartCard is located. Ranges from 0 (first slot in *Hub*) to 19 (last card in *Hub*).
	iPort	**int** Identifies the SmartCard port. (On the current SmartCards, *Port* is always 0.)
Return Value	The return value is >= 0 if the function executed successfully. A failure code, which is less than zero, is returned if the function failed. See Appendix A.	
Comments	It is assumed that the calling function has declared a HTCountStructure and reserved memory for it.	

HTGetEnhancedCounters

Description	Retrieves standard counters and card related counters from the port. This information is placed into the EnhancedCounterStructure pointed to in the input argument.	
Syntax	int HTGetEnhancedCounters(EnhancedCountStructure* pEnCounter, int iHub, int iSlot, int iPort)	
Parameters	*pEnCounter*	**EnhancedCounterStructure*** A pointer to the first element of an array of counter structures in which count information is to be placed. (See page 56.)
	iHub	**int** Identifies the hub where the SmartCard is located. The range is 0 (first hub) through N(number of hubs) -1. Remember to subtract one since the hub identification starts at 0. Important: See *Working with Multiple Hubs* in Chapt 1.
	iSlot	**int** Identifies the slot where the TokenRing SmartCard is located. Ranges from 0 (first slot in *Hub*) to 19 (last card in *Hub*).
	iPort	**int** Identifies the TokenRing SmartCard port. (On the current TokenRing SmartCard, *Port* is always 0.)
Return Value	The return value is >= 0 if the function executed successfully. A failure code, which is less than zero, is returned if the function failed. See Appendix A.	
Comments	None	

HTGetEnhancedStatus

Description	Retrieves card related status information from the port. This information is placed into the int pointed to in the input argument. This command applies to SmartCards and TokenRing SmartCards.	
Syntax	int HTGetEnhancedStatus(unsigned long* piData, int iHub, int iSlot, int iPort)	
Parameters	*piData*	**unsigned long*** A pointer to an unsigned long in which status information is to be placed.
	iHub	**int** Identifies the hub where the SmartCard is located. The range is 0 (first hub) through N(number of hubs) -1. Remember to subtract one since the hub identification starts at 0. Important: See *Working with Multiple Hubs* in Chapt 1.
	iSlot	**int** Identifies the slot where the TokenRing SmartCard is located. Ranges from 0 (first slot in *Hub*) to 19 (last card in *Hub*).
	iPort	**int** Identifies the TokenRing SmartCard port. (On the current TokenRing SmartCard, *Port* is always 0.)

Return Value	The return value is >= 0 if the function executed successfully. A failure code, which is less than zero, is returned if the function failed. See Appendix A. If the return is successful, then the following is true: *piData* A bitmap of card status information is returned in the high three bytes: **If bit set on a Token Ring SmartCard:** TR_STATUS_ACCESSED Card received stream download TR_STATUS_BADSTREAM Not used TR_STATUS_BURST_MODE Card is in burst mode TR_STATUS_BEACONING Card received MAC beacon frame TR_STATUS_DEVICE If set in half duplex, station If off in half duplex, MAU If set in full duplex, adapter If off in full duplex, concentrator TR_STATUS_EARLY_TOKEN_RELEASE Early token release enabled TR_STATUS_FULL_DUPLEX Full duplex TR_STATUS_16MB 16 Mbps mode TR_STATUS_RING_ALIVE Ready for TX TR_STATUS_LATENCY_STABLE Latency value stable for readout. TR_STATUS_TRANSMITTING Transmitting **If bit set on a Gigabit Ethernet SmartCard:** GIG_STATUS_LINK Link established GIG_STATUS_TX_PAUSE Pause holdoff in process GIG_STATUS_CAPTURED_FRAMES Frames captured GIG_STATUS_CAPTURE_STOPPED Capture stopped **If bit set on an SX-7410 SmartCard:** FAST7410_STATUS_LINK Link established

	FAST7410_STATUS_TX_PAUSE Pause holdoff in process **If bit set on a L3-6705 or L3-6710 SmartCard:** L3_STATUS_6710 If set, L3-6710, If off, L3-6705 **If bit set on a VG-xxxx SmartCard:** VG_STATUS_MODE If set, Ethernet, If off, TokenRing **If bit set on a Frame Relay SmartCard:** FR_STATUS_LINK_OK link established FR_STATUS_GROUP_MEMBER card is "grouped" FR_STATUS_UNI_UP UNI is up FR_STATUS_EIA_DSR DSR line is high FR_STATUS_EIA_CTS CTS line is high FR_STATUS_EIA_DCD DCD line is high FR_STATUS_EIA_TM TM line is high FR_STATUS_EIA_DTR DTR line is high FR_STATUS_EIA_RTS RTS line is high FR_STATUS_EIA_RDL RDL line is high FR_STATUS_EIA_LLB LLB line is high
Comments	The low byte contains card LED information. Please refer to the appendix on LED values for more information.

HTGetHubLEDs

Description	Determine the state of the LEDs on a SmartBits hub.
Syntax	int HTGetHubLEDs(int iHub, int* piLEDs)
Parameters	*iHub* **int** Identifies the hub where the SmartCard is located. The range is 0 (first hub) through N(number of hubs) -1. Remember to subtract one since the hub identification starts at 0. Important: See *Working with Multiple Hubs* in Chapt 1. piLEDs **int*** a pointer to an integer array of MAX_SLOTS size that receives the LED states of all SmartCards in hub iHub.
Return Value	The return value is >= 0 if the function executed successfully. A failure code, which is less than zero, is returned if the function failed. See Appendix A.
Comments	Behavior of this function is undefined if the hub contains passive cards.

HTGetLEDs

Description	Determine the state of the LEDs on an SmartCard type at the specified hub/slot/port.
Syntax	int HTGetLEDs(int iHub, int iSlot, int iPort)
Parameters	*iHub* **int** Identifies the hub where the SmartCard is located. The range is 0 (first hub) through N(number of hubs) -1. Remember to subtract one since the hub identification starts at 0. Important: See *Working with Multiple Hubs* in Chapt 1. *iSlot* **int** Identifies the slot where the card is located. Ranges from 0 (first slot in *Hub*) to 19 (last card in *Hub*). *iPort* **int** Identifies the card port.
Return Value	The return value is the current state of the LEDs. This return value can be and'ed against the following to determine if the LED is on. `HTLED_TXRED` Unconfigured card `HTLED_TXGREEN` Transmitting `HTLED_COLLRED` Collision detected `HTLED_COLLGREEN` Trigger detected `HTLED_RXRED` Receive with errors `HTLED_RXGREEN` Receive A failure code, which is less than zero, is returned if the function failed. See Appendix A.
Comments	This function is available only for SmartCards. LED return states are not a hardware function, but are derived from the states of the counters. If both HTLED_COLLRED and HTLED_COLLGREEN are set, then the LED is yellow. No other LED can be yellow.

HTGetHWVersion

Description	Retrieves version information of the specified SmartCard. Information is retrieved into *pulData*.
Syntax	int HTGetHWVersion(unsigned long* pulData, int iHub, int iSlot, int iPort)
Parameters	*pulData* **unsigned long*** A pointer to an unsigned long array in which version information is to be placed. The size of the array depends on specific card inquired. An array size of 32 is recommended. [See comments below.] *iHub* **int** Identifies the hub where the SmartCard is located. The range is 0 (first hub) through N(number of hubs) -1. Remember to subtract one since the hub identification starts at 0. For more information, see *Working with Multiple Hubs* in Chapt 1. *iSlot* **int** Identifies the slot where the SmartCard is located. Ranges from 0 (first slot in *Hub*) to 19 (last card in *Hub*). *iPort* **int** Identifies the Card port. (On the current SmartCards, *Port* is always 0.)
Return Value	The return value is >= 0 if the function executed successfully and will indicate the number of items in the pulData array which have been loaded with version information related to this SmartCard. For example, a TokenRing Card will return 3. A failure code, which is less than zero, is returned if the function failed. See Appendix A.
Comments	Each SmartCard will fill the pulData array with only that number of items that is given as the return value. No other items in the pulData will be changed. A TokenRing Card will return Firmware, Transmit, and Receive information in the unsigned long array pointed at by pulData. It is recommended to zero the pulData array items prior to this call.

HTGetStructure

Description	Sends a command to a SmartCard which accepts HTGetStructure() actions. The commands, defines, and structure definitions for this command can be found in the *Message Functions* manual for Layer 3, Multi-Layer, Gigabit, ATM, and Frame Relay SmartCards. These SmartCards allow control using HTSetCommand(), HTSetStructure(), and HTGetStructure(). The correct combination of iType parameter values and the structure parameter cause the SmartCards to be setup in an elegant and intricate manner.
Syntax	int HTGetStructure(int iType1,int iType2,int iType3,int iType4,void* pData,int iSize,int iHub, int iSlot, int iPort);
Parameters	*iType1* **int** defines the command action. The value (and action) depends on the SmartCard being addressed. iType2 **int** value depends on SmartCard *IType3* **int** value depends on SmartCard *IType4* **int** value depends on SmartCard *pData* **void*** Pointer to a structure or an array in which returned data will be placed. *iSize* **int** indicates the maximum size of the pData pointer which should be utilized. While in most cases this will be the size of the structure, in some cases it is the size of an array of structures or bytes. See the *Message functions* manual for clarification. *iHub* **int** Identifies the hub where the SmartCard is located. The range is 0 (first hub) through N(number of hubs) -1. Remember to subtract one since the hub identification starts at 0. Important: See *Working with Multiple Hubs* in Chapt 1. *iSlot* **int** Identifies the slot where the SmartCard is located. Ranges from 0 (first slot in *Hub*) to 19 (last card in *Hub*). *iPort* **int** Identifies the SmartCard port. (On the current SmartCard, *Port* is always 0.)
Return Value	The return value is >= 0 if the function executed successfully. The exact value will vary according to what iType parameters have been used The return value is < 0 if the function failed. See Appendix A.
Comments	See the *Message functions* manual for appropriate values for the iType and structure parameters for HTSetCommand(), HTSetStructure(), and HTGetStructure().

HTGroupStart

Description	Simultaneously starts the transmission of packets in a group of SmartCards within the specified hub. The group must have been previously defined using the "Set Group" commands.
Syntax	int HTGroupStart(int iHub)
Parameters	*iHub* **int** Identifies the hub where the SmartCard is located. The range is 0 (first hub) through N(number of hubs) -1. Remember to subtract one since the hub identification starts at 0. Important: See *Working with Multiple Hubs* in Chapt 1.
Return Value	The return value is >= 0 if the function executed successfully. A failure code, which is less than zero, is returned if the function failed. See Appendix A.
Comments	None

HTGroupStep

Description	Simultaneously causes the transmission of a single packet in each of a group of SmartCards within the specified hub. The group must have been previously defined using the "Set Group" commands.
Syntax	int HTGroupStep(int iHub)
Parameters	*iHub* **int** Identifies the hub where the SmartCard is located. The range is 0 (first hub) through N(number of hubs) -1. Remember to subtract one since the hub identification starts at 0. Important: See *Working with Multiple Hubs* in Chapt 1.
Return Value	The return value is >= 0 if the function executed successfully. A failure code, which is less than zero, is returned if the function failed. See Appendix A.
Comments	None

HTGroupStop

Description	Simultaneously halts the transmission of packets in a group of SmartCards within the specified hub. The group must have been previously defined using the "Set Group" commands.
Syntax	int HTGroupStop(int iHub)
Parameters	*iHub* **int** Identifies the hub where the SmartCard is located. The range is 0 (first hub) through N(number of hubs) -1. Remember to subtract one since the hub identification starts at 0. Important: See *Working with Multiple Hubs* in Chapt 1.
Return Value	The return value is >= 0 if the function executed successfully. A failure code, which is less than zero, is returned if the function failed. See Appendix A.
Comments	None

HTHubId

Description	Fill an array with the currently connected port types.
Syntax	int HTHubId(char PortTypes[MAX_HUBS][MAX_SLOTS][MAX_PORTS])
Parameters	*PortTypes* **char** An array of character that will be filled with one of the available card types. The card types are: `A` 10Mb Ethernet `F` 10/100Mb Fast Ethernet `T` 4/16Mb TokenRing `V` VG/AnyLan `3` Layer 3 10Mb Ethernet `G` Gigabit Ethernet `S` ATM Signaling `N` Not present
Return Value	The return value is >= 0 if the function executed successfully. A failure code, which is less than zero, is returned if the function failed. See Appendix A.
Comments	None

HTHubSlotPorts

Description	Fill an array with the currently connected port types.
Syntax	int HTHubSlotPorts(int iPortTypes[MAX_HUBS][MAX_SLOTS][MAX_PORTS])
Parameters	*iPortTypes* **int** An array of integers that will be filled with one of the available card types. The card types are: `CT_ACTIVE` 10Mb Ethernet `CT_FASTX` 10/100Mb Ethernet `CT_TOKENRING` 4/16Mb TokenRing `CT_VG` VG/AnyLan `CT_L3` Layer 3 10Mb Ethernet `CT_GIGABIT` Gigabit Ethernet `CT_ATM_SIGNALING` ATM Signaling `CT_NOT_PRESENT` Not present
Return Value	The return value is >= 0 if the function executed successfully. A failure code, which is less than zero, is returned if the function failed. See Appendix A.
Comments	For TCL: Use the utility function ETMake3DArray in order to create 3D arrays in TCL.

HTLayer3SetAddress

Description	Configures the card to send/receive background traffic such as PING, SNMP, etc. This command is not used to set up regular L3 test streams.
Syntax	int HTLayer3SetAddress (Layer3Address* pLayer3Address, int iHub, int iSlot, int iPort)
Parameters	*pLayer3Address* **Layer3Address** A pointer to the structure containing Layer 3 information such as IP address. For more information about Layer3Address structure elements, see Chapter 6: Data Structures. *iHub* **int** Identifies the hub where the SmartCard is located. The range is: 0 (first hub) through n(number of hubs) -1. Remember to subtract one since the hub identification starts at 0. For more information, see *Working with Multiple Hubs* in Chapt 1. *iSlot* **int** Identifies the destination SmartCard. *iPort* **int** Identifies the port on the SmartCard. At this time the iPort value is set to 0.
Return Value	The return value is >= 0 if the function executed successfully. A failure code, which is less than zero, is returned if the function failed. See Appendix A.
Comments	Use HTLayer3SetAddress if you want to send additional frames during your test process such as PING, SNMP, RIP, and *Card* ARP response. This command is not necessary for defining test traffic. To set up test traffic (traditional mode) see the NSCreateFrame series. To set up test traffic in the more powerful SmartMetrics mode, see the Message Functions manual under your specific SmartCard type. For using this command with multiple SmartCards in TCL see also: ETMake3DArray.

HTLatency

Description	Tests latency using the SmartBits.
Syntax	int HTLatency(int iMode, HTLatencyStructure* pHTLat, int iHub, int iSlot, int iPort)
Parameters	*iMode* **int** Set one of four specific modes of operation: `HT_LATENCY_OFF` removes the SmartCard from participating in any latency measurements. `HT_LATENCY_RX` Sets the SmartCard as a latency receiver. Only ports set as receivers can use the latency report function. `HT_LATENCY_RXTX` Set as latency receiver, and also as latency transmitter. The receive setting enables the latency report function on this card `HT_LATENCY_TX` Set as latency transmitter. (can not use the latency report function) `HT_LATENCY_REPORT` Enables latency counter value to be returned in the ulReport member of the HTLatencyStructure provided in pHTLat below. (The Latency Counter value is in units of 100 nanoseconds.) Only ports set as receivers will obtain valid results when using this mode. The latency counters start running when a group transmit function starts, and stops when a packet matching the contents and at the position of data set in pHTLat. *pHTLat* **HTLatencyStructure*** This structure sets the position, size and contents of packet data that will stop latency counters when a complete match occurs, and holds the ulReport value when retrieving the latency measurements on each port. *iHub* **int** Identifies the hub where the SmartCard is located. The range is 0 (first hub) through N(number of hubs) -1. Remember to subtract one since the hub identification starts at 0. Important: See *Working with Multiple Hubs* in Chapt 1. *iSlot* **int** Identifies the slot where the SmartCard is located. Ranges from 0 (first slot in *Hub*) to 19 (last card in *Hub*). *iPort* **int** Identifies the SmartCard port. On current cards, i*Port* is always 0.
Return Value	The return value is >= 0 if the function executed successfully. A failure code, which is less than zero, is returned if the function failed. See Appendix A.
Comments	Note - When using this command, VFD 3 of the transmitting port, and the Triggers of any receiving ports are utilized. [Also, on 10MB cards, the ByteCount counter function is disabled.] The latency counter is a special counter in a SmartCard. It is enabled when a card is set in latency mode, and starts counting when a group transmit command [e.g. HGGroupStart()] is issued. It stops when a packet is received which matches the characteristics specified in the HTLatencyStructure when HT_LATENCY_RX or HT_LATENCY_RXTX was issued.

