
MultiConnect™ Adapter

Serial-to-Serial Adapter with IP

User Guide

MultiConnect™ Adapter User Guide **Serial-to-Serial Adapter (MTS2SA-T & MTS2SA-T-R)**

PN S000354A, Version A

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Revisions

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A	07/12/04	Initial release for Serial-to-Serial adapter.

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Patents

This device is covered by one or more of the following patents: 6,031,867; 6,012,113; 5,628,030; 5,450,425. Other patents pending.

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Chapter 1 – Product Description & Specifications

Product Description

The MultiConnect serial-to-serial adapter enables installed serial devices to connect to the Internet for remote monitoring, control and configuration.

Internet-Enable Any Device. The MultiConnect adapter provides the powerful ability to IP-enable serial devices allowing more options for data acquisition, device management, and industrial control than would otherwise be available.

Simply install the MultiConnect between a serial device and an analog, ISDN, or wireless modem to send and receive data over the Internet. It can also serve as a single Web page in response to a Web browser request.

Reduces Development Time. MultiConnect can make your existing and next generation serial device IP-ready without requiring hardware changes to its design. MultiConnect actually provides faster time-to-market because it relieves the burden and expense of writing and maintaining Internet applications. The complete, ready-to-integrate MultiConnect adapter allows you to enhance your product while you focus on developing its core features.

Management and Configuration. MultiConnect has several means of management and configuration built into the design. It supports remote configuration, which means you can have central site setup and control of the remote adapters via the command line interface or telnet.

Applications

The MultiConnect adapters will IP-enable any device to provide remote monitoring, control and configuration of any system. The solution is ideal for the following applications:

- Appliances
- ATM terminals
- Credit card and check verification systems
- Data collection
- Gas pumps
- Industrial and medical remote monitoring systems
- Point-of-sale terminals
- Remote diagnostics
- Remote metering
- Security systems
- Ticketing machines
- Vending/gaming machines
- And more.....

Types of Adapters Available

Product	Adapter Description	Region
MTS2SA-T	Serial-to-Serial + IP (External Power)	Global
MTS2SA-T-R	Serial-to-Serial + IP (RS-232 Power)	Global
Note: The RS-232–powered adapters are powered through the DSR pin of the RS-232 cable.		

Package Contents

- One MultiConnect Adapter
- One universal power supply with power cord included with the externally powered adapters
- One RS-232 cable included with the RS-232 Serial-to-Serial Adapter
- Two mounting brackets
- Four adhesive-backed rubber feet (table-top mounting)
- One Quick Start Guide
- One MultiConnect CD

Handling Precautions

All devices must be handled with certain precautions to avoid damage due to the accumulation of static charge. Although input protection circuitry has been incorporated into the devices to minimize the effect of this static buildup, proper precautions should be taken to avoid exposure to electrostatic discharge during handling and mounting.

Specifications

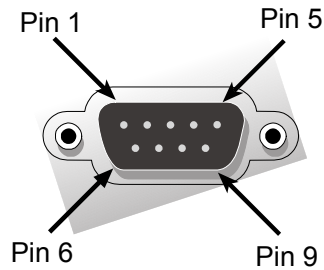
Category	Description
Memory	8 MEG
Flash Memory	2 MEG
Protocols Supported	ARP, DHCP, FTP, HTTP, ICMP, IP, POP3, PPP, SMTP, TCP, Telnet, TFTP, and UDP
Serial Interface	Standard DCE serial
Data Formats	Serial, binary, asynchronous
Data Rates	300; 1200; 2400; 4800; 9600; 19200; 38400; 57600; 115200; 230400 bps
Flow Control	RTS/CTS (hardware)
Management	Serial; Telnet
Security	Username and password authentication using local database
System Software	Flash ROM standard: downloadable from a TCP/IP host (TFTP) or Xmodem via Serial
LEDs	ACT (Activity) and STS (Status)
Ethernet	IEEE 802.3
Power Requirements	With External Power (MTS2SA-T) Power Consumption @ 9V DC: Typical 240mA Maximum 250mA With RS-232 Power (MTS2SA-T-R) Power Consumption @ 5V DC: Typical 95mA Maximum 105mA @ 10V DC: Typical 50mA Maximum 60mA @ 15V DC: Typical 35mA Maximum 45mA @ 20V DC: Typical 28mA Maximum 38mA @ 25V DC: Typical 24mA Maximum 34mA
Operating Temperature	32° to +120°F (0° to 50°C); humidity range 25-85% (non-condensing)
Storage Temperature	-40°C to +85°C
Physical Dimensions	3.5" w x 2.1" h x 0.98" d; 3.4 oz. 8.8 cm x 5.3 cm x 6 cm; 96 g
Certifications	Safety Certifications: UL60950 cUL60950 EN60950 ACA TS001 / AS 3260 EMC Safety Approvals: FCC Part 15 Class A EN55022 EN55024 CE Marked

Category	Description
Intelligent Features	High performance 10/100BaseT Ethernet bridge Half duplex or full duplex support on the WAN interface 256 frame buffer Stores 10,000 MAC addresses Automatically learns MAC addresses Serial interface supports DTE speeds to 230K bps External and RS-232 power options High performance processor runs ARP, DHCP, FTP, HTTP, ICMP, IP, POP3, PPP, SMTP, SNMP, TCP, Telnet, TFTP, UDP protocols Command line interface Flash memory to update firmware with the latest enhancements Flexible IP protocol stack Compact, rugged industrial chassis design Desktop or panel mounting Two-year warranty
Software Features	Internet Applications DHCP Client: Request IP address for Ethernet Interfaces Telnet Server: Command Line Configuration Auto Dial-out Feature Command line via custom port (other than standard port 23) Telnet Client: Connect to remote Telnet Server Serial Auto Dial-in Feature Terminal Server: Network to Serial Connectivity Serial to Network Connectivity TFTP Server: Flash Upgrade SMTP Client: The email client embedded in the MultiConnect sends email to the configured recipients. POP3 Client: The email client embedded in the MultiConnect receives email from the POP3 Server. This feature is useful for field upgrades. Firmware upgrades can be sent as attachments. HTTP Server: To host Web pages on behalf of the serial device for monitoring and configuration of the serial device. Functional Features Command Line Configuration over Serial or Ethernet Serial - TTY Ethernet - Telnet Username and Password Authentication Using Local Database The Username and Password can be created using commands. The User database authenticates the Users before access to command mode of the MultiConnect adapter is enabled. Remote Transparent Bridging Ethernet to Serial Bridging Point-to-Point Protocol (PPP) Negotiations Bridging Control Protocol - 802.3 MAC Type CCP Compression

LED Indicators

Name	Description
ACT	Activity – Lit when data is being transmitted or received.
STS	Status – Blinks to indicate that the unit is functioning.

RS-232 9-Pin Connector Pinout



Pins for the Serial-to-Serial Adapter when Power Is Supplied Externally

Pin	Description
1	DCD
2	RX Data
3	TX Data
4	DTR
5	Ground
6	DSR
7	RTS
8	CTS
9	RI

Pins for the Serial-to-Serial Adapter when Power Is Supplied Through the RS-232 Pin

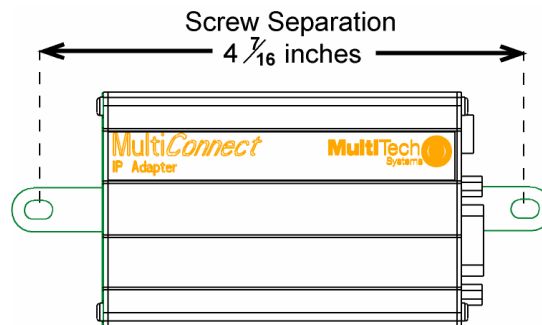
Pin	Description
1	DCD
2	RX Data
3	TX Data
4	DTR
5	Ground
6	Power
7	RTS
8	CTS
9	RI

Chapter 2 – Installation

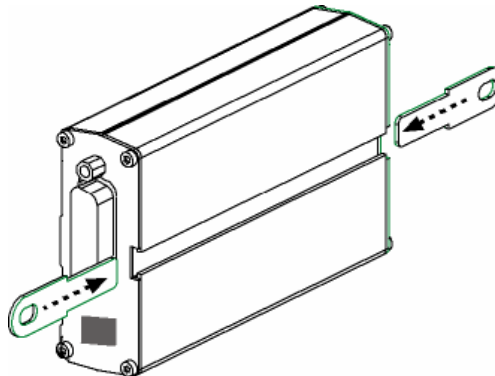
Attaching the MultiConnect to a Fixed Location

The MultiConnect adapter is design to be used on the desktop or to be panel-mounted. To attach the bracket for panel-mounting, following these steps:

1. Typically, the MultiConnect adapter is mounted against a flat surface with two mounting screws. Drill the mounting holes at the desired location. The mounting holes must separated by 4 -7/16 inches center-to-center.