	The actual latency measurement is determined by subtracting the HTLatencyStructure.ulReport values of the transmitting SmartCard from the receiver SmartCard. This difference is the bit to bit latency measurement. Your program will need to make any adjustments for cut-through vs. store and forward operations of the device(s) attached to each port. On 10MB cards, the ByteCount counter function is superseded with the Latency counter function. When getting the counters from a 10MB card which is included in a Latency measurement, the ByteCount value will reflect the raw Latency measurement.

HTMultiBurstCount

Description	Sets up the number of bursts for transmitting out a SmartCard while in MULTI_BURST_MODE.
Syntax	int HTMultiBurstCount(long lVal, iHub, iSlot, iPort)
Parameters	*lVal* **long** Specifies the burst count. Ranges anywhere from 1 to 16,777,215. *iHub* **int** Identifies the hub where the SmartCard is located. The range is 0 (first hub) through N(number of hubs) -1. Remember to subtract one since the hub identification starts at 0. Important: See *Working with Multiple Hubs* in Chapt 1. *iSlot* **int** Identifies the slot where the SmartCard is located. Ranges from 0 (first slot in *Hub*) to 19 (last card in *Hub*). *iPort* **int** Identifies the SmartCard port. (On the current SmartCards, *Port* is always 0.)
Return Value	The return value is >= 0 if the function executed successfully. A failure code, which is less than zero, is returned if the function failed. See Appendix A.
Comments	This instruction is only applied if **HGTransmitMode,** or **HTTransmitMode** has selected MULTI_BURST_MODE. Use **HGRun, HGStart, HTGroupStart,** and **HTRun** to start the transmission of the bursts.

HTPortProperty

Description	Determine the card type at the specified hub/slot/port.
Syntax	int HTPortProperty(unsigned long *pulProperties, int iHub, int iSlot, int iPort)
Parameters	*pulProperties* **unsigned long *** The contents of this address gets filled with the value of the properties for the specified port. The value is filled with the logical OR values below. This value can be AND'ed against the following to determine if the Port Property is present:

	CA_SIGNALRATE_10MB 10 MB capable CA_SIGNALRATE_100MB 100 MB capable CA_DUPLEX_FULL Full Duplex capable CA_DUPLEX_HALF Half Duplex capable CA_CONNECT_MII MMI connector CA_CONNECT_TP Twisted Pair connector CA_CONNECT_BNC BNC connector CA_CONNECT_AUI AUI connector CA_CAN_ROUTE Routing capable CA_VFDRESETCOUNT Resets VFD1 &2 counter CA_SIGNALRATE_4MB 4 MB capable CA_SIGNALRATE_16MB 16 MB capable CA_CAN_COLLIDE Generates collisions CA_SIGNALRATE_25MB 25 MB capable CA_SIGNALRATE_155MB 155 MB capable CA_BUILT_IN_ADDRESS Has a built in address CA_HAS_DEBUG_MONITOR Allows Debug monitoring CA_SIGNALRATE_1000MB 1 GB capable CA_CONNECT_FIBER Fiber optic connector CA_CAN_CAPTURE Has capture capability CA_ATM_SIGNALING Performs ATM Signaling CA_CONNECT_V35 CA_SIGNALRATE_8MB CA_SIGNALRATE_622MB CA_SIGNALRATE_45MB CA_SIGNALRATE_34MB CA_SIGNALRATE_1_544MB CA_SIGNALRATE_2_048MB CA_HASVFDREPEATCOUNT *iHub* **int** Identifies the hub where the SmartCard is located. The range is 0 (first hub) through N(number of hubs) -1. Remember to subtract one since the hub identification starts at 0. Important: See *Working with Multiple Hubs* in Chapt 1. *iSlot* **int** Identifies the slot where the card is located. Ranges from 0 (first slot in *Hub*) to 19 (last card in *Hub*). *iPort* **int** Identifies the card port.
Return Value	The return value is one of the following if the function executed successfully: CT_NOT_PRESENT 0 (Card not present) CT_ACTIVE 1 CT_FASTX 3 CT_TOKENRING 4 CT_VG 5

	CT_GIGABIT 8 CT_ATM_SIGNALING 9 CT_WAN_FRAME_RELAY 10 CT_MAX_CARD_TYPE CT_WAN_FRAME_RELAY A failure code, which is less than zero, is returned if the function failed. See Appendix A.
Comments	For more detail about CA_VFDRESETCOUNT, see HT_VFD_Structure.

HTPortType

Description	Determine the card type at the specified hub/slot/port.
Syntax	int HTPortType(int iHub, int iSlot, int iPort)
Parameters	*iHub* **int** Identifies the hub where the SmartCard is located. The range is 0 (first hub) through N(number of hubs) -1. Remember to subtract one since the hub identification starts at 0. Important: See *Working with Multiple Hubs* in Chapt 1.*iSlot* **int** Identifies the slot where the card is located. Ranges from 0 (first slot in *Hub*) to 19 (last card in *Hub*). *iPort* **int** Identifies the card port.
Return Value	The return value is one of the following if the function executed successfully: CT_NOT_PRESENT 0 (Card not present) CT_ACTIVE 1 CT_FASTX 3 CT_TOKENRING 4 CT_VG 5 CT_GIGABIT 8 CT_ATM_SIGNALING 9 CT_WAN_FRAME_RELAY 10 CT_MAX_CARD_TYPE CT_WAN_FRAME_RELAY A failure code, which is less than zero, is returned if the function failed. See Appendix A.
Comments	None

HTReadMII

Description	Reads a specific MII Address/Register. This command applies only to 100 Mb SmartCards.
Syntax	int HTReadMII(unsigned int uiAddress, unsigned int uiRegister, unsigned short* puiBits, int iHub, int iSlot, int iPort)
Parameters	*uiAddress* **unsigned int** Specific address. Must be from 0 to 31 *uiRegister* **unsigned int** Specific register. Must be from 0 to 31 *puiBits* **unsigned short*** Bits read are returned here *iHub* **int** Identifies the hub where the SmartCard is located. The range is 0 (first hub) through N(number of hubs) -1. Remember to subtract one since the hub identification starts at 0. Important: See *Working with Multiple Hubs* in Chapt 1. *iSlot* **int** Identifies the slot where the SmartCard is located. Ranges from 0 (first slot in *Hub*) to 19 (last card in *Hub*). *iPort* **int** Identifies SmartCard port. On current cards, *Port* is always 0.
Return Value	The return value is >= 0 if the function executed successfully. A failure code, which is less than zero, is returned if the function failed. See Appendix A.
Comments	None

HTResetPort

Description	Resets the addressed SmartCard to a default condition with all errors off.
Syntax	int HTResetPort(int iResetType, int iHub, int iSlot, int iPort)
Parameters	*iResetType* **int** Identifies the run mode of the board. Legal modes can be conveyed using the following constants: `RESET_FULL` Reset all card parameters including hardware interface parameters (e.g. Token Ring Speed) `RESET_PARTIAL` Reset all card parameters except hardware interface parameters. This option can be used for Token Ring cards, to keep the card in the ring. *iHub* **int** Identifies the hub where the SmartCard is located. The range is 0 (first hub) through N(number of hubs) -1. Remember to subtract one since the hub identification starts at 0. Important: See *Working with Multiple Hubs* in Chapt 1. *iSlot* **int** Identifies the slot where the SmartCard is located. Ranges from 0 (first slot in *Hub*) to 19 (last card in *Hub*). *iPort* **int** Identifies the SmartCard port. (On the current SmartCards, *Port* is always 0.)
Return Value	The return value is >= 0 if the function executed successfully. A failure code, which is less than zero, is returned if the function failed. See Appendix A.
Comments	This command is not implemented on the ATM and WAN (FR) card families at this time.

HTRun

Description	Sets up the run state of an SmartCard. A card can be set up to transmit a series of packets ("RUN" state), transmit a single packet ("STEP" state) or stop transmission altogether ("STOP" state). If the Burst mode has been set up to transmit a burst of packets (using the **HTTransmitMode** command), then transitioning from "STOP" to "RUN" will cause the specified number of packets to be transmitted.
Syntax	int HTRun(int Mode, int iHub, int iSlot, int iPort)
Parameters	*Mode* **int** Identifies the run mode of the board. Legal modes can be conveyed using the following constants: `HTRUN` `**For Visual Basic use HTRUN_VALUE. **` Transmit continuously or send a burst of packets. `HTSTEP` Transmit a single packet. `HTSTOP` Halt transmission of packets. *iHub* **int** Identifies the hub where the SmartCard is located. The range is 0 (first hub) through N(number of hubs) -1. Remember to subtract one since the hub identification starts at 0. Important: See *Working with Multiple Hubs* in Chapt 1.

	iSlot **int** Identifies the slot where the SmartCard is located. Ranges from 0 (first slot in *Hub*) to 19 (last card in *Hub*). *iPort* **int** Identifies the SmartCard port. (On the current SmartCards, *Port* is always 0.)
Return Value	The return value is >= 0 if the function executed successfully. A failure code, which is less than zero, is returned if the function failed. See Appendix A.
Comments	Because VisualBasic does not distinguish by case, these values have been put in the ETSMBAPI.TXT file to be used for the Mode parameter: `HTRUN_VALUE` `Transmit continuously or send a burst of packets.` *Note: Select a desired mode using HTTransmitMode before using the HTRUN function. Otherwise the transmit mode will be the one used previously.*

HTSelectReceive

Description	Selects a port on a SmartBits that is to be used for receive data. The receive data from this port is routed directly back to the ET-1000's Port B for detailed analysis. This function is valid for both Passive and SmartCards.
Syntax	int HTSelectReceive(int iHub, int iSlot, int iPort)
Parameters	*iHub* **int** Identifies the destination hub where the SmartCard is located. Can range anywhere from 0 (first hub) to 3 (fourth hub). *iSlot* **int** Identifies the slot where the SmartCard is located. Ranges from 0 (first slot in *Hub*) to 19 (last card in *Hub*). *iPort* **int** Identifies the SmartCard port. On the current SmartCards, i*Port* is always 0.
Return Value	The return value is >= 0 if the function executed successfully. A failure code, which is less than zero, is returned if the function failed. See Appendix A.
Comments	If any of iHub, iSlot, iPort are equal to -1, the last selected port will be disabled. If disabling HTSelectReceive and the last selected port is unknown, then the first available active port will be selected, then deselected. No check is made as to whether this card is currently transmitting. This function assumes that at least one SmartBits is attached to the ET-1000. It will be ignored by the ET-1000 if there is not a SmartBits present.

HTSelectTransmit

Description	Enables the PortB transmission of the ET-1000 to be transmitted to the port specified Transmission mode is determined by *iMode.* This function is valid for both Passive and SmartCards.
Syntax	int HTSelectTransmit(int iMode, int iHub, int iSlot, int iPort)
Parameters	*iMode* **int** Determines the function of the Port: `HTTRANSMIT_OFF` `Transmitter is turned off` `HTTRANSMIT_STD` `Transmitter transmits standard packets` `HTTRANSMIT_COL` `Transmitter transmits collision packets` All other values are invalid and will not have an effect on the SmartBits. *iHub* **int** Identifies the hub where the SmartCard is located. The range is 0 (first hub) through N(number of hubs) -1. Remember to subtract one since the hub identification starts at 0. Important: See *Working with Multiple Hubs* in Chapt 1. *iSlot* **int** Identifies the slot where the card is located. Ranges from 0 (first slot in *Hub*) to 19 (last card in *Hub*). *iPort* **int** Identifies the card port. On current SmartCards, i*Port* is always 0. NOTE: If any of iHub, iSlot, iPort are equal to -1, then the last selected port will be disabled.
Return Value	The return value is >= 0 if the function executed successfully. A failure code, which is less than zero, is returned if the function failed. See Appendix A.
Comments	This function assumes that at least one SmartBits is attached to the ET-1000. It will be ignored by the ET-1000 if there is not a SmartBits present.

HTSendCommand

Description	This function is used to save a small amount of time by storing up commands on the SMB, and then sending them to the SmartCards all at once. This function works in conjunction with HTSeparateHubCommands. The default setting used by HTSendCommand is HUB_DEFAULT_ACTION.
Syntax	int HTSendCommand(int State)
Parameters	*State* **int** If zero, all commands that can be queued up are queued up. If non-zero, commands are not deferred; they are sent to the SmartCards as soon as they reach the SMB controller. Any commands that have been deferred are sent first.
Return Value	The return value is >= 0 if the function executed successfully. A failure code, which is less than zero, is returned if the function failed. See Appendix A.
Comments	It is strongly advised that this function not be called unless the time necessary to handle each function separately is intolerably long. Call HTSendCommand at the beginning of a long series of commands with "State" set to 0. This causes the SMB to start buffering certain commands instead of forwarding them separately to the SmartCards. Before the last command, call this function once again with "State" set to 1. This causes the SMB to then send all the deferred commands to the cards at once, shotgun style. NOTE: This function is not useful if commands are sent to the SMB across a network that adds more time than the time from controller to SmartCard.

HTSeparateHubCommands

Description	Determines how commands are synchronized across multiple hubs, including whether GPS is used or not. Used in conjunction with HGRun, HGStart, HGStop, HGStep, and HTSendCommand.
Syntax	int HTSeparateHubCommands (int iFlag)
Parameters	*iFlag* **int** This value determines how if and how SmartBits chassis are synchronized. HUB_GROUP_DEFAULT_ACTION Enables a group action across SMB hubs. and stacks (GPS is not used). This setting allows a single command for stacks of hubs linked by the expansion ports (see comment). Use this value to skip GPS sync time if GPS is available but you don't want to use it. This value is the default for HGRun, HGStart, HGStep, and HGStop. HUB_GROUP_INDEPENDENT_ACTION Enables a group start for each SMB hub. No synchronization BETWEEN hubs. This setting causes a separate command to be sent for each SMB hub regardless of whether there are stacks, expansion connection, or GPS. This parameter was originally used to deal with older equipment that could not perform a group start across hubs. HUB_GROUP_SYNC_ACTION Enables GPS capability for a synchronized group start across multiple hubs. This setting allows a single command for stacks of hubs linked by the expansion ports (see comment). ERROR CONDITIONS: 1 - GPS enabled on a "Slave stack" (expansion cable plugged in the IN port.) 2 - One or more active "Links" (direct to the PC)with neither expansion con nor GPS.
Return Value	The return value is the value HTSeparateHubCommands was previously set to: 0 = HUB_DEFAULT_ACTION 1 = HUB_ACT_AS_LINK_UNIT 2 = HUB_ACT_INDEPENDENTLY 3 = HUB_ACT_AS_MASTER
Comments	Expansion ports refer to ports available on the SMB 2000 or later. Expansion ports are used to link one stack of chassis to another.

HTSetCommand

Description	Sends a command to a SmartCard which accepts HTSetCommand() actions. The commands, defines, and structure definitions for this command can be found in the *Message Functions* manual for Layer 3, Multi-Layer, Gigabit, ATM, and Frame Relay SmartCards. These SmartCards allow control using HTSetCommand(), HTSetStructure(), and HTGetStructure(). The correct combination of iType parameter values and the structure parameter cause the SmartCards to be setup in an elegant and intricate manner.
Syntax	int HTSetCommand(int iType1,int iType2,int iType3,int iType4,void* pData,int iHub, int iSlot, int iPort);
Parameters	*iHub* **int** Identifies the hub where the SmartCard is located. The range is 0 (first hub) through N(number of hubs) -1. Remember to subtract one since the hub identification starts at 0. Important: See *Working with Multiple Hubs* in Chapt 1. *iSlot* **int** Identifies the slot where the SmartCard is located. Ranges from 0 (first slot in *Hub*) to 19 (last card in *Hub*). *iPort* **int** Identifies the SmartCard port. (On the current SmartCard, *Port* is always 0.)
Return Value	The return value is >= 0 if the function executed successfully. The return value is < 0 if the function failed. See Appendix A.
Comments	See the *Message functions* manual for appropriate values for the iType and structure parameters for HTSetCommand(), HTSetStructure(), and HTGetStructure().