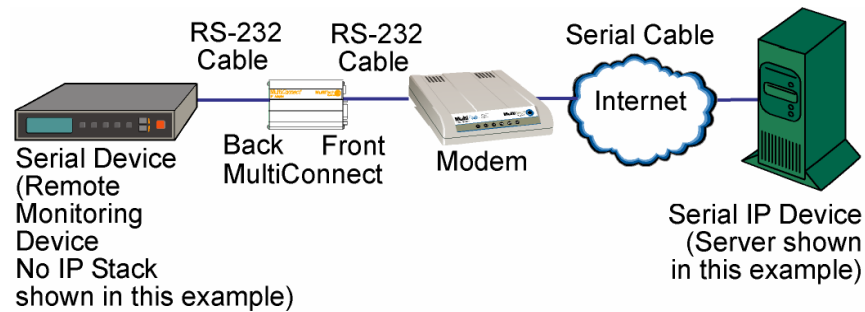


2. To attach the brackets to the MultiConnect, slide the mounting brackets into the corresponding slots on the back of the MultiConnect chassis.



3. Attach the adapter to the surface with two screws.

Serial-to-Serial Adapter Installation



Connecting the Cables

Serial-to-Serial Adapter
Front
Back shown with External Power Option
1. Plug one end of the RS-232 cable into the front of the Serial-to-Serial adapter. Plug the other end into the RS-232 connector on the modem that is setup with an Internet connection. 2. Plug one end of the other RS-232 cable into the back of the Serial-to-Serial adapter. Plug the other end into the RS-232 connector on the serial device you want connected to the Internet.

Connecting the Power

The adapters are powered in one of two ways:

- **Through the DSR Pin of the RS-232 Cable**

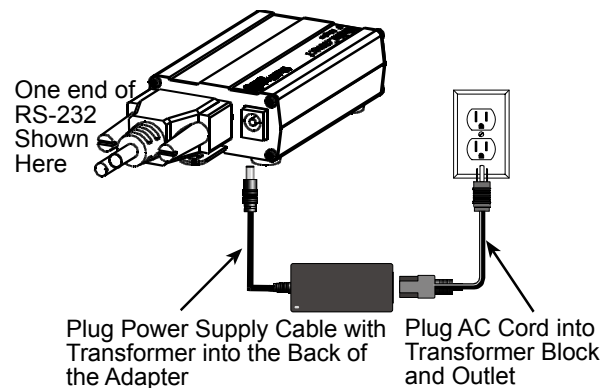
Adapters powered this way are shipped with an RS-232 cable that has a power pin instead of a DSR pin.

- **Through an External Power Supply**

Adapters powered this way are shipped with a universal power supply and its accompanying power cord and an RS-232 cable that has a DSR pin instead of a power pin.

Connecting the External Power

1. Plug the power supply cable with attached transformer block into the power connector on the back of the MultiConnect adapter.
2. Plug the AC cord receptacle into the transformer block. Plug the other end into a power outlet.



Chapter 3 – Managing and Configuring the MultiConnect Adapter

Two Ways to Login

Login Using TTY

- Use TTY to configure your MultiConnect IP for the first time. Configure the host serial port using the defaults listed below:
Baud: 115.2K
Data: 8
Parity: N
Stop: 1
Flow-Control: None
- Press the Enter key three times to get to the Login prompt or send three carriage returns.
- At the Login prompt, type *admin*.
At the Password prompt, type *admin*.

Important: The user name and password are case sensitive. They must be typed in lowercase letters.

Login Using Telnet through the PPP Interface

- Open the PPP interface on the modem port.
- Upon successful establishment of a Telnet session, the MultiConnect IP displays the Login prompt.
At the Login prompt, type *admin*.
At the Password prompt, type *admin*.
- After a successful login, the MultiConnect IP enters **Command Mode**. In Command Mode, the MultiConnect IP can be configured and managed using the Command Line Interface (CLI) command set.