HTSetSpeed

Description	Sets the addressed port to the selected speed. The speed selected must be appropriate to the addressed SmartCard type.
Syntax	int HTSetSpeed(int iSpeed, int iHub, int iSlot, int iPort)
Parameters	*iSpeed* **int** Determines the speed of the Port: `SPEED_10MHZ` Sets a 10 MB capable SmartCard to a 10 MHZ Signaling rate (Ethernet) `SPEED_100MHZ` Sets a 100 MB capable SmartCard to a 100 MHZ Signaling rate (Ethernet) `SPEED_4MHZ` Sets a 4 MB capable SmartCard to a 4 MHZ Signaling rate (Token Ring) `SPEED_16MHZ` Sets a 16 MB capable SmartCard to a 16 MHZ Signaling rate (Token Ring) All other values are invalid and will not have an effect on the SmartBits. *iHub* **int** Identifies the hub where the SmartCard is located. The range is 0 (first hub) through N(number of hubs) -1. Remember to subtract one since the hub identification starts at 0. Important: See *Working with Multiple Hubs* in Chapt 1. *iSlot* **int** Identifies the slot where the card is located. Ranges from 0 (first slot in *Hub*) to 19 (last card in *Hub*). *iPort* **int** Identifies the card port. On current SmartCards, i*Port* is always 0.
Return Value	The return value is >= 0 if the function executed successfully. A failure code, which is less than zero, is returned if the function failed. See Appendix A.
Comments	On 100 MB Ethernet SmartCards, speed auto-negotiation can be enabled by configuring the MII registers. See the HTWriteMII() command for more information.

HTSetStructure

Description	Sends a command to a SmartCard which accepts HTSetStructure() actions. The commands, defines, and structure definitions for this command can be found in the *Message functions* manual for Layer 3, Multi-Layer, Gigabit, ATM, and Frame Relay SmartCards. These SmartCards allow control using HTSetCommand(), HTSetStructure(), and HTGetStructure(). The correct combination of iType parameter values and the structure parameter cause the SmartCards to be setup in an elegant and intricate manner.
Syntax	int HTSetStructure(int iType1,int iType2,int iType3,int iType4,void* pData,int iSize,int iHub, int iSlot, int iPort);
Parameters	*iType1* **int** defines the command action. The value (and action) depends on the SmartCard being addressed. iType2 **int** value depends on SmartCard. *IType3* **int** value depends on SmartCard. *IType4* **int** value depends on SmartCard. *pData* **void*** Pointer to a structure or an array containing the data to send. *iSize* **int** indicates the size of the pData pointer which should be utilized. While in most cases this will be the size of the structure, in some cases it is the size of an array of structures or bytes. See the *Message Functions* manual for clarification. *iHub* **int** Identifies the hub where the SmartCard is located. The range is 0 (first hub) through N(number of hubs) -1. Remember to subtract one since the hub identification starts at 0. Important: See *Working with Multiple Hubs* in Chapt 1. *iSlot* **int** Identifies the slot where the SmartCard is located. Ranges from 0 (first slot in *Hub*) to 19 (last card in *Hub*). *iPort* **int** Identifies the SmartCard port. On current cards, *Port* is always 0.
Return Value	The return value is >= 0 if the function executed successfully. The return value is < 0 if the function failed. See Appendix A.
Comments	See the *Message Functions* manual for appropriate values for the iType and structure parameters for HTSetCommand(), HTSetStructure(), and HTGetStructure().

HTSetTokenRingAdvancedControl

Description	Generates specialized frames for the selected TokenRing SmartCard.
Syntax	int HTSetTokenRingAdvancedControl(TokenRingAdvancedStructure *pTRAdvancedStructure, int iHub, int iSlot, int iPort)
Parameters	*pTRAdvancedStructure* TokenRingAdvancedStructure* Points to a TokenRingAdvancedStructure structure which contains all the information required to transmit special control frames. See Data Structure section of this document for a description of the TokenRingAdvancedStructure structure. *iHub* **int** Identifies the hub where the SmartCard is located. The range is 0 (first hub) through N(number of hubs) -1. Remember to subtract one since the hub identification starts at 0. Important: See *Working with Multiple Hubs* in Chapt 1. *iSlot* **int** Identifies the slot where the TokenRing SmartCard is located. Ranges from 0 (first slot in *Hub*) to 19 (last card in *Hub*). *iPort* **int** Identifies the TokenRing SmartCard port. (On the current TokenRing SmartCard, *Port* is always 0.)
Return Value	The return value is >= 0 if the function executed successfully. A failure code, which is less than zero, is returned if the function failed. See Appendix A.
Comments	This command will cause ring operation to fail if not used with caution.

HTSetTokenRingErrors

Description	Generates traffic with error frames for the selected TokenRing SmartCard.
Syntax	int HTSetTokenRingErrors(int ErrorTrafficRatio, int iTRErrors, int iHub, int iSlot, int iPort)
Parameters	*ErrorTraficRatio* **int** Specifies the error traffic ratio in tenths of seconds. Ranges anywhere from 0 to 1000. A value of 0 will turn off error generation. *iTRErrors* **int** Specifies the type of frame errors to generate. Value can be a combined OR of the following defines: `TR_ERR_FCS` FCS errors `TR_ERR_FRAME_COPY` Frame copy errors `TR_ERR_FRAME_BIT` Frame Bit errors `TR_ERR_FRAME_FS` FS Frame errors `TR_ERR_ABORT_DELIMITER` Abort delimiter errors `TR_ERR_BURST` Burst errors *iHub* **int** Identifies the hub where the SmartCard is located. The range is 0 (first hub) through N(number of hubs) -1. Remember to subtract one since the hub identification starts at 0. Important: See *Working with Multiple Hubs* in Chapt 1. *iSlot* **int** Identifies the slot where the TokenRing SmartCard is located. Ranges from 0 (first slot in *Hub*) to 19 (last card in *Hub*). *iPort* **int** Identifies the TokenRing SmartCard port. (On the current TokenRing SmartCard, *Port* is always 0.)
Return Value	The return value is >= 0 if the function executed successfully. A failure code, which is less than zero, is returned if the function failed. See Appendix A.
Comments	The number in the ratio is nominally in tenths of a percent. However, as it is rationalized to a count the precision will be poor at large percentage values.

HTSetTokenRingLLC

Description	Configures LLC frame for the selected TokenRing SmartCard.
Syntax	int HTSetTokenRingLLC(TokenRingLLCStructure *pTRLStructure, int iHub, int iSlot, int iPort)
Parameters	*pTRLStructure* **TokenRingLLCStructure*** Points to a TokenRingLLCStructure (see page 68) which contains all the information required to preform LLC Type 1 frames. *iHub* **int** Identifies the hub where the SmartCard is located. The range is 0 (first hub) through N(number of hubs) -1. Remember to subtract one since the hub identification starts at 0. Important: See *Working with Multiple Hubs* in Chapt 1. *iSlot* **int** Identifies the slot where the TokenRing SmartCard is located. Ranges from 0 (first slot in *Hub*) to 19 (last card in *Hub*). *iPort* **int** Identifies the TokenRing SmartCard port. (On the current TokenRing SmartCard, *Port* is always 0.)
Return Value	The return value is >= 0 if the function executed successfully. A failure code, which is less than zero, is returned if the function failed. See Appendix A.
Comments	A TokenRing MAC header has to be defined first for LLC to take effect.

HTSetTokenRingMAC

Description	Configures TokenRing MAC header for the selected TokenRing SmartCard.
Syntax	int HTSetTokenRingMAC(TokenRingMACStructure *pTRMStructure, int iHub, int iSlot, int iPort)
Parameters	*pTRMStructure* TokenRingMACStructure* Points to a TokenRingMACStructure (see page 69) which defines a preformed MAC header. *iHub* **int** Identifies the hub where the SmartCard is located. The range is 0 (first hub) through N(number of hubs) -1. Remember to subtract one since the hub identification starts at 0. Important: See *Working with Multiple Hubs* in Chapt 1. *iSlot* **int** Identifies the slot where the TokenRing SmartCard is located. Ranges from 0 (first slot in *Hub*) to 19 (last card in *Hub*). *iPort* **int** Identifies the TokenRing SmartCard port. (On the current TokenRing SmartCard, *Port* is always 0.)
Return Value	The return value is >= 0 if the function executed successfully. A failure code, which is less than zero, is returned if the function failed. See Appendix A.
Comments	None

HTSetTokenRingProperty

Description	Configures ring operation characteristics for the selected TokenRing SmartCard.
Syntax	int HTSetTokenRingProperty(TokenRingPropertyStructure *pTRPStructure, int iHub, int iSlot, int iPort)
Parameters	*pTRPStructure* TokenRingPropertyStructure* Points to a TokenRingPropertyStructure (see page 70) which contains all the information required to configure ring operation. *iHub* **int** Identifies the hub where the SmartCard is located. The range is 0 (first hub) through N(number of hubs) -1. Remember to subtract one since the hub identification starts at 0. Important: See *Working with Multiple Hubs* in Chapt 1. *iSlot* **int** Identifies the slot where the TokenRing SmartCard is located. Ranges from 0 (first slot in *Hub*) to 19 (last card in *Hub*). *iPort* **int** Identifies the SmartCard port. (On the current TokenRing SmartCard, *Port* is always 0.)
Return Value	The return value is >= 0 if the function executed successfully. A failure code, which is less than zero, is returned if the function failed. See Appendix A.
Comments	This command defines card properties which are retained in non-volatile storage. These parameters should not be altered on a live ring as they will probably cause ring malfunction (usually Beaconing by other stations which might cause them to close down pending a hard reset).

HTSetTokenRingSrcRouteAddr

Description	Configures Source Route Address(SRA) for the selected TokenRing SmartCard.
Syntax	int HTSetTokenRingSrcRouteAddr(int UseSRA, int *piData, int iHub, int iSlot, int iPort)
Parameters	*UseSRA* **int** specifies if a SRA field is included in a TokenRing frame. **0** No SRA defined **1** Use SRA filed defined in piData parameter. *piData* **int *** Points to an array of int which contains the Source Route Address information. The maximum length of this array is 32 and the length information is encoded in the lower 5 bits of the first byte of this array of SourceRouteAddress information. *iHub* **int** Identifies the hub where the SmartCard is located. The range is 0 (first hub) through N(number of hubs) -1. Remember to subtract one since the hub identification starts at 0. Important: See *Working with Multiple Hubs* in Chapt 1. *iSlot* **int** Identifies the slot where the TokenRing SmartCard is located. Ranges from 0 (first slot in *Hub*) to 19 (last card in *Hub*). *iPort* **int** Identifies the TokenRing SmartCard port. (On the current TokenRing SmartCard, *Port* is always 0.)
Return Value	The return value is >= 0 if the function executed successfully. A failure code, which is less than zero, is returned if the function failed. See Appendix A.
Comments	This field is part of a pre-formed header and so the MAC header has to be active for it to be active. The data in this field will be parsed by the card to determine the size of the source routing field to use and the maximum frame size to transmit. (See the Token Ring Architectural Reference for details of how to code this field.)

HTSetVGProperty

Description	Configures ring operation characteristics for the selected VG SmartCard.	
Syntax	int HTSetVGProperty(VGCardPropertyStructure *pVGPStructure)	
Parameters	*pVGPStructure*	VGCardPropertyStructure* Points to a VGCardPropertyStructure (see page 70) which contains all the information required to configure Card.
	iHub	**int** Identifies the hub where the SmartCard is located. The range is 0 (first hub) through N(number of hubs) -1. Remember to subtract one since the hub identification starts at 0. Important: See *Working with Multiple Hubs* in Chapt 1.
	iSlot	**int** Identifies the slot where the TokenRing SmartCard is located. Ranges from 0 (first slot in *Hub*) to 19 (last card in *Hub*).
	iPort	**int** Identifies the SmartCard port. (On the current TokenRing SmartCard, *Port* is always 0.)
Return Value	The return value is >= 0 if the function executed successfully. A failure code, which is less than zero, is returned if the function failed. See Appendix A.	
Comments	None	

HTSymbol

Description	Generates symbol error for the 100 Mbits SmartCard. The port can be set up to transmit a series of packets which generates invalid wave form data pattern. This command applies only to 100 Mbits SmartCards.	
Syntax	int HTSymbol(int Mode, int iHub, int iSlot, int iPort)	
Parameters	*Mode*	int Identifies the symbol mode of the board. Legal modes can be conveyed using the following constants:
	SYMBOL_OFF	Turn off symbol errors
	SYMBOL_ON	Turn on symbol errors
	iHub	**int** Identifies the hub where the SmartCard is located. The range is 0 (first hub) through N(number of hubs) -1. Remember to subtract one since the hub identification starts at 0. Important: See *Working with Multiple Hubs* in Chapt 1.
	iSlot	**int** Identifies the slot where the SmartCard is located. Ranges from 0 (first slot in *Hub*) to 19 (last card in *Hub*).
	iPort	**int** Identifies the SmartCard port. (On the current SmartCards, *Port* is always 0.)
Return Value	The return value is >= 0 if the function executed successfully. A failure code, which is less than zero, is returned if the function failed. See Appendix A.	

Comments	None

HTTransmitMode

Description	Indicates to the selected Port how to control the transmission of packets when running.
Syntax	int HTTransmitMode(int iMode, int iHub, int iSlot, int iPort)
Parameters	*iMode* **int** Indicates the mode of operation when transmitting packets according to the following defines: `CONTINUOUS_PACKET_MODE` Sets port to transmit single packets continuously. `SINGLE_BURST_MODE` Sets port to transmit a single burst of packets, and then stop. `MULTI_BURST_MODE` Sets port to transmit multiple bursts of packets, indicated by the HxMultiBurstCount command, with each burst being separated by the amount specified in the HxBurstGap command, and then stop. `CONTINUOUS_BURST_MODE` Sets port to repetitively send bursts of packets with each burst being separated by the amount specified in the HxBurstGap command. `ECHO_MODE` Sets port to transmit a single packet upon receiving a Receive Trigger event. The packet transmitted will match the programmed parameters of the port addressed. *iHub* **int** Identifies the hub where the SmartCard is located. The range is 0 (first hub) through N(number of hubs) -1. Remember to subtract one since the hub identification starts at 0. Important: See *Working with Multiple Hubs* in Chapt 1. *iSlot* **int** Identifies the slot where the SmartCard is located. Ranges from 0 (first slot in *Hub*) to 19 (last card in *Hub*). *iPort* **int** Identifies the SmartCard port. (On the current SmartCards, *Port* is always 0.)
Return Value	The return value is >= 0 if the function executed successfully. A failure code, which is less than zero, is returned if the function failed. See Appendix A.
Comments	None

HTTrigger

Description	Sets up the triggering mechanism for a SmartCard. HTTrigger specifies the trigger number (1 or 2), the operational configuration, trigger pattern range, trigger pattern offset and trigger pattern data. This function applies only to SmartCards.
Syntax	int HTTrigger(int iTrigId, int iConfig, HTTriggerStructure* phtTStruct, int iHub, int iSlot, int iPort)
Parameters	*iTrigId* **int** Identifies the trigger source. There are two possible triggers on each SmartCard. They are identified as follows: `HTTRIGGER_1` Trigger 1 `HTTRIGGER_2` Trigger 2 *iConfig* **int** There are three possible types of configurations for the triggers on the SmartCards: `HTTRIGGER_OFF` disables the triggering mechanism for TrigId `HTTRIGGER_ON` enables the triggering mechanism for TrigId `HTTRIGGER_DEPENDENT` enables the triggering mechanism for TrigId after the other trigger has triggered. *phtTStruct* **HTTriggerStructure*** A structure containing the trigger pattern, offsets and ranges. Note that the maximum range is 6 bytes, and. though the range is specified in bits., the specified number is rounded up to the nearest byte multiple. i.e.; the SmartCards can only trigger on patterns that are a length that is a multiple of 8 bits. The offset ranges from 1 to 12,112 bits (specified in bits). See the Data Structures section of this document for more information on the **HTTriggerStructure**. *iHub* **int** Identifies the hub where the SmartCard is located. The range is 0 (first hub) through N(number of hubs) -1. Remember to subtract one since the hub identification starts at 0. Important: See *Working with Multiple Hubs* in Chapt 1. *iSlot* **int** Identifies the slot where the SmartCard is located. Ranges from 0 (first slot in *Hub*) to 19 (last card in *Hub*). *iPort* **int** Identifies the SmartCard port. (On the current SmartCards, *Port* is always 0.)
Return Value	The return value is >= 0 if the function executed successfully. A failure code, which is less than zero, is returned if the function failed. See Appendix A.
Comments	It is possible to misconfigure triggers when using **HTTRIGGER_DEPENDENT**. A TrigId set to **HTTRIGGER_DEPENDENT** is to be active after the other TrigId trigger has occurred. So, if trigger 2 is set to be dependent on trigger 1:

	A properly configured trigger dependent combination would be: `HTTrigger(HTTRIGGER_1,HTTRIGGER_ON,&TStruct,0,0,1)` `HTTrigger(HTTRIGGER_2,HTTRIGGER_DEPENDENT,&TStruct ,0,0,1)` A misconfigured trigger combination would be: `HTTrigger(HTTRIGGER_1,HTTRIGGER_OFF,&TStruct,0,0,1)` `HTTrigger(HTTRIGGER_2,HTTRIGGER_DEPENDENT,&TStruct ,0,0,1)` Here, trigger 2 will never fire because trigger 1 is off.

HTVFD

Description	Sends VFD information to a SmartCard. This function applies only to SmartCards.
Syntax	int HTVFD(int iVFDId, HTVFDStructure* phtHStruct,int iHub, int iSlot, int iPort)
Parameters	*iVFDId* **int** Identifies the VFD pattern being addressed. There are a total of three VFD patterns. They are identified as shown below: `HVFD_1` `VFD Pattern 1` `HVFD_2` `VFD Pattern 2` `HVFD_3` `VFD Pattern 3` *phtHStruct* **HTVFDStructure*** pointer to a structure that holds VFD information for use with a SmartCard. This structure holds the VFD Configuration, Range, Offset and Pattern. See section 5 of this document for more details on this structure. *iHub* **int** Identifies the hub where the SmartCard is located. The range is 0 (first hub) through N(number of hubs) -1. Remember to subtract one since the hub identification starts at 0. Important: See *Working with Multiple Hubs* in Chapt 1.*iSlot* **int** Identifies the slot where the SmartCard is located. Ranges from 0 (first slot in *Hub*) to 19 (last card in *Hub*). *iPort* **int** Identifies the SmartCard port. (On the current SmartCards, *Port* is always 0.)
Return Value	The return value is >= 0 if the function executed successfully. A failure code, which is less than zero, is returned if the function failed. See Appendix A.
Comments	None

HTWriteMII

Description	Writes a specific MII Address/Register. This command applies only to 100 Mb SmartCards.	
Syntax	int HTWriteMII(unsigned int uiAddress, unsigned int uiRegister, unsigned short uiBits, int iHub, int iSlot, int iPort)	
Parameters	*uiAddress*	**unsigned int** Specific address. Must be from 0 to 31
	uiRegister	**unsigned int** Specific register. Must be from 0 to 31
	uiBits	**unsigned short** Bit value to write to address/register
	iHub	**int** Identifies the hub where the SmartCard is located. The range is 0 (first hub) through N(number of hubs) -1. Remember to subtract one since the hub identification starts at 0. Important: See *Working with Multiple Hubs* in Chapt 1.
	iSlot	**int** Identifies the slot where the SmartCard is located. Ranges from 0 (first slot in *Hub*) to 19 (last card in *Hub*).
	iPort	**int** Identifies the SmartCard port. (On the current SmartCards, *Port* is always 0.)
Return Value	The return value is >= 0 if the function executed successfully. A failure code, which is less than zero, is returned if the function failed. See Appendix A.	
Comments	None	

NSCreateFrame

Description	Automates and simplifies creation of frames with the use of the structure: FrameSpec.
Syntax	long NSCreateFrame(FrameSpec_Type* framespec)
Parameters	*framespec* **FrameSpec_Type*** pointer to a structure that holds information about the type of frame(s) to be created. Elements shown below can have a wide variety of values. For values of iEncap, iSize, iProtocol, and iPattern, see FrameSpec structure definition in Chapter 6: Data Structures. `iEncap` — `The type of frame (Ethernet, ATM, etc.)` `iSize` — `The size of the frame. If iSize value is either too large or too small (based on selected iEncap and iProtocol values), an error value is returned.` `iProtocol` — `The type of Layer 3 protocol to use, e.g., IP, ARP, None, etc.` `iPattern` — `The background pattern to use. This pattern is used to pad the frame (to match the iSize value) after all specified bytes have been inserted.`
Return Value	If successful, a Frame ID is returned. This ID represents a single frame prototype. Use this ID to put the frame in the card buffer with HTFrame. If failure occurs, a negative integer is returned. See Appendix A.
Comments	For a custom payload (background pattern), set the `iPattern` to `PAT_CUST`, and then create the custom pattern with **NSSetPayload**. Once a frame is created, put it into the SmartCard transmit buffer using the **HTFrame** function. (This function is similar to HTFillPattern.) Related functions: **NSDeleteFrame**, **NSCreateFrameAndPayload**, and **NSModifyFrame**. Since NSCreateFrame functions are intended for "layer 2" mode, VTEs and Signature fields are not part of these frames.

NSCreateFrameAndPayload

Description	Automates and simplifies creation of frames with the use of the structure: FrameSpec. For use *only* with a customized payload (fill pattern). For predefined SmartLib payload, use NSCreateFrame.
Syntax	long NSCreateFrame(FrameSpec_Type* framespec, int iPayloadSize, unsigned char* pucPayload)
Parameters	*framespec* **FrameSpec_Type*** pointer to a structure that holds information about the type of frame(s) to be created. *Structure elements* shown below can have a wide variety of values. For values of iEncap, iSize, iProtocol, and iPattern, see FrameSpec structure definition in Chapter 6: Data Structures. `iEncap` — `The type of frame (Ethernet, ATM, etc.)` `iSize` — `The size of the frame. If iSize value is either too large or too small (based on selected iEncap and iProtocol values), an error value is returned.` `iProtocol` — `The type of Layer 3 protocol to use, e.g., IP, ARP, None, etc.` `iPattern` — `The background pattern to use. For this function the only valid value is: PAT_CUST.` *iPayloadSize* **int** Specifies the length of the payload (fill pattern) array. *pucPayload* **unsigned char** Pointer to user-created array containing the customized payload (fill pattern).
Return Value	If successful, a Frame ID is returned. This ID represents a single frame prototype. Use this ID to put the frame in the card buffer using the **HTFrame** function. (This function is similar to HTFillPattern.) If failure occurs, a negative integer is returned. See Appendix A.
Comments	If you want to use a pre-created fill pattern, use **NSCreateFrame**. A second way to accomplish the same task (a frame with a custom fill pattern) is to use the **NSCreateFrame** function, using PAT_CUST for the iPattern parameter, and then defining the custom pattern with **NSSetPayload**. Once a frame is created, put it into the SmartCard transmit buffer using **HTFrame**. (This function is similar to HTFillPattern.) Other related functions: **NSDeleteFrame** and **NSModifyFrame**.

NSDeleteFrame

Description	Deletes a single frame prototype specified by the lFrameID. The frame prototype is identified by the Frame ID (which is returned by NSCreateFrame and NSCreateFrameAndPayload).
Syntax	long NSDeleteFrame (long iFrameID)
Parameters	*lFrameID* **long** The ID number is unique to each frame prototype, and is returned when a frame is created. Use the iFrameID value to put the frame in the card buffer with HTFrame, and to delete the frame from the SmartLib buffer with NSDeleteFrame.
Return Value	The return value is >= 0 if the function executed successfully. A failure value of less than zero is returned if the function failed. See Appendix A.
Comments	Use NSDeleteFrame to clear the Prototype From the SmartLib buffer once that type of frame is no longer needed. Other related functions: **HTFrame**, **NSCreateFrame, NSSetPayload, NSCreateFrameAndPayload**, and **NSModifyFrame**.

NSModifyFrame

Description	Modifies a section of a frame created by NSCreateFrame, or by NSCreateFrameAndPayload. This function can be used for a series of frames based on an original frame prototype.
Syntax	long NSModifyFrame (long lFrameID, int iIdentifier, unsigned char* pucBytes, int iNumBytes)
Parameters	*lFrameID* **long** The FrameID number is unique for each frame prototype. It is returned by NSCreateFrame and NSCreateFrameAndPayload. *iIdentifier* **int** This value specifies which portion of the frame to modify. For example, you might modify the Destination MAC, or the Time-to-Live, etc. By selecting an element, you do not need to know it's offset, only its size and content. Note: Some elements can modify "Only" one type of frame, while others have multiple uses defined by "All Followed." FRAME_VERSION "ONLY" IP version. FRAME_HEADER_LENGTH "ALL FOLLOWED:" IP length, IPX length. FRAME_UDP_HEADER_LENGTH "ONLY" UDP length. FRAME_TCP_HEADER_LENGTH "ONLY" TCP length. FRAME_TYPE_SERVICE "ONLY" IP type of service. FRAME_TOTAL_LENGTH "ONLY" IP total length. FRAME_SEQUENCE "ALL FOLLOWED:" IP sequence, ICMP sequence. FRAME_UDP_SEQUENCE "ONLY" UDP sequence. FRAME_TCP_SEQUENCE "ONLY" TCP sequence. FRAME_FLAGS "ONLY" IP flags. FRAME_FRAGMENTS_OFFSET "ONLY" IP fragment and offset. FRAME_TIME_TO_LIVE "ONLY" IP time to live. FRAME_PROTOCOL "ONLY" IP protocol. FRAME_HEADER_CRC "ALL FOLLOWED:" IP checksum, IPX checksum. FRAME_UDP_HEADER_CRC "ONLY" UDP checksum. FRAME_TCP_HEADER_CRC "ONLY" TCP checksum. FRAME_DST_IP_ADDR "ANY" frame Destination IP Address. FRAME_SRC_IP_ADDR "ANY" frame Source IP Address. FRAME_SRC_PORT "ANY" frame Source Port number FRAME_DST_PORT "ANY" frame Destination Port number. FRAME_ACKNOWLEDGE "ONLY" TCP Acknowledge number. FRAME_RESERVED "ONLY" TCP reserved bits. FRAME_URG_BIT "ONLY" TCP URG bit. FRAME_ACK_BIT "ONLY" TCP ACK bit. FRAME_PSH_BIT "ONLY" TCP PSH bit. FRAME_RST_BIT "ONLY" TCP RST bit. FRAME_SYN_BIT "ONLY" TCP SYN bit. FRAME_FIN_BIT "ONLY" TCP FIN bit. FRAME_WINDOW_SIZE "ONLY" TCP window size. FRAME_URGENT_POINTER "ONLY" TCP urgent pointer. FRAME_HARDWARE_TYPE "ALL FOLLOWED:" ARP, RARP hardware type. FRAME_HEADER_TYPE "ALL FOLLOWED:" ICMP Header type, IPX Header Type. FRAME_HARDWARE_SIZE "ALL FOLLOWED:" ARP, RARP hardware size. FRAME_PROTOCOL_TYPE "ALL FOLLOWED:" ARP, RARP protocol type. FRAME_PROTOCOL_SIZE "ALL FOLLOWED:" ARP, RARP protocol size. FRAME_OPERATION "ALL FOLLOWED:" ARP, RARP operations. FRAME_HEADER_CODE "ONLY" ICMP Header codes. FRAME_IDENTIFIER "ONLY" ICMP Identifier. FRAME_SEN_MAC_ADDR "ANY" protocol MAC sender address. FRAME_REC_MAC_ADDR "ANY" protocol MAC receiver address. FRAME_HOP "ONLY" IPX Hop FRAME_DST_SOCKET "ONLY" IPX destination socket. FRAME_SRC_SOCKET "ONLY" IPX source socket. FRAME_ICMP_HEADER_CRC "ONLY" ICMP Header checksum. *pucBytes* **unsigned char*** Pointer to the replacement bytes used to modify the frame component.

	iNumBytes	**int** Length of new segment (pucBytes). If this value does not match the bytes being replace, an error will result.
Return Value	The return value is >= 0 if the function executed successfully. A failure code, which is less than zero, is returned if the function failed. See Appendix A.	
Comments	Use this function after creating a frame with either NSCreateFrame or NSCreateFrameAndPayload. Other related functions: HTFrame and HSDeleteFrame.	

NSSetPayLoad

Description	Used in conjunction with NSCreateFrame; this function configures the customized payload (background pattern).	
Syntax	long NSSetPayLoad (long lFrameID, int iSize, unsigned char* pucPayload)	
Parameters	*lFrameID*	**long** The FrameID number is unique for each frame prototype. It is returned by NSCreateFrame and NSCreateFrameAndPayload.
	iSize	**int** The size of the array specifying the payload.
	pucPayload	**unsigned char*** The pointer to the array specifying the payload (the background pattern).
Return Value	The return value is >= 0 if the function executed successfully. A failure code, which is less than zero, is returned if the function failed. See Appendix A.	
Comments	NSSetPayLoad is only used in conjunction with NSCreateFrame, when the value of iPattern (in the structure FrameSpec) is PAT_CUST. This causes NSCreateFrame to not specify a background pattern. Other pre-created payload patterns are available. However, when PAT_CUST is specified, use NSSetPayLoad to specify a customized pattern. You can also use NSCreateFrameAndPayLoad to accomplish the same task. Other related functions: **HTFrame**, **NSDeleteFrame**, and **NSModifyFrame**.	

Appendix A
Error Code Definitions

Error codes are returned from the library functions in lieu of data. Error codes values are less than zero. They may be signed integers or signed long integers. A description of each of these codes is included in the table below.

Error Code	Description
UNSPECIFIED_ERROR **Error value: -1**	An error condition which could not be identified was encountered. This will occur if the system experienced an error that does not fit into any of the above categories.
PORT_NOT_LINKED **Error value: -2**	An attempt to use a Programming Library function was made when no active link exists to the ET-1000 or SMB-1000.
UNLINK_FAILED **Error value: -3**	An attempt to unlink the ET-1000 from the serial port failed. This could occur if the ET-1000 is already unlinked from the port before the ETUnLink command is called.
INCORRECT_MODE **Error value: -4**	The attached ET-1000 was put into a such a mode of operation that the attempted call to the library function was not applicable. For instance, you cannot access any packet data unless the capture mode has been enabled.
PARAMETER_RANGE **Error value: -5**	An incorrect or invalid range was specified on a parameter of a library function. This may include ranges within structures whose pointers are passed as a parameter to the function.
PACKET_NOT_AVAILABLE **Error value: -6**	An attempt was made to access information from an indexed packet that is not currently within the capture buffer of the attached ET-1000.
SERIAL_PORT_DATA **Error value: -7**	Though no errors were detected on the serial port, the data returned from it doesn't appear to be correct. This is indicative of a serial port with a lot of interference. Try reducing the baud rate (ETSetBaud(...)).
ET1000_OUT_OF_SYNC **Error value: -8**	The attached ET-1000 is operating in a mode different than what was expected. Perform an ETUnLink command followed by Link.
PACKET_NOT_FOUND **Error value: -9**	An attempt to locate a packet within the ET-1000's capture buffer was made, but the packet contents could not be found and/or verified.
FUNCTION_ABORT **Error value: -10**	A function was aborted by the user before it could run to completion.