About Command Mode and Data Mode

- In **Command Mode**, a # sign designates the prompt. If you type the word **Help** at the command prompt, a complete list of commands displays.
- If you type the word **Usage** at the command prompt, a list of the command semantics displays.
- In **Data Mode**, the # sign is not displayed.
- To leave Command Mode, exit your terminal or Telnet session or type the word **Exit** at the command prompt.

Note: See the **Restore** command and **IP Escape String** command.

Chapter 4 – Command Line Interface (CLI)

The MultiConnect commands are grouped based on the functionality.

- **General Setup Commands**
- **IP Setup Commands**
- **Serial Setup Commands**
- **PPP Setup Commands**
- **HTTP Setup Commands**
- **SMTP Setup Commands**
- **POP3 Setup Commands**
- **FTP Client Setup Commands**
- **SNTP Client Setup Commands**

General Notes

- Required command parameters are indicated between < >.
- Optional command parameters are indicated between [].
- Parameter choices are delineated by /.
- Upon successful execution of a command, the "OK" string is echoed to the client.
- When an unsuccessful command is executed, an appropriate error message is displayed followed by an "ERROR" string.
- All the commands are case sensitive (they must be typed in lower case).
- PPP is enabled on the modem interface S1.
- All serial-related applications such as dial-in and dial-out are with respect to the serial interface S0.
- The PPP interface is the modem interface S1.

General Setup Commands

General setup of a MultiConnect IP is port-independent (physical S0, S1 etc.). The following command set is used to set the global configuration of MultiConnect IP.

Command Syntax	dialout serial s0
Description	Manual Telnet dialout (Internet-to-serial connectivity). Invoked from the command shell.
Default Value	NA
Success	OK
Error	1. Too few arguments “Usage: dialout serial <serial port> Type ‘dialout ?’ for more information” 2. Invalid argument Possible argument(s) are: <i>Serial</i> 1. When invoked from Serial Shell This command is not supported through serial dial-in

Command Syntax	Exit
Description	Exits the command parser, unlocks the configurations, terminates session.
Default Value	NA
Success	OK

Command Syntax	Help
Description	Provides the first level of commands in MultiConnect IP.
Default Value	NA
Success	OK

Command Syntax	restore default-config
Description	Restores the factory defaults. Note: All previous configurations will be lost upon invoking this command. The changes are made permanent only if <i>save config</i> is invoked.
Default Value	NA
Success	OK
Error	1. Too few arguments “Possible arguments are <i>default-config</i> and <i>session</i> ” 2. Invalid argument Invalid argument “ <i>invalid string</i> ” Valid arguments are <i>default-config</i> and <i>session</i>

Command Syntax	restore session
Description	On Telnet dialout, the control is transferred to the command parser passing the escape sequence “+++ inet”. Invoking “restore session” would resume the Telnet dialout exiting the command parser.
Default Value	NA
Success	OK
Error	1. Too few arguments Possible arguments are <i>default-config</i> and <i>session</i> 2. ERROR: Session not opened

General Commands – Setup

Command Syntax	reset modem
Description	At will, reset the built-in modem.
Default Value	NA
Success	OK
Error	1. Too few arguments Possible argument(s) are <i>modem</i>

Command Syntax	save
Description	Command to Save the configuration to the flash and reboot.
Default Value	NA
Success	OK

Command Syntax	telnet <dial-ip-addr> [<port>]
Description	Manual serial dial-in (device port to modem port connectivity). Invoked from the command shell.
Default Value	NA
Success	OK
Error	1. Too few arguments 2. Invalid IP address/Port “(Error: hostp = “configured host”. Error: hostp=“configured IP address” 3. When invoked from Command shell connected through Telnet This command is not supported through Telnet

Command Syntax	Usage
Description	Provides the command semantics for all the commands.
Default Value	NA
Success	OK

Command Syntax	user add <user-name> [<passwd>]
Description	Add the user name and the password to the group. Notes: Default Groups: admin, users Default Users: admin, ipmodule Only Admin can configure the MultiConnect IP
Default Value	NA
Success	OK
Error	1. Too few arguments “Too few arguments. Possible value(s) are username followed by password” 2. Unable to add the user name: “user ‘username’ exists”

Command Syntax	user delete <user-name>
Description	Delete the user name from the group.
Default Value	NA
Success	OK
Error	1. Too few arguments “Too few arguments. Possible value(s) are username followed by password” 2. Unable to delete the user name: “user ‘username’ does not exist”