ACTIVE_HUB_NOT_INITIALIZED **Error value: -11**	An attempt to execute a command that requires a SmartCard was unsuccessful due to the library's failure to properly initialize the board. The library will always try to initialize the board if it hasn't been done so already, but for some reason, the initialization failed. This could indicate a failed SmartCard.
ACTIVE_HUB_NOT_PRESENT **Error value: -12**	An attempt to execute a command that requires a SmartCard was unsuccessful due to the fact that the addressed port had no board installed in it.
WRONG_HUB_CARD_TYPE **Error value: -13**	An attempt to execute a command that requires a SmartCard was unsuccessful due to the fact that the addressed port contained a Passive Hub board.
MEMORY_ALLOCATION_ERROR **Error value: -14**	The library attempted to allocate memory for some internal operations and was unsuccessful. This indicates that the PC Memory Manager could not find the necessary space to run the function.
UNSUPPORTED_INTERLEAVE **Error value: -15**	Not currently implemented.
PORT_ALREADY_LINKED **Error value: -16**	The Programming Library supports 1 connection at a time to an ET-1000 or SMB-1000. An ETLink command was issued when an active link already exists.
HUB_SLOT_PORT_UNAVAILBLE **Error value: -17**	A request was made to perform an operation on a Hub/Slot/Port that does not exist in the current configuration.
GROUP_HUB_SLOT_PORT_ERROR **Error value: -18**	A request was made to create or perform an operation on a group with a Hub/Slot/Port that does not exist in the current configuration.
REENTRANT_ERROR **Error value: -19**	An attempt was made to call a Programming Library function while BackgroundProcessing was enabled, and the Programming Library was already performing a function.
DEVICE_NOT_FOUND_ERROR **Error value: -20**	An attempt was made to address an attached device which could not be found [e.g. an MII transceiver].
PORT_RELINK_REQUIRED **Error value: -21**	The connection is down, but no disconnect action was taken by either side.
DEVICE_NOT_READY **Error value: -22**	At this time, this error value is returned when a Token Ring is down.
GROUP_NOT_HOMOGENEOUS **Error value: - 23**	Not currently implemented. (Only used by undocumented commands).

INVALID_GROUP_COMMAND **Error value: - 24**	Not currently implemented. (Only used by undocumented commands).
ERROR_SMARTCARD_INIT_FAILED **Error value: - 25**	Unable to initialize SmartCard.
SOCKET_FAILED **Error value: - 26**	Error in the socket connection for an Ethernet Link (PC to SMB).
SOCKET_TIMEOUT **Error value: - 27**	Timeout on the socket connection for an Ethernet Link (PC to SMB).
COMMAND_RESPONSE_ERROR **Error value: - 28**	Invalid command response received from SmartBits.
CRC_ERROR **Error value: - 29**	CRC error in the data transfer.
INVALID_LINK_PORT_TYPE **Error value: - 30**	An attempt was made to link a PC to a SmartBits chassis over a connection which is not recognized as a normal Serial Comm Port, nor as a proper TCP/IP Socket Link. (This error message should not occur.)
INVALID_SYNC_CONFIGURATION **Error value: - 31**	User attempted to perform a GPS/sync action when the SMB is not set for GPS. (Could indicate that GPS is not ready.)
SERIAL_PORT_TIMEOUT **Error value: -98**	The serial port timed out while waiting for a response from the ET-1000. This usually indicates a problem with the physical serial link.

Appendix B
Notes on Tcl

Introduction

The SmartLib Programming Library commands can be utilized from Tcl just as they can from C++ or any other supported language. This section describes how to use the SmartLib commands and data structures through the Tcl interface.

Loading SmartLib

In order to use SmartLib with Tcl, you need to start your Tcl script by "sourcing" the SmartLib Tcl interface header file, et1000.tcl, with the following line:

```
source et1000.tcl
```

Of course, you may need to specify a path to et1000.tcl if your program is running in a different directory. The et1000.tcl file will perform the following tasks:

1. Loads the interface library (tclet100.dll in Windows, tclet100.so in Unix). This library maps the Tcl SmartLib commands to their corresponding C/C++ SmartLib commands. The interface library loads the actual C/C++ SmartLib (etsmbw32.dll in Windows, libetsmb.so in Unix).

2. Loads the TclStruct 1.3 library. TclStruct is an extension to Tcl which we use to represent data structures in Tcl. Using data structures will be discussed in more detail later in this document.

3. Initializes all the pre-defined constants. All the "#define" statements in the C/C++ SmartLib header files have been translated to "set" statements in Tcl, allowing you to use these constants in your scripts.

4. Creates all the SmartLib data structure types. All data structures used by the SmartLib are declared using the syntax dictated by the TclStruct extension.

Commands

SmartLib commands can be called in Tcl in much the same way as they are in C/C++. The difference is that the function calls follow the standard Tcl syntax instead of the C/C++ syntax. For example, compare the following calls to ETLink and HGAddToGroup in C/C++ and Tcl:

C/C++:

```
ETLink(ETCOM2);
HGAddToGroup(iHub, iSlot, iPort);
```

Tcl:

```
ETLink $ETCOM2
HGAddToGroup $iHub $iSlot $iPort
```

Checking a command's return value, a common (and recommended) practice when using the SmartLib, can also be done similarly through Tcl:

C/C++:

```
iResponse = HGAddToGroup(iHub, iSlot, iPort);
```

Tcl:

```
set iResponse [HGAddToGroup $iHub $iSlot $iPort]
```

Data Structures

Data structures are represented in Tcl using the TclStruct extension. All data structure types are declared in et1000.tcl using the "struct_typedef" command provided by TclStruct. To create a data structure of a previously declared type, use the "struct_new" command. For example, to create a data

structure named "gt" of the type "GIGTransmit", use the following line:

```
struct_new gt GIGTransmit
```

Arrays of data structures can also be created by the struct_new command. The following example creates the variable "strms" to be an array of five "StreamIP" structures:

```
struct_new strms StreamIP*5
```

Data structure fields are referenced by a simple syntax. The structure name is followed by an open parenthesis ("("), followed by the name of the desired field to reference, followed by a close parenthesis (")"). Sub-fields are separated by periods (".". For example, using the "strms" variable created above, set the third stream's uiFrameLength field to 60 with:

```
set strms(2.uiFrameLength) 60
```

For more examples of using data structures in Tcl, refer to the provided samples: sample.tcl in the TclFiles directory and the Tcl scripts in the Manufacturing directory.

Memory allocated for data structures using the struct_new command can be freed like any other variable in Tcl, using the "unset" command. For example:

```
unset gt
unset streams
```

Data types

The data structure types declared in et1000.tcl contain fields with types corresponding to those in the C/C++ header files. Because of the nature of Tcl, you must take care in setting character values. Tcl assumes that any value assigned to a "char" or "uchar" field is meant to be a character. However, it is common and sometimes necessary to assign a numeric value to a character field. For example, suppose you wanted to

set the first byte of the ucVFD1Data field of the GIGTransmit structure to the character with a value of 8. In C/++, this can be done like this:

```
gt.ucVFD1Data[0] = 8;  // C/C++ syntax
```

In Tcl, however, a direct translation of this line of code would cause the field to be set to the character '8' instead of the character with the value 8. To specify a character value in Tcl, use the "format" command:

```
set gt(ucVFD1Data.0.uc) [format %c 8]  ;# Tcl syntax
```

A backslash can be used as a short-hand method to set simple character values, such as 0 or 1.

```
set gt(ucLoopBackMode) \1
```

Tcl does support hexadecimal values. The syntax is identical to C/C++:

```
set gt(ucVFD1Data.0.uc) [format %c 0x8A]
```

You can use the backslash character notation with hex numbers as well:

```
set gt(ucLoopBackMode) \x01
```

Arrays

Many of the SmartLib data structures contain fields that are arrays of basic types. In the Tcl interface to the SmartLib, arrays of basic types are implemented as arrays of "utility structure" types which we provide. These utility structures are structures containing a single field which is one of the basic types. For example, the "ULong" structure contains a single element of type "ulong" (unsigned long). The "Char" structure contains a single "char" element. To illustrate this concept, let's examine the "HTTriggerStructure". The HTTriggerStructure contains a "Pattern" field which is an array of six integers. Notice that in et1000.tcl, the

HTTriggerStructure is declared as follows:

```
struct_typedef HTTriggerStructure {struct
        {uint Offset}
        {int Range}
        {Int*6 Pattern}
}
```

As you can see, the Pattern field consists of an array of six "Int"s (not "int"s). The Int type is the data structure used for arrays of integers (specifically "short"s). It is defined as follows:

```
struct_typedef Int {struct
        {short i}
}
```

In Tcl, to fill this structure with the desired data, you must specify the "i" field. Compare the following equivalent C/C++ and Tcl code:

C/C++:

```
HTTriggerStructure trig;
trig.Offset = 0;
trig.Range = 6;
trig.Pattern[0] = 0x0A;
trig.Pattern[1] = 0x0B;
trig.Pattern[2] = 0x0C;
trig.Pattern[3] = 0x0D;
trig.Pattern[4] = 0x0E;
trig.Pattern[5] = 0x0F;
```

Tcl:

```
struct_new HTTriggerStructure trig
set trig(Offset) 0
set trig(Range) 6
set trig(Pattern.0.i) 0x0A
set trig(Pattern.1.i) 0x0B
set trig(Pattern.2.i) 0x0C
set trig(Pattern.3.i) 0x0D
```

```
set trig(Pattern.4.i) 0x0E
set trig(Pattern.5.i) 0x0F
```

Multi-Dimensional Arrays

Some of the SmartLib commands have multi-dimensional arrays arguments, such as HTHubSlotPorts and HTCardModels. We have provided the utility functions ETMake2DArray and ETMake3DArray that create 2-dimensional and 3-dimensional arrays, respectively. Observe the following example of how to create and use a multi-dimensional array:

```
ETMake3DArray HSP $MAX_HUBS $MAX_SLOTS $MAX_PORTS
HTHubSlotPorts HSP
for {set iPort 0} {$iPort < $MAX_PORTS} {incr iPort} {
        for {set iHub 0} {$iHub < $MAX_HUBS} {incr iHub} {
                for {set iSlot 0} {$iSlot < $MAX_SLOTS} {incr iSlot} {
                        puts $HSP($iHub,$iSlot,$iPort)
                }
        }
}
```

Pointers

In rare cases in the SmartLib, structure fields may be pointers to a particular data type. An example of this is the "Data" field of the HTVFDStructure data structure. In C/C++ form, the HTVFDStructure is declared in et1000.h like this:

```
typedef struct
        {
        int Configuration;
        int Range;
        int Offset;
        int* Data;
        int DataCount;
        } HTVFDStructure;
```

The Data field is a pointer to an int. Since Tcl doesn't support pointers, we use another form of indirection. The Data field is declared as a character array instead. The Tcl structure as declared in et1000.tcl is like this:

```
struct_typedef HTVFDStructure {struct
        {int Configuration}
        {int Range}
        {int Offset}
        {char*256 Data}
        {int DataCount}
}
```

The Data field will be used to hold the name of an integer array created locally. The integer array can be created as an array of Int structures:

```
struct_new localData Int*50
```

For example purposes, let's say we have created a variable of type HTVFDStructure:

```
struct_new vfd HTVFDStructure
```

After filling in the local data array...

```
set localData(0.i) 0xAA
set localData(1.i) 0xAB
# ... etc ...
```

...we set the Data field to be the name of the newly created integer array:

```
set vfd(Data) localData
```

Notice that there is no "$" in front of "localData". This is because we are setting the Data field to the actual string "localData", the name of the variable, not the value of that variable.

Structure Commands

Advanced SmartLib programming is done through the use of the "structure commands": HTSetStructure, HTGetStructure, and HTSetCommand. These structure commands can be used in Tcl similar to how they are used in C/C++. In some instances, these commands require you to pass an array of basic elements as the "pData" argument. In these cases you must use an array of one of the single element utility structures: UChar, Char, Int, etc. Just create an array of these structures and use that as the pData argument. The following example sets the background data to an incrementing pattern of 60 bytes:

```
struct_new data UChar*60
for {set i 0} {$i < 60} {incr i} {
        set data($i.uc) [format %c $i]
}
HTSetStructure $GIG_STRUC_FILL_PATTERN 0 0 0 data 60 $iHub $iSlot $iPort
```

Although you may use the "uiLen" argument to specify the size of the data being sent or received in the pData argument, it is not actually necessary to do so when using the Tcl interface. The SmartLib Tcl interface calculates the size of the data being sent or received itself and passes this value on to the core SmartLib.

More Examples

For more examples of using the SmartLib with Tcl, refer the extensive collection of TCL examples found in the **Samples | Tcl** directory of the installation CD.

Appendix C
Revision History

Version 3.05

- Added support for the SMB-6000 SmartBits chassis and the LAN-6200A SmartCard, to the level of compatibility with the SMB-2000 SmartBits chassis and the GX-1405 SmartCard.

- New function: ETSetGPSDelay(unsigned long ulSeconds); to set the delay time before a GPS synchronized start/stop.

- Fixed RemoveHubSlotPortFromGroup() - only worked in certain cases. Now it should work all the time.

- Fixed bug in HTDuplexMode to allow half-duplex settings.

- Fixed bug in one-to-many test if ATM is on one side. (Bug #3920)

- Changed HTBurst "AH" for "mode" command.

- Fixed bug for throughput test. Rate never increased when ATM card was the source.

- One-to-many ATM test improved to support result retrieval when multiple streams have only one connection.

- Fixed bug where ATM cards after first card weren't being initialized in one-to-many or many-to-one tests.

- Fixed bug where ATM card was being initialized several times.

- Added function ETIsSyncCapable for GPS support.

- Added one more decimal place of resolution to status results.

- Changed ucSearchType field to ulSearchType.

- Added utility functions for U64 structure

- Fixed SASA bug in ARP replies: IP destination was incorrect when both "multiple trials" and "learning every trials" options elected.

- Report format modified to allow apps to create tabular reports.

- SASA corrected to check packet errors before calculating throughput results.

- Store and Forward latency calculation fixed for Token Ring, 100Mbit Ethernet, and 1Gbit Ethernet.

- Extended frame relay timeout period to be 2 * NN1 * NT1 to fix a reported bug.

- Fixed problem with decoding 2 bytes of the lecid returned back from card.

- Per-Connection Burst Count (ATM-2). This feature enables applications controlling the ATM cards to specify a quantity of frames to transmit (and then stop) for each active connection.

- Per-Port Burst Count (ATM-2) This feature is the same as above except here we specify it for each card or per-port basis inclusive of all active connections)

- Cell Scheduling (ATM-2) This feature provides the ability to schedule N connections equally and at a specific percentage of line rate.

- Stream Copy, Stream Modify and Stream Fill for ATM cards. This feature helps reduce the setup time associated with configuring streams. Stream Copy creates a given number of streams (up to the max for the card) which are identical to an already existing "source" stream. Stream Modify modifies the parameters of a given number of streams which already exist on a card, with an absolute value. Stream Fill, is similar to the Stream Modify feature, except here a delta value to increment, from the initial value, is specified.

- Frame Copy for ATM cards. This feature helps reduce the setup time with configuring frames. Frame Copy defines frames for multiple existing streams in a single command.

- Histogram retrieval from the frame relay cards has been fixed. Index and count now work as well for the FR_HIST_LATENCY_INFO iType.

- Modified HTSeparateHubCommands(HUB_GROUP_SYNC_ACTION) to return error if SmartBits is not configured properly for GPS or synchronized start.

- Modified Tcl interface to allow either of the following syntaxes for declaring a single element array: "struct_new ulVar ULong" OR "struct_new ulVar ULong*1".

- Added SMB-200 support for ETGetController() function--returns CONTROLLER_SMB200 constant.

- HGSetGroup fixed so it can support setting a group across multiple links. (Bug #3767)

- ETLink, ETSocketLink fixed so that if it is successfully executed, the return value will be the new link count.

- Added the capability to change gigabit latency adjustment factors from the .ini file.

- Modified ETLink to check if a comport is already linked before attempting to link again. (Bug #3894)

- Changed FieldCount member of Layer3ModifyStreamDelta to FieldRepeat.

- Fixed problems with HGResetPort.

- Added capability to specify which histogram records to retrieve.

- Added new error codes.

- Fixed report file and log file problem for Unix (Bug #4278)

- New constant names for HTSeparateHubCommands.

- Modified ETSetTimeout to use max timeout when given 0 as the timeout parameter.

- Fixed HTLatency to not require background pattern to be set separately.

- Fixed Unix byte-ordering problems with SmartAPI.

Version 3.04

- Added Ethernet message functions.