General Commands – Setup

Command Syntax	user password <username> <new password>
Description	Change the password for a user.
Default Value	NA
Success	OK
Error	Too few arguments "Too few arguments. Possible value(s) are username followed by password" Unable to change the password "Password does not match Unable to change user <username> password"

Command Syntax	set operation-mode <modem/ipmodule>
Description	modem - In the modem mode, the target functions like a modem ipmodule - In the ipmodule mode, all the functional features of MultiConnect IP can be achieved.
Default Value	Ipmodule
Success	OK
Error	Too few arguments "Too few arguments. Possible argument(s) are <i>modem</i> and <i>ipmodule</i>" Invalid string "Invalid argument "string" Valid argument(s) are <i>modem</i> and <i>ipmodule</i>"

Command Syntax	set boot-messages <enable/disable>
Description	enable - Prints the boot-messages during module boot-up. disable - Suppresses the boot-messages during module boot-up.
Default Value	Enable
Success	OK
Error	Too few arguments "Too few arguments. Possible argument(s) are <i>disable</i> and <i>enable</i>" Invalid string "Invalid argument "string" Valid argument(s) are <i>disable</i> and <i>enable</i>"

Command Syntax	set date <DD/MM/YYYY>
Description	Sets the system date.
Default Value	Jan 1 1970
Success	OK
Error	Too few arguments Usage: set date DD/MM/YYYY Type 'set date ?' for more information Error: Date in DD/MM/YYYY format Too few arguments. Possible argument(s) are ip ppp date serial login time

General Commands – Setup

Command Syntax	set login
Description	Prompts the Login for the command shell when enabled, and doesn't when disabled.
Default Value	Enable
Success	OK
Error	Too few arguments "Usage: set login <enable/disable> Type 'set login ?' for more information" Invalid string "error: set login <enable/disable>"

Command Syntax	set login auto-dialout-login <enable/disable>
Description	Enables/Disables authentication for Telnet auto-dialout.
Default Value	Disable
Success	OK
Error	Too few arguments "Usage: set login auto-dialout-login <enable/disable> Type 'set login auto-dialout-login ?' for more information" Invalid string "error: set login auto-dialout-login <enable/disable>"

Command Syntax	set time <HH:MM:SS>
Description	Sets the system time.
Default Value	00:00:00
Success	OK
Error	Too few arguments Usage: set date HH:MM:SS Type 'set date ?' for more information Error: Time in HH:MM:SS format Too few arguments. Possible argument(s) are ip login serial date ppp time

Command Syntax	set watchdog <enable/disable>
Description	Enables/Disables the watchdog timer. The timer value is set to 6.5 seconds. This is the upper threshold value. Note: Watchdog timer comes into effect only after reboot. Hence, invoking this command calls for a reboot on save.
Default Value	Enable
Success	OK
Error	Too few arguments "Usage: set watchdog <enable/disable> Type 'set watchdog <enable/disable> ?' for more information" Invalid string "error: set watchdog <enable/disable>"

General Commands – Setup

Command Syntax	show buildrun
Description	Command Line Configuration - History. Upon invoking any command, either through Telnet or Serial TTY, the command is added to the <i>buildrun</i> file. This is very useful in case of version updates.
Default Value	NA
Success	OK
Error	1. Too few arguments "Too few arguments. Possible argument(s) are serial date statistics users buildrun ip sys-info configuration ppp time 2. Invalid argument Invalid argument "string". Valid arguments are serial date statistics users buildrun ip sys-info configuration ppp time

General Commands – Show

Command Syntax	show configuration
Description	Displays the MultiConnect IP configuration.
Default Value	NA
Success	OK
Error	1. Too few arguments "Too few arguments. Possible argument(s) are: serial ppp sys-info device-parameter configuration recv-mail time date http users buildrun statistics send-mail 2. Invalid argument Valid arguments are: serial ppp sys-info device-parameter configuration recv-mail time date http users buildrun statistics send-mail

Command Syntax	show date
Description	Shows the system date.
Default Value	NA
Success	OK
Error	1. Too few arguments Too few arguments. Possible argument(s) are: ip statistics users configuration ppp sys-info date serial time 2. Invalid argument Invalid argument " <i>Invalid string</i> ". Valid arguments are ip statistics users configuration ppp sys-info date serial time

Command Syntax	show statistics
Description	Displays MultiConnect IP statistics.
Default Value	NA
Success	OK
Error	1. Too few arguments “Too few arguments. Possible argument(s) are: ip configuration date statistics ppp serial users sys-info time 2. Invalid argument Valid arguments are: ip configuration date statistics ppp serial users sys-info time

Command Syntax	show sys-info																		
Description	Displays the system related information. • Hardware information • System Uptime • Memory Utilization • Flash Memory Map																		
Default Value	NA																		
Success	OK																		
Error	1. Too few arguments Too few arguments. Possible argument(s) are:<table><tr><td>ip</td><td>statistics</td><td>users</td></tr><tr><td>configuration</td><td>ppp</td><td>sys-info</td></tr><tr><td>date</td><td>serial</td><td>time</td></tr></table> 2. Invalid argument Invalid argument "<i>Invalid string</i>". Valid arguments are:<table><tr><td>ip</td><td>statistics</td><td>users</td></tr><tr><td>configuration</td><td>ppp</td><td>sys-info</td></tr><tr><td>date</td><td>serial</td><td>time</td></tr></table>	ip	statistics	users	configuration	ppp	sys-info	date	serial	time	ip	statistics	users	configuration	ppp	sys-info	date	serial	time
ip	statistics	users																	
configuration	ppp	sys-info																	
date	serial	time																	
ip	statistics	users																	
configuration	ppp	sys-info																	
date	serial	time																	

Command Syntax	show time																		
Description	Displays the system time.																		
Default Value	NA																		
Success	OK																		
Error	1. Too few arguments Too few arguments. Possible argument(s) are <table><tr><td>serial</td><td>ip</td><td>sys-info</td></tr><tr><td>configuration</td><td>ppp</td><td>time</td></tr><tr><td>date</td><td>statistics</td><td>users</td></tr></table> 2. Invalid argument Invalid argument "<i>Invalid string</i>" Valid arguments are: <table><tr><td>serial</td><td>ip</td><td>sys-info</td></tr><tr><td>configuration</td><td>ppp</td><td>time</td></tr><tr><td>date</td><td>statistics</td><td>users</td></tr></table>	serial	ip	sys-info	configuration	ppp	time	date	statistics	users	serial	ip	sys-info	configuration	ppp	time	date	statistics	users
serial	ip	sys-info																	
configuration	ppp	time																	
date	statistics	users																	
serial	ip	sys-info																	
configuration	ppp	time																	
date	statistics	users																	

Command Syntax	show users																		
Description	Displays the configured users.																		
Default Value	NA																		
Success	OK																		
Error	1. Too few arguments “Too few arguments. Possible argument(s) are: <table><tr><td>serial</td><td>ip</td><td>sys-info</td></tr><tr><td>configuration</td><td>ppp</td><td>time</td></tr><tr><td>date</td><td>statistics</td><td>users</td></tr></table> 2. Invalid argument Valid arguments are: <table><tr><td>serial</td><td>ip</td><td>sys-info</td></tr><tr><td>configuration</td><td>ppp</td><td>time</td></tr><tr><td>date</td><td>statistics</td><td>users</td></tr></table>	serial	ip	sys-info	configuration	ppp	time	date	statistics	users	serial	ip	sys-info	configuration	ppp	time	date	statistics	users
serial	ip	sys-info																	
configuration	ppp	time																	
date	statistics	users																	
serial	ip	sys-info																	
configuration	ppp	time																	
date	statistics	users																	

IP Setup Commands

Command Syntax	set ip dns <enable/disable>
Description	Enables/disables the DNS client.
Default Value	Enabled
Success	OK
Error	Too few arguments “Usage: set ip dns <enable/disable> Type ‘set ip dns ?’ for more information” Invalid string Type ‘set ip dns ?’ for more information”

Command Syntax	set ip hostname <hostname>
Description	Sets the host name of the MultiConnect IP.
Default Value	“MultiConnectIP”
Success	OK
Error	Too few arguments “Usage: set ip hostname <hostname> Type ‘set ip hostname ?’ for more information”

Command Syntax	set ip pri-dns <ip addr>
Description	Sets the primary DNS IP address to 0.0.0.0.
Default Value	0.0.0.0
Success	OK
Error	Too few arguments “Usage: set ip pri-dns <ip addr> Type ‘set ip pri-dns ?’ for more information” Invalid IP Address “error: Invalid IP address Type ‘set ip pri-dns ?’ for more information”