- Support for starts synchronized by GPS added.
- Added support for ATMClassicalIPInfo structure.
- Added support for T1/E1 Frame Relay cards.
- Fixed bug where StopOnError failed to stop test under UNIX SmartAPI. for SmartApps default error callback.
- Fixed ETGetBaud bug with multiple links.
- Fixed HGSetSpeed function.
- Added TCL and C sample code.
- Fixed timeouts on high-latency connections.
- Added delay for UNI restart on ATM cards.
- Added option to setup Stream8023 streams for Frame Relay cards in the SmartAPI for SmartApps.
- Increased latency resolution from 32 to 64 bits with ATM cards.
- Added support for Gigabit autonegotiation to SmartAPI for SmartApps.
- Changed SmartAPI for SmartApps to allow back-to-back test to reach 100% regardless of resolution setting.
- Changed SmartAPI for SmartApps to report packet loss based on the transmitter rate instead of the receiver.
- Added lUseIdenticalRate parameter to ATM setup for SmartAPI for SmartApps.
- Added uiMaxRateWithTeardown and uiMaxRateWithoutTeardown into ATMCardCapability structure.
- Changed HTResetPort to stop ping, SNMP, and ARP reply packets from being transmitted from Layer 3 cards.
- Fixed bug in HTGetStructure when used with ATM cards to retrieve more than 2048 bytes of data.
- Added VFD1, 2, and 3 Block count to support 7710.
- Added support for WN-3415 and -3420 to HTGetCardModel.
- Added commands for ATM Classical IP client establish/release
- Fixed bug causing L3 and ML cards to crash if reset while running.
- Fixed bug with WriteMII to register 0.
- Added new command for per-connection burst count.
- Added support for UNI 3.0 signaling in the back to back mode for the SmartSignaling API.
- Modified the test approach for the Call Capacity test of the SmartSignaling API. The test will now run until all connections

have failed rather than quitting after the first failed connection.
- The timestamps in the Signaling API are now 64 bits long supporting time durations to 58,000+ years.
- Added HGClearGroup command to replace obscure HGSetGroup(NULL)
- Added "Frame" functions for easy static frame generation. Functions allow multiple frames to be created, modified, and set as the fill pattern. Sensible default frame values are placed into new frames, and the CRC is recalculated automatically as the frame contents are altered.
- Fixed installation problems under SunOS 4.1.4. The installation is now successful with the following items installed first: GCC shared library, GNU Make 3.77, and GNU ld 2.9.1 (which comes in GNU binutils 2.9.1).
- Programming Library extension to Tcl 7.6 or 8.0 now installs successfully under SunOS 4.1.4.
- Fixed excessively long timeout for duplicate socket link.
- Fixed excessively long timeout for unlink from dead SmartBits.
- Added embedded structure definitions in Message Functions manual.
- Corrected code omissions in SmartAPI Manual.
- Split SmartAPI manual into: SmartAPI for SmartApps and SmartAPI for Smart Sig.
- Manuals converted to full-size 8.5 X 11 page format.
- Extensive documentation about histograms (SmartMetrics Results).

Version 3.03

- Added Frame Relay SmartCard support to TestAPI.
- Implemented HTResetPort and HGResetPort for Gigabit SmartCards.
- Added Enable Pause Flow Control option to TestAPI for Gigabit and Fast Ethernet SmartCards.
- Added synchronized start capability between master and slave links.
- Support for Gigabit SmartCard VFD3 buffer sizes of up to 16K.
- Fixed minor Gigabit SmartCard VFD3 bugs.
- Added interface support for Tcl 8.0 to Windows SmartLib.
- Extended maximum number of calls for ATM SmartCards from 512 to 8388607.
- Added Linear Search for the ATM Peak Call Rate test in the TestAPI.
- Added option of no call teardowns for ATM Peak Call Rate test - affecting Message Functions and TestAPI.

- Additional Smart API results format.
- Other miscellaneous minor bug fixes and improvements. Contact Technical Support for complete list.

Documentation:

- New Manual, SmartLib Smart API, covering functionality and concepts.
- Corrected examples in SmartLib User Guide, Chapter 8.
- Miscellaneous updates and corrections.

Version 3.02

Added support for the following SmartCards:

ML-7710 100Mb Multi-Layer 10/100 Mbps Ethernet SmartCard

Fixes and new features:

- Reworked all gap commands to send all data in nanoseconds to be consistent with SmartWindow
- Increased receive time-out for command downloads
- Fix of capture count retrieval
- Added Frame relay Get_Structure call to return WAN card version
- Corrected static ILMI command
- Full list available from Technical support
- Corrected report file results problem
- Corrected GbE gap size update

New Documentation:

- User Manual - Major update for new functions supported in Version 3.00 and 3.02.
- SmartLib Message Functions manual - All new manual:

  The SmartLib Message Functions manual is used in addition to the SmartLib User Manual. It covers the newer SmartLib Hardware API functions in detail.

  It contains a complete list of the SmartLib 3.02 message functions and all related

  parameters. It also includes basic concepts of the message function syntax, as well as examples specific to different programming languages.

Version 3.00

Added support for the following SmartCards:

SX-7410 100Mb Fast Ethernet

AT-9622 622Mb OC-12c ATM

AT-9155 155Mb OC-3 ATM Signaling and Frame Generation

AT-9045 45Mb DS3 ATM Signaling and Frame Generation

AT-9034 34Mb E3 ATM Signaling and Frame Generation

AT-9020 2.048 E1 ATM Signaling and Frame Generation

AT-9015 1.544 T1 ATM Signaling and Frame Generation

GX-1405 Gigabit Ethernet

WN-3405 V.35 FrameRelay

Visual Basic Interface changes:

Added updated Visual Basic Interface files. These files are in the VB directory with filenames matching their corresponding ".h" header files. The 16-bit VB files have extensions ".b16" and the 32-bit VB files have extensions ".b32". In addition to containing updated commands, structures, and constants, the new VB interface files have the following changes from the previously distributed VB interface files:

- HTVFDStructure: iPointer and iLength fields have been renamed to pData and DataCount respectively, to more closely match the field names in et1000.h.

The previously distributed VB interface files (etsmbapi.txt, etsmbw32.txt, and atmitem32.txt) are still distributed in the CommLib directory, for use with previously written tests. These do NOT contain updated commands, structures, and constants, however.

Version 2.50-20

Added TestAPI functions to perform the RFC1242 tests and retrieve the test results.

```
int NS1242TestStart( int iTestType,
PortPairStruct *pPortPair,
int iTestPairs,
TestSetup *pTestSetup,
StatusCallbackFunc StatusCallBack,
```

```
ErrorCallbackFunc ErrorCallBack );
int NS1242TestStartVB( int iTestType,

PortPairStruct *pPortPair,
int iTestPairs,
TestSetup *pTestSetup );
int NS1242TestStop( int iTestType );
int NS1242TestReport( int iTestType, char *pszReport );
```

Version 2.42

Added functions to set and save card speed and duplex modes.
Added functions to get the card specific minimum and maximum interpacket gap allowed and acceptable, and length allowed and acceptable.

Version 2.37

Added functions to save trigger configurations.
Fixed bug where port 79 (hub 4, port 19) card type was being overwritten.
Fixed Interburst gap.
Added HGStartSetGroup and HxModifyFillPattern.
Fixed VB prototypes
Automatically defer sending group configure hub group command until group start/stop/step is required. This can result in very large speedups when using HGSetGroup and HGAddToGroup in a loop.
Added the STATUS_xxx items which are documented under the GetEnhancedStatus() manual. However, entered the values as the correct values being returned from the TokenRing card.
In HTHubSlotPorts(), added valid returns for CT_TOKENRING and CT_VG.

Version 2.32

Fixed behaviour for Multiburst gap for 100mb cards.
Added optimization for HGAddToGroup command where a HGStartSetGroup()/HGEndSetGroup pair can bracket a multiple change of ports in a group to speed up command processing time.
Added HGModifyFillPattern and HTModifyFillPattern to allow multiple cards to be programmed followed by a difference file for particular cards.

Version 2.31

Added library commands for VG SmartCard:

int HGSetVGProperty(pVGPStructure)

int HTSetVGProperty(pVGPStructure, iHub, iSlot, iPort)

Version 2.3

Added library commands for better “group” configuration control:

int HGGetGroupCount(void)

int HGRemoveFromGroup(int iHub, int iSlot, int iPort)

int HGRemovePortIdFromGroup(int iPortId)

int HGIsPortInGroup(int iPortId)

int HGIsHubSlotPortInGroup(int iHub, int iSlot, int iPort)

Added TokenRing SmartCard commands:

int HTPortProperty(unsigned long* pulProperties,int iHub, int iSlot, int iPort)

int HTSetTokenRingErrors(iTRErrors, iHub, iSlot, iPort)

int HTSetTokenRingAdvancedControl(pTRAdvancedStructure, iHub, iSlot, iPort)

int HGSetTokenRingAdvancedControl(pTRAdvancedStructure)

int HGSetTokenRingErrors(iTRErrors)

int HTSetTokenRingProperty(pTRPStructure, iHub, iSlot, iPort)

int HTSetTokenRingLLC(pTRLStructure, iHub, iSlot, iPort)

int HTSetTokenRingMAC(pTRMStructure, iHub, iSlot, iPort)

int HTSetTokenRingSrcRouteAddr(UseSRA, piData, iHub, iSlot, iPort)

int HTGetEnhancedCounters(pEnCounter, iHub, iSlot, iPort)

int HTGetEnhancedStatus(piData, iHub, iSlot, iPort)

int HGGetEnhancedCounters(pEnCounter)

int HGSetTokenRingProperty(pTRPStructure)

int HGSetTokenRingLLC(pTRLStructure)

int HGSetTokenRingMAC(pTRMStructure)

int HGSetTokenRingSRA(UseSRA, piData)

Added link status commands. These COM port “linkage” related functions now allow multiple ET-1000 and/or ETSMB-1000 systems to be connected and controlled from a single program using the ETSMB Programming Library.

int ETSetCurrentLink(ComPort)

int ETGetCurrentLink()

int ETGetLinkFromIndex(iLink)

int ETGetTotalLinks()

Version 2.22

Fixed Gap scale and gap range problem.

Documented HTCollisionBackoffAggressiveness().

Version 2.21

Added:

int ETGetLibVersion(pszDescription, pszVersion)

long ETGetBaud();

int HTFindMIIAddress(pAddress,pControlBits,hub,slot,port).

Now allow Range = 0 when HTVFD set to HVFD_NONE.

Fixed a bug in RecallSettings() when being issued to a 100 Mbit FastCard.

Version 2.20

Added support for 100 Mbit Fast cards.

Added HTReadMII and HTWriteMII functions to support the 100 Mbit Fast cards.

Added HTDuplexMode() and HGDuplexMode().

The Range for (ET)VFDStructure Base pattern and Increment buffer has been limited to 4096 bytes.

The packet length may now range from 1 to 8191 bytes in the HTDataLength() command to allow runts and jabbers. A value of zero still generates random lengths.

Extended the HTVFDStructure.Range member to allow specifying bit sized fields for VFD1 and VFD2.

Added library commands for the following SmartCard controls:

int HTTransmitMode(iMode, hub, slot, port)

int HTBurstCount(lCount, hub, slot, port)

int HTInterBurstGap(lCount, hub, slot, port)

int HTInterBurstGapAndScale(lCount, iScale, hub, slot, port)

int HTMultiBurstCount(lCount, hub, slot, port)

int HTGapAndScale(lCount, iScale, hub, slot, port)

and the corresponding hub group commands:

int HGTransmitMode(iMode)

int HGBurstCount(lCount)

int HGInterBurstGap(lCount)

int HGInterBurstGapAndScale(lCount,iScale)

int HGMultiBurstCount(lCount).

int HGGapAndScale(lCount, iScale)

The two commands, HxTransmitMode(), and HxBurstCount() replaces the single command HxBurst(). The HxBurst() cmd used to set the burst count, and then immediately set the transmit mode. With the introduction of the HxTransmitMode() command, the user now has explicit control over the transmit mode. Future commands should use the HxTransmitMode(iMode), and HxBurstCount(lCount) commands and no longer utilize the HxBurst() command.

The introduction of the HxGapAndScale() commands affect the interpretation of the HxGap() command. Please review the detailed description of each command for specific behaviors in common usage.

Version 2.13

Added missing HGSelectTransmit prototype.

Fixed sample ET1000 initialization code.

Version 2.12

Added support for Solaris, SunOS 4.x, and Linux.

HTGap and HGGap commands were limited to an unsigned int.

HTLatency did not set the appropriate trigger.

All references to Active port were changed to SmartCard.

Version 2.11

Visual Basic function prototypes for HTGetHubLEDs and HGGetLEDs were incorrect.

The SETUP program would not allow installation from a non-root directory. A:\SETUP or C:\SETUP would work, C:\TEMP\SETUP would not.

Version 2.10

New functions

HGAddtoGroup now can be used along with HGSetGroup to create groups of ports.

HTLatency can now be used to measure latency using specific cards.

HTCRC and HGCRC can be used to generate CRC errors.

HTAlign and HGAlign can be used to generate alignment errors.

HTDribble and HGDribble can be used to generate dribbling bit errors.

HTPortType and HTHubSlotPorts can be used to determine what cards exist in a SmartBits hub.

HTVFD now supports a static field definition for easy programming of MAC addresses.

HTGetLEDs and HGGetLEDs now returns LED states.

HTGetHubLEDs now returns LED states for an entire hub.

HTSelectTransmit now selects via Hub/Slot/Port ET-1000 transmission.

HTSelectReceive now selects via Hub/Slot/Port ET-1000 reception and capture.

New advanced functions

ETEnableBackgroundProcessing which can be used to enhance the responsiveness of applications.

ETIsBackgroundProcessing determines if a background process is running.

ETReturnAddress returns a pointer to a Visual Basic data type. An example of this call is shown in the VFD3 code snippet below.

Corrected Errors

Using ETSetup with ETRECALLSETUP and SetupId of 0 (return to factory defaults), could leave an attached SmartBits hub in an unknown state. Now, all hubs and all cards are reset to the default state when this command is issued. Also, the connection to the ET-1000/SmartBits is maintained across this call. The baud rate in effect before issuing this call is restored before the call returns. There is no need to disconnect and reconnect after this call.

ETSetBaud now maintains a connection to the ET-1000/SmartBits. There is no longer a need to disconnect and reconnect after using this call.

Initial connection time when using an ETLink command may be minimized by calling ETSetBaud to the baud rate of the device prior to ETLink as below:

```
ETSetBaud(ETBAUD_38400);   //Start searching at 38400
ETLink(ETCOM2);            //Try to connect to ET1000
//This will search all baud rates, but will set the baud
//rate to 38400 for the first search.  If you want to
//guarantee the fastest possible connection after
//connect, use:
ETSetBaud(ETBAUD_38400);   //Start searching at 38400
ETLink(ETCOM2);            //Try to connect to ET1000
ETSetBaud(ETBAUD_38400);   //Reset to 38400
```

Visual Basic structure definition HTVFDStructure has changed. The new structure is:

```
Type HTVFDStructure
  Configuration As Integer
  Range As Integer
  Offset As Integer
  iPointer As Long
  iLength As Integer
End Type
```

An example Visual Basic snippet to set a VFD3 field is:

```
Static inData(24) As Integer
Static VFD As HTVFDStructure
inData(0) = 255   'Set up "VFD" data structure
inData(1) = 255   'to contain 2 source and dest
inData(2) = 255   'addresses
inData(3) = 255   '
inData(4) = 255   ' Destination:
inData(5) = 255   '   “FF-FF-FF-FF-FF-FF”
inData(6) = 0     ' Source:
inData(7) = 160   '   “00-A0-86-FF-00-00”
inData(8) = 134   '
inData(9) = 255   '
inData(10) = 0    '
inData(11) = 0
inData(12) = 0     'Start of 2nd packet structure
inData(13) = 160   ' Destination:
inData(14) = 134   '   “00-A0-86-FF-00-00”
inData(15) = 255   '
inData(16) = 0     '
inData(17) = 0     '
inData(18) = 0     ' Source:
inData(19) = 160   '   “00-A0-86-FF-00-01”
inData(20) = 134   '
inData(21) = 255   '
inData(22) = 0     '
inData(23) = 1     '
VFD.Configuration = HVFD_ENABLED
VFD.Range = 12     'Bytes in VFD
VFD.Offset = 0     'Offset in bits from first bit
VFD.iPointer = ETReturnAddress(inData(0))
                   'VisualBasic does not support a
                   'pointer type, so this is a
                   'work-around.
VFD.iLength = 24   'two different destination/source
                   'addresses
iRtn = HTVFD(HVFD_3, VFD, 0, 0, 0)
```

Version 2.01

HTSelectReceivePort and HGSelectReceivePort were incompletely documented.

Version 2.0

Software Additions

A new set of Hub "Group" commands have been added. All of these commands are prefixed with an "HG" and are fully described in the Detailed Description section of this manual. The customer should look to utilize these new "HG" commands any time that multiple SmartBits ports are being sent the same "HT" command. Significant performance improvements can be achieved in the ET-1000/SmartBits programming time.

There are two main steps to utilizing the new "HG" commands. First, one must setup a "PortIdGroup" string using the new HGSetGroup(char* PortIdGroup) command. Then use the "HG" commands similar to how the HT commands are currently used. Every subsequent "HG" command will take effect on all ports listed in the PortIdGroup string.

This has benefits in coding and significant execution time improvements when dealing with more than a few cards at a time. For most programmers, this will enable more inline coding, thus preventing most need to repetitively loop through all the ports to be set up using the HT commands. At run time, the combined overhead of the code loops, operating system, serial communication, and instrument hardware response times are cut by as much as twenty times. This can be quite a significant performance increase if many commands are used to configure and reconfigure your SmartCards during and between various test procedures. There is a new coding example with this distribution which demonstrate the HG commands in C (PORTGRUP.EXE).

The library is now available as a Microsoft Windows Version 3.1 DLL. This file is called ETSMBW16.DLL and should be copied to the \WINDOWS\SYSTEM directory.

The HTCountStructure was changed to use unsigned longs for all event counters.

Notes on Using Microsoft Visual Basic

Applications that are created in Visual Basic may call any exported DLL function. Visual Basic calls these functions "external procedures". These external procedures must be defined by using the "Declare" statement in the Declarations section of a form or module. Netcom distributes a file named "ETSMBAPI.TXT" which declares all the functions and structures referenced in this manual. This file may be included in your Visual Basic projects.

Structures are called "User-Defined Data Types" in Visual Basic. All structures referenced in this manual have equivalent Type definitions in ETSMBAPI.TXT.

Some of the constants used have changed names. This is because Visual Basic does not allow functions and global constants to have the same names.

C	Visual Basic
HTSTOP	HTRUN_STOP
HTSTEP	HTRUN_STEP
HTRUN	HTRUN_RUN
ETSTOP	ETRUN_STOP
ETSTEP	ETRUN_STEP
ETRUN	ETRUN_RUN

The DLL opens the Comm port to communicate to the ET-1000 & SmartBits Hub. The DLL creates and uses an internal memory block throughout the set of calls used to communicate with the device. Visual Basic does not handle this situation in a normal fashion. Normally, Visual Basic loads and unloads a DLL for each call or procedure used. This would have the effect of removing the memory block in-between DLL calls. So, to handle this situation, programs use the following code fragments:

In a global module,

```
Declare Function LoadLibrary Lib "Kernel" (ByVal
lpLibFileName As String) As Integer
Declare Sub FreeLibrary Lib "Kernel" (ByVal hLibModule As
Integer)


Global OpenedET As Integer
Global ETLibHandle As Integer
```

in the initial form load:

```
Sub Form_Load ()
    ETLibHandle = LoadLibrary("etsmbw16.dll")
    OpenedET = ETLink(ETCOM2)
End Sub
```

At the unload of this form, use:

```
Sub Form_Unload (Cancel As Integer)
    If (OpenedET > 0) Then
        iRtn = ETUnLink()
        If (iRtn < 0) Then
            MsgBox "Bad Close of ET Connection", 48
        End If
    End If
    FreeLibrary ETLibHandle
End Sub
```

This will load the DLL and keep it in memory throughout the application life.

Visual Basic Demonstration Application

There is a demonstration program, ETVBDEMO.EXE, written in Visual Basic, that demonstrates several different capabilities of the device.

This demonstration is distributed the source code. The source code modules used are:

Form	Description
SPLASH.FRM	A introductory "splash" screen shown for a short time while initializing the ET-1000
CONNECT.FRM	A background form, not shown, that controls background processing. This background processing is retrieving the counters for display
MAIN.FRM	The main sample form
ETSETUP.FRM	Setup transmission of the ET-1000 ports
SMBSETUP.FRM	Setup transmission of any of the SmartCards found.
PATTERN.FRM	A dummy pattern editor
GLOBALS.BAS	Global variables used by the forms above.
ETSMBAPI.BAS	A module created by including the ETSMBAPI.TXT file.

Several capabilities are not implemented in this demonstration program:

- VFD fields do not have any effect.
- Hex pattern editors for the Fill and VFD fields are not implemented.
- Triggering is not implemented.
- Error generation is not implemented.

- Echo mode is not implemented.
- The program does not query the device state prior to displaying any information. No checking is done prior to transmission of packet length, gap, data contents, error generation or any other type of packet transmission capability.
- The SMB Hub/Port cards when switched, do not update the state of the Run/Stop/Burst buttons

Software Modifications

HTTrigger was confusing to operate. HT_TRIGGER_ON, HT_TRIGGER_OFF, and HT_TRIGGER_INDEPENDENT are now the only mode arguments required

Version 1.32

Software Additions

An HTEcho command has been added to the library. This command is detailed in a new page in the reference section of the manual. Once a card is setup to trigger on an event (e.g. data pattern received), then that card will echo the received packet by transmitting it out the same port of that card.

Software Modifications

The **HTVFDStructure** now has a new parameter which is necessary for **VFD_3**. This structure has been amended to add the integer variable member "DataCount" to the end of the structure. The HTVFDStructure.DataCount member should be filled with the byte count (the size) of the Data buffer your program wants VFD_3 to pull bytes from to make up packet transmissions. This is the same buffer that is pointed to by the HTVFDStructure.Data member. The HTVFDStructure.Range member is still the packet size.

The **HTSelectReceivePort(int PortId)** now allows the programmer to turn off the last selected Receive Port by entering a PortId of 0 (zero). This is equivalent to the newly defined value in the ET1000.H file as defined in the following table.

Defined Value	Value Meaning
HTRECEIVE_OFF	OFF

This allows the programmer to turn off the receive mode of the last board routed to PortB of the ET1000 for analysis.

Software Environment

The ET-1000 library now supports Borland C/C++ 4.02 as well as 4.0 and 3.1. To do this, the name of the Borland 4.0 library has changed. Refer to the table below for the correct library to use with your program. You must decide which library is compatible before attempting to link.

File Name	File Type
B4ET1000.LIB	For development of Borland C/C++ version 4.02 applications
B40ET1K.LIB	For development of Borland C/C++ version 4.0 applications
B3ET1000.LIB	For development of Borland C/C++ version 3.1 applications
MSET1000.LIB	For development of Microsoft C/C++ (Visual C/C++ version 1.5) applications
ET1000.H	Library header file

Corrected Errors

The VFD's were not correctly generated.

The Trigger pattern was not correctly generated.

The Trigger_Off Mode parameter was not disabling the Trigger.

The HTSelectReceivePort command was not functional.

The HTSelectTMTPort command indexed SmartBits ports incorrectly. It now indexes them like Passive Hub cards which assumes two ports per board.

IMPORTANT NOTE:

Even though SmartCards have only one port, they are indexed as if there are two ports. This is important to note if you use any of the following three library calls which take a single PortId parameter instead of the "Hub, Slot, Port" addressing of other commands. These three commands are:

HTSelectReceivePort(PortId, Mode),

HTSelectTMTPort(PortId, Mode),

HTSetLED(PortId, Color).

So, if you have all SmartCards, if PortId is equal to 1 or 2, it will address the first SmartCard in the first Hub. Similarly, PortId equal to 3 or 4 will address the second SmartCard in the first Hub. And so on through to PortId 159 or 160 will address SmartCard 20 in the fourth Hub. For customers whose cards have two ports already, those are Passive cards, so your code should not be affected.

Compatibility with previous version

Most code previously linked with version 1.3 of this library will link with version 1.32 without modifications other than what has been noted above. There have also been upgrades to the Firmware that must be loaded before the HTEcho command will work. For best results you should have firmware version 8 or above to avoid problems when trying to control an attached SmartBits**.** Do **NOT** link your code with version 1.32 unless you have upgraded (or are about to upgrade) the firmware on your ET-1000 to Version 8 or above.

A field upgrade of ET-1000 firmware is available from Netcom Systems. The firmware is upgraded using a MS-DOS executable program (provided by Netcom Systems), and it requires about five to ten minutes to complete the upgrade process.

Version 1.3

Software

Functions for controlling and monitoring a SmartBits with SmartCards installed have been added. These additional commands allow you to exercise control over any SmartCards installed within the SmartBits Hub Tester. Compatibility with the previous HT-40 functions is maintained.

Structure HTCountStructure has been added; it is used to obtain statistical information on the SmartBits SmartCards.

Structure HTVFDStructure has been added. HTVFDStructure is used to define VFD information required by all SmartCards that are to implement VFD functions.

Functions for setting and reading the Live Network Mode (LNM) of the ET-1000 have been added. These functions are ETGetLNM() for reading the current status of LNM and ETLNM() for setting LNM in a specific mode.

The ET-1000 library now supports Borland C/C++ 3.1 as well as 4.0. Separate library files have been released for each type of compiler. If you are using a Borland compiler, you must decide which library is compatible before attempting to link.

A function for getting the timestamp of a captured packet has been provided. Function ETGetCaptureTime() performs this task. A new structure, "TimeStructure," has been provided with this release for holding the timestamp information.

User's Manual

There have been several modifications to this manual due to either A) the addition of functions in the library, or B) correction of errors in the Version 1.2 User's Manual.

Compatibility with previous version

All code previously linked with version 1.2 of this library will link with version 1.3 without modification; however, attempting to run this new version on an ET-1000 that does not have firmware version 8 or above may produce problems when trying to control an attached HT-40. Thus, do **NOT** link your code with version 1.3 unless you have upgraded (or are about to upgrade) the firmware on your ET-1000 to Version 8 or above. Field upgrade firmware is available from Netcom Systems. The firmware is upgraded using a MS-DOS executable program (provided by Netcom Systems), and it requires about five to ten minutes to complete the upgrade process.

Appendix D
Obsolete Functions and Structures

Capture	int ETGetCaptureTime (TimeStructure* TStruct)	OBSOLETE this function is not supported.
SmartBits	`int HGBurst (long lVal)`	**OBSOLETE** Sets the burst count and then sets burst mode. Replaced by the two commands: HGBurstCount and HGTransmitMode.
HT-40	`int HGClear (void)`	**OBSOLETE** Used on an HT-40 with Passive Hub cards only. Clears all ports of a PortIdGroup attached to the ET-1000. Passive cards only. For non-Passive SmartCards this function has been replaced by the command: HTClearPort
SmartBits	`int HGEcho (int iMode)`	**OBSOLETE** When Mode is ON, the select port will echo back the received packet when a trigger condition is met. Replaced by the command: HGTransmitMode
SmartBits	`int HGSelectReceivePort (int PortId)`	**OBSOLETE** Selects a single receive port on the HT-40 Hub Tester(s) which is to be routed to the ET-1000's Port B for analysis. Only one port can be selected at a time. This command can be used on both SmartCards and Passive Hub cards. Replaced by the command,: HGSelectReceive.
SmartBits	`int HGSelectTMTPort (int Mode)`	**OBSOLETE** Selects the HT-40 Hub Tester(s) to transmit the ET-1000's Port B signals through the PortIds in the PortIdGroup. This command an be used on both SmartCards and Passive Hub Cards. Replaced by the command: HGSelectTransmit.
SmartBits	`int HGSetLED (int Color)`	**OBSOLETE** Illuminates an HT-40's LED associated with a PortIdGroup in the specified color
SmartBits	`int HTBurst (long lVal, int iHub, int iSlot, int iPort)`	**OBSOLETE** Sets the burst count and then sets the transmit mode to a single burst of packets. Replaced by the two commands: HTBurstCount and HTTransmitMode.
HT-40	`int HTClear (int HubId)`	**OBSOLETE** Used on an HT-40 with Passive Hub cards only. Clears one or all HT-40 Hub Testers attached to the ET-1000. Passive cards only. For non-Passive SmartCards this function has been replaced by the command, HTClearPort.

SmartBits	int HTEcho (int iMode, int iHub, int iSlot, int iPort)	**OBSOLETE** When Mode is ON, the select port will echo back the received packet when a trigger condition is met. Replaced by the command: HTTransmitMode.
SmartBits	int HTGroup (int iHub, char* pszGroupString)	**OBSOLETE** Use HGSetGroup Used to group ports on a SmartBits for purposes of coordinating starting, stopping and stepping the transmission of Ethernet packets from different ports. Replaced by the command: HGSetGroup and its related "HG.." (group) commands.
SmartCard	int HTLatencyTest (SetLatencyStructure* pSLS, unsigned long* pulResults, int iMode)	**OBSOLETE** Used to run latency tests on a group of ports of a SmartBits. Replaced by the command: HTLatency.
SmartBits	int HTSelectReceivePort (int PortId)	**OBSOLETE** Selects a single receive port on the HT-40 Hub Tester(s) which is to be routed to the ET-1000's Port B for analysis. Only one port can be selected at a time. This command can be used on both SmartCards and Passive Hub cards. Replaced by the command: HTSelectReceive.
SmartBits	int HTSelectTMTPort (int PortId, int Mode)	**OBSOLETE** A transmit port on the HT-40 Hub Tester(s) which is to transmit the ET-1000's Port B signals. This command can be used on both SmartCards and Passive Hub Cards. Replaced by the command: HTSelectTransmit.
SmartBits	int HTSetLED (int PortId, int Color)	**OBSOLETE** Illuminates an HT-40's LED associated with a particular port in the specified color. This command can be used on both SmartCards and Passive Hub Cards.

SetLatencyStructure

int **Hub**

Identifies the hub on which latency tests are to be run. Ranges from 0 to 3.

int **TransmitSlot**

Identifies the transmit slot within the hub that is to transmit the test pattern. This test pattern is used on receiving slots to determine the latency.

int **ReceiveSlot[20]**

An array of 20 integers. A zero in a particular position of the array indicates that the corresponding slot on the hub is NOT used for latency testing. A one in a particular position of the array indicates that the corresponding slot on the hub IS used for latency testing.

---

int **Offset**

This is the offset, in bits, from the beginning of the packet (after the preamble bits) that the bit pattern is located. Packets containing the bit pattern are transmitted from the slot identified in TransmitSlot and triggered upon in the slots identified in the ReceiveSlot array.

---

int **Range**
unsigned char **Pattern[12]**

This is the size of the bit pattern, in bytes. This contains the bit pattern, represented as unsigned characters across the entire array. Pattern[12] contains the most significant byte, Pattern[0] the least significant.

ETGetCaptureTime

Current implementation always forces TIME_TAG_OFF. This command does not return valid information.

Description	Returns time stamp information from the most recently acquired captured packet
Syntax	int ETGetCaptureTime(TimeStructure* Tstruct)
Parameters	*TStruct* **TimeStructure*** Points to the structure to be filled with time stamp information.
Return Value	The return value is >= 0 if the function executed successfully. The return value is < 0 if the function failed. See Appendix A.
Comments	1. See the definition of TimeStructure in the Data Structures portion of this manual. 2. The TimeTag member of the CaptureStructure structure most recently sent to the ET-1000 (via the ETCaptureParams function) must be set to TIME_TAG_ON in order for this function to yield any useful information. In other words, the ET-1000 must be told to save time tag ETCaptureParams function) must be set to TIME_TAG_ON in order for this function to yield any useful information. In other words, the ET-1000 must be told to save time tag information with each captured packet before ETGetCaptureTime can be expected to produce any data. Furthermore, function ETGetCapturePacket must be executed prior to executing this function. ETGetCapturePacket actually acquires the time tag information and puts it into an internal array – ETGetCaptureTime simply copies this information into the provided TimeStructure structure. Thus, the time tag information provided by this function pertains to the packet most recently acquired by ETGetCapturePacket.

HGBurst

Description	Sets up a burst count for transmitting a burst of packets from all ports associated with the PortIdGroup defined by the HGSetGroup(PortIdGroup) command.
Syntax	int HGBurst(long lVal)
Parameters	*lVal* **long** Specifies the burst count. Ranges anywhere from 0 to 16,777,215. A value of zero turns off the burst mode, and a non-zero value automatically enables the burst mode.
Return Value	The return value is >= 0 if the function executed successfully. A failure code, which is less than zero, is returned if the function failed. See Appendix A.
Comments	This instruction does not cause a burst of packets to be sent. Use **HGRun, HGStart, HGStep, HTGroupStart, HTGroupStep,** and **HTRun** to actually start the transmission of the burst.

HGClear

Description	Clears one or all HT-40 Hub Testers attached to the ET-1000. This instruction applies only to HT-40s populated with passive hub cards. For SmartBits with SmartCards, use **HTClearPort**.
Syntax	int HGClear()
Parameters	None.
Return Value	The return value is >= 0 if the function executed successfully. A failure code, which is less than zero, is returned if the function failed. See Appendix A.
Comments	This function assumes that at least one HT-40 Hub Test device is attached to the ET-1000. It will be ignored by the ET-1000 if there is not an HT-40 device present.

HGEcho

Description	Indicates whether to echo back the received packet when a Trigger condition is met from all ports associated with the PortIdGroup defined by the previous HGSetGroup(PortIdGroup) command.
Syntax	int HGEcho(int iMode)
Parameters	*iMode* **int** Indicates whether the selected Port should turn ON or OFF it's echo mode. The OFF mode puts the card into a continuous mode of operation. `HTECHO_ON` Sets port to Echo mode `HTECHO_OFF` Sets port to Continuous mode (disabling Echo)
Return Value	The return value is >= 0 if the function executed successfully. A failure code, which is less than zero, is returned if the function failed. See Appendix A.

Comments	None

HGSelectReceivePort

Description	Selects a port on an HT-40 Hub Tester(s) or SmartBits that is to be used for receive data. The receive data from this port is routed directly back to the ET-1000's Port B for detailed analysis. This function is valid for both Passive and SmartCards.
Syntax	int HGSelectReceivePort(int PortId)
Parameters	PortId int Determines the specific port on the HT-40 Hub Tester or SmartBits from which to route data back to the ET-1000's Port B for detailed analysis. Each HT-40 has up to 40 passive ports, or 20 active ports. Up to 4 HT-40s may be cascaded for a total of 160 passive ports, or 80 active ports. PortId ranges from 1 (Port 1 of the first HT-40) to 160, or 80 (last port on the last HT-40). The selected port will be used for analysis of received data. If PortId is 0, the currently selected receive port will be set off. Any values outside this range are invalid and will not have an effect on the attached ET-1000 or its HT-40 counterpart. NOTE: This command follows the same PortId numbering convention as the **HGSetGroup** command. The ports are referenced according to their actual presence in the Hub Tester. For example, if the first board in the first Hub is not present, PortId = 1 will refer to the next actual board in the Hub Tester system.
Return Value	The return value is >= 0 if the function executed successfully. A failure code, which is less than zero, is returned if the function failed. See Appendix A.
Comments	Because the ET-1000 circuitry only allows one channel to be fully detailed, this command only works on the single port listed in the PortId parameter, but is referenced the same as all ports in the "HG" commands (See "NOTE" above). This function assumes that at least one SmartBits or HT-40 Hub Test device is attached to the ET-1000. It will be ignored by the ET-1000 if there is not a SmartBits or HT-40 device present.

HGSelectTMTPort

Description	Enables the PortB transmission of the ET-1000 to be transmitted to all ports associated with the PortIdGroup defined by the previous HGSetGroup(PortIdGroup) command. Transmission mode is determined by *Mode*. This function is valid for both Passive and SmartCards.
Syntax	int HGSelectTMTPort(int Mode)
Parameters	*Mode* **int** Determines the function of the Port specified in *PortId*: `HTTRANSMIT_OFF` `Transmitter is turned off` `HTTRANSMIT_STD` `Transmitter transmits standard packets` `HTTRANSMIT_COL` `Transmitter transmits collision packets` All other values are invalid and will not have an effect on the attached ET-1000 or its HT-40 counterpart.

Return Value	T he return value is >= 0 if the function executed successfully. A failure code, which is less than zero, is returned if the function failed. See Appendix A.
Comments	1. This function assumes that at least one SmartBits is attached to the ET-1000. It will be ignored by the ET-1000 if there is not a SmartBits or HT-40 device present. 2. Note that when the HTTRANSMIT_COL parameter is set in the **Mode** argument, the collision type produced by the specified SmartBits or HT-40 port is determined by the most recent parameters placed in the CollisionStructure and sent to the ET-1000 with the ETCollision command. Specifically, only the **Offset** and **Duration** fields of the CollisionStructure are used to determine the offset and duration of the collisions produced by the specified HT-40 port. It doesn't matter what the **Count** or **Mode** fields of the CollisionStructure are set to -- only the Offset and Duration are used by the HT-40. (This is true even if the Mode field of the CollisionStructure is set to COLLISION_OFF -- Collisions are turned off for the ET-1000's ports but not necessarily the same is true for the HT-40's ports.)

HGSetLED

Description	Illuminates the HT-40's LED in the specified color for all ports associated to the PortIdGroup defined by the previous HGSetGroup(PortIdGroup).
Syntax	int HGSetLED(int Color)
Parameters	*Color* **int** Determines the color in which to illuminate the selected Port's LED: `HTLED_OFF` `LED is off` `HTLED_RED` `LED is on and red` `HTLED_GREEN` `LED is on and green` `HTLED_ORANGE` `LED is on and orange` Any values outside this range are invalid and will not have an effect on the attached ET-1000 or its HT-40 counterpart
Return Value	T he return value is >= 0 if the function executed successfully. A failure code, which is less than zero, is returned if the function failed. See Appendix A.
Comments	This function assumes that at least one HT-40 is attached to the ET-1000. It will be ignored by the ET-1000 if there is not an HT-40 present.

HTBurst

Description	Sets up a burst count for transmitting a burst of packets from a SmartCard.
Syntax	int HTBurst(long lVal, int iHub, int iSlot, int iPort)
Parameters	*lVal* **long** Specifies the burst count. Ranges anywhere from 0 to 16,777,215. A value of zero turns off the burst mode, and a non-zero value automatically enables the burst mode. *iHub* **int** Identifies the hub where the SmartCard is located. The range is 0 (first hub) through N(number of hubs) -1. Remember to subtract one since the hub identification starts at 0. Important: See *Working with Multiple Hubs* in Chapt 1.*iSlot* **int** Identifies the slot where the SmartCard is located. Ranges from 0 (first slot in *Hub*) to 19 (last card in *Hub*). *iPort* **int** Identifies the SmartCard port. (On the current SmartCards, *Port* is always 0.)
Return Value	The return value is >= 0 if the function executed successfully. A failure code, which is less than zero, is returned if the function failed. See Appendix A.
Comments	This instruction does not cause a burst of packets to be sent. The **HTRun** command must be used to start the transmission of the burst.

HTClear

Description	Clears one or all HT-40 Hub Testers attached to the ET-1000. This instruction applies only to HT-40s populated with passive hub cards. For SmartBits with SmartCards, use **HTClearPort**.
Syntax	int HTClear(int iHubId)
Parameters	*iHubId* **int** Identifies the specific Hub Tester that is to be cleared: `HTHUBID_1` Hub Tester 1 `HTHUBID_2` Hub Tester 2 `HTHUBID_3` Hub Tester 3 `HTHUBID_4` Hub Tester 4 `HTHUBID_ALL` All attached Hubs Any other value is invalid and will not have an effect on the attached ET-1000 or its HT-40 counterpart.
Return Value	The return value is >= 0 if the function executed successfully. A failure code, which is less than zero, is returned if the function failed. See Appendix A.
Comments	This function assumes that at least one HT-40 Hub Test device is attached to the ET-1000. It will be ignored by the ET-1000 if there is not an HT-40 device present.

HTEcho

Description	Indicates to the selected Port whether to echo back a programmed packet when a Trigger condition is met.
Syntax	int HTEcho(int iMode, int iHub, int iSlot, int iPort)
Parameters	*iMode* **int** Indicates whether the selected Port should turn ON or OFF it's echo mode. The OFF mode puts the card into a continuous mode of operation. `HTECHO_ON` Sets port to Echo mode `HTECHO_OFF` Sets port to Continuous mode (Disabling Echo) *iHub* **int** Identifies the hub where the SmartCard is located. The range is 0 (first hub) through N(number of hubs) -1. Remember to subtract one since the hub identification starts at 0. Important: See *Working with Multiple Hubs* in Chapt 1. *iSlot* **int** Identifies the slot where the SmartCard is located. Ranges from 0 (first slot in *Hub*) to 19 (last card in *Hub*). *iPort* **int** Identifies the SmartCard port. (On the current SmartCards, *Port* is always 0.)
Return Value	The return value is >= 0 if the function executed successfully. A failure code, which is less than zero, is returned if the function failed. See Appendix A.

Comments	None

HTGroup

Description	Reserves a group of ports within a specified hub. These ports may then be manipulated simultaneously with one another (as a group) using the **HTGroupStart()**, **HTGroupStep()** and **HTGroupStop()** instructions.	
Syntax	int HTGroup(int iHub, char* pszGroupString)	
Parameters	*iHub*	**int** Identifies the hub where the SmartCard is located. The range is 0 (first hub) through N(number of hubs) -1. Remember to subtract one since the hub identification starts at 0. Important: See *Working with Multiple Hubs* in Chapt 1.
	pszGroupString	**char*** A NULL terminated ASCII character string of up to 255 characters which describes the ports that are to be grouped. Port descriptions consist of numbers separated by commas and/or blank spaces. A range of ports may be specified by inserting a hyphen between two port numbers. *For example:* **`0 ,, 3,5 11 - 7, 17 19`** specifies ports 0, 3, 5, 7, 8, 9, 10, 11, 17 and 19. Note that though the range appears to specify a descending order, it is still interpreted correctly. Ranges are inclusive; thus, the endpoints (7 and 11, in this case) are part of the group. Also, any number of commas or blank spaces may be inserted between the port numbers, as long as the overall length of the string doesn't exceed 255.
Return Value	The return value is >= 0 if the function executed successfully. A failure code, which is less than zero, is returned if the function failed. See Appendix A.	
Comments	Only one group can exist at any time within a hub. Groups cannot cross hub boundaries. i.e.; you cannot group ports in one hub with ports in another hub. This function can only group SmartCards together. HTGroup() will not return an error indication if you attempt to group ports that are not of the SmartBits type. Groups may be defined and redefined at any time. Each SmartBits hub may have its own group defined.	

HTLatencyTest

Description	Sets up the hub identified in LStruct for latency testing. A single slot is selected for transmission of a packet containing a bit pattern, and several receive slots are set up to trigger on the reception of packets containing the pattern. This function is also used to read the results of a latency test. The results of the latency test are deposited in array "Data," which contains 20 elements corresponding to each of the 20 possible slots.	
Syntax	int HTLatencyTest(SetLatencyStructure* LStruct, unsigned long* Data, int Mode)	
Parameters	*LStruct*	**SetLatencyStructure*** Points to a SetLatencyStructure data structure which contains all information necessary to set up a hub for latency testing. This structure also contains the array in which

		the results of latency test are deposited. See section 5 of this document for a complete description of this structure.
	Data	**unsigned long*** Points to an array large enough to hold 20 unsigned long types. The results of the latency measurement are deposited in this array -- each element in the array corresponds to a particular slot. For example, slot 0's results are deposited into Data[0], slot 1 into Data[1], and so on. A value of 0xFFFFFFFF indicates an invalid reading. The results are provided in terms of bit times. (i.e.; 100 ns increments.)
	Mode	**int** Defines the mode of operation for this command. If Mode == HT_RUN_LATENCY, then a latency test is run. i.e.; the transmitting slot is instructed to transmit a packet with a particular bit sequence, and all the requested receivers are instructed to trigger on that same pattern. Results returned in Data may not be valid upon return from this function. If Mode == HT_GET_LATENCY, then the results from a previous function call (in which Mode == HT_RUN_LATENCY) are scooped up from the receiving ports and returned in the Data array. When HTLatencyTest is run in this mode, only the "Hub" element of the HStruct needs to be defined.
Return Value	The return value is >= 0 if the function executed successfully. A failure code, which is less than zero, is returned if the function failed. See Appendix A.	
Comments	1. The calling function must allocate sufficient room (20 **unsigned long**s) within the space pointed to by Data before calling this routine. 2. When this function is run with Mode == HT_RUN_LATENCY, the results returned in Data most likely will not be valid. In order to get valid results, this function must be run again with Mode == HT_GET_LATENCY. It must follow the initial execution of this function, but only after a period of time at which all trigger packets have arrived on their receive ports. In other words, you must run this function twice: the first time, the function sends out the packets and starts all the necessary timers; the second time, the function gets results from all the timers. Obviously, on the second time that this function is executed, you must be reasonably sure that the trigger packets have had enough time to arrive at the receive ports. 3. It typically requires 3 clock periods (300 nanoseconds) for the latency pattern to circulate out the transmit slot and directly into a receive slot. This must be subtracted off any latency measurements made with these slots.	

HTSelectReceivePort

Description	Selects a port on an HT-40 or SmartBits that is to be used for receive data. The receive data from this port is routed directly back to the ET-1000's Port B for detailed analysis. This function is valid for both Passive and SmartCards.	
Syntax	int HTSelectReceivePort(int PortId)	
Parameters	**int**	Determines the specific port on the HT-40 Hub Tester or

	SmartBits from which to route data back to the ET-1000's Port B for detailed analysis. Each HT-40 has up to 40 ports, and up to 4 HT-40s may be cascaded for a total of 160 ports. *PortId* ranges from 1 (Port 1 of the first HT-40) to 160 (Port 40 on the last HT-40). The selected port will be used for analysis of received data. If PortId is 0, the currently selected receive port will be set off. Any values outside this range are invalid and will not have an effect on the attached ET-1000 or its HT-40 counterpart. NOTE: If you have all SmartCards, then Port numbers 1 and 2 will address your port on the card in slot 1, and Port numbers 3 and 4 will address your port on the card in slot 2, etc.
Return Value	The return value is >= 0 if the function executed successfully. A failure code, which is less than zero, is returned if the function failed. See Appendix A.
Comments	This function assumes that at least one SmartBits is attached to the ET-1000. It will be ignored by the ET-1000 if there is not an HT-40 device present.

HTSelectTMTPort

Description	Selects a transmit port on an HT-40 or Smart Bits. Transmission mode is determined by *Mode*. This function is valid for both Passive and SmartCards.
Syntax	int HTSelectTMTPort(int PortId, int Mode
Parameters	*PortId* **int** Identifies the HT-40 port to which the data length command is to be sent. *Mode* **int** Determines the function of the Port specified in *PortId*: `HTTRANSMIT_OFF` `Transmitter is turned off` `HTTRANSMIT_STD` `Transmitter transmits standard packets` `HTTRANSMIT_COL` `Transmitter transmits collision packets` All other values are invalid and will not have an effect on the attached ET-1000 or its HT-40 counterpart.
Return Value	The return value is >= 0 if the function executed successfully. A failure code, which is less than zero, is returned if the function failed. See Appendix A.
Comments	1. This function assumes that at least one SmartBits is attached to the ET-1000. It will be ignored by the ET-1000 if there is not an HT-40 device present. 2. Note that when the HTTRANSMIT_COL parameter is set in the **Mode** argument, the collision type produced by the specified HT-40 port is determined by the most recent parameters placed in the CollisionStructure and sent to the ET-1000 with the ETCollision command. Specifically, only the **Offset** and **Duration** fields of the CollisionStructure are used to determine the offset and duration of the collisions produced by the specified HT-40 port. It doesn't matter what the **Count** or **Mode** fields of the CollisionStructure are set to -- only the Offset and Duration are used by the HT-40. (This is true even if the Mode field

	of the CollisionStructure is set to COLLISION_OFF -- Collisions are turned off for the ET-1000's ports but not necessarily the same is true for the HT-40's ports.)

HTSetLED

Description	Illuminates an HT-40's LED associated with a particular port in the specified color.
Syntax	int HTSetLED(int PortId, int Color)
Parameters	*PortId* **int** Identifies the HT-40 port to which the data length command is to be sent.. *Color* **int** Determines the color in which to illuminate the selected Port's LED: `HTLED_OFF` `LED is turned off` `HTLED_RED` `LED is turned ON and is red` `HTLED_GREEN` `LED is turned ON and is green` `HTLED_ORANGE` `LED is turned ON and is orange` Any values outside this range are invalid and will not have an effect on the attached ET-1000 or its HT-40 counterpart.
Return Value	The return value is >= 0 if the function executed successfully. A failure code, which is less than zero, is returned if the function failed. See Appendix A.
Comments	his function assumes that at least one HT-40 Hub Test device is attached to the ET-1000. It will be ignored by the ET-1000 if there is not an HT-40 device present.

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