Command Syntax	set ip sec-dns <ip addr>
Description	Sets the secondary DNS IP address to 0.0.0.0.
Default Value	0.0.0.0
Success	OK
Error	Too few arguments “Usage: set ip sec-dns <ip addr> Type ‘set ip sec-dns ?’ for more information” Invalid IP Address “error: Invalid IP address Type ‘set ip sec-dns ?’ for more information”

Command Syntax	set ip syslogd <enable/disable>
Description	Enables/Disables syslogd.
Default Value	Disable
Success	OK
Error	Too few arguments “Usage: set ip syslogd <enable/disable> Type ‘set ip syslogd ?’ for more information”

Command Syntax	set ip syslogd-server <ip addr>
Description	Sets the remote syslog server's IP address.
Default Value	0.0.0.0
Success	OK
Error	Too few arguments "Usage: set ip syslogd-server <ip_addr> Type 'set ip syslogd-server ?' for more information" Invalid IP address "error: Invalid IP address Type 'set ip syslogd-server ?' for more information"

Command Syntax	set ip tcp-keepalive <t mins>
Description	Sets the TCP keep-alive timeout for the MultiConnect IP. 't' : range from 3-120 minutes
Default Value	3 minutes
Success	OK
Error	Too few arguments "Usage: set ip tcp-keepalive <t mins> Type 'set ip tcp-keepalive ?' for more information" Invalid IP address "error: Invalid value, range [3-120] mins Type 'set ip tcp-keepalive ?' for more information"

Command Syntax	set ip telnet <enable/disable>						
Description	Enables/disables the Telnet Server. This is a global setting, which will enable/disable the Telnet Server in the MultiConnect IP. Note: Upon disabling Telnet server, the administrator cannot configure the MultiConnect IP over the built-in Modem interface (wherein PPP has acquired IP Address). The only option is to connect through a terminal application over the Serial port.						
Default Value	Enabled						
Success	OK						
Error	Too few arguments Too few arguments. Possible argument(s) are set ip telnet<enable/disable> Type : set ip telnet ? for more information) Multiple matches telnet telnet-port Invalid String Invalid argument "<i>invalid string</i>" Valid arguments are <table> <tr> <td>auto-dialout</td> <td>escape-string</td> </tr> <tr> <td>inactivity</td> <td>inactivity-timeout</td> </tr> <tr> <td>escape-monitor</td> <td>raw-mode</td> </tr> </table> Possible value(s) are <i>enable</i> or <i>disable</i>	auto-dialout	escape-string	inactivity	inactivity-timeout	escape-monitor	raw-mode
auto-dialout	escape-string						
inactivity	inactivity-timeout						
escape-monitor	raw-mode						

IP Commands – Setup

Command Syntax	set ip telnet auto-dialout <enable/disable>
Description	Enables Telnet connectivity between the MultiConnect IP and the remote device. This flag enables/disables the Telnet Auto dialout globally.
Default Value	Enabled
Success	OK
Error	Too few arguments “Usage: set ip telnet auto-dialout <enable/disable> Type ‘set ip telnet auto-dialout ?’ for more information” Invalid String Type ‘set ip telnet auto-dialout ?’ for more information”

Command Syntax	set ip telnet escape-string <string>
Description	The Telnet Server scans for this escape sequence and transfers the control to the command parser. By default, the Telnet Server scans for “+++inet”.
Default Value	+++ inet
Success	OK
Error	Too few arguments “Usage: set ip telnet escape-string <string> Type ‘set ip telnet escape-string ?’ for more information” Multiple matches escape-monitor escape-string

Command Syntax	set ip telnet escape-monitor <enable/disable>
Description	Enables/disables the “monitor” flag that scans for the escape sequence.
Default Value	Enabled
Success	OK
Error	Too few arguments “Usage: set ip telnet escape-monitor <enable/disable> Type ‘set ip telnet escape-monitor ?’ for more information” Multiple matches escape-monitor escape-string Invalid String Type ‘set ip telnet escape-monitor ?’ for more information”

Command Syntax	set ip telnet inactivity <enable/disable>
Description	Enables/disables the inactivity functionality.
Default Value	Disable
Success	OK
Error	Too few arguments “Usage: set ip telnet inactivity <enable/disable> Type ‘set ip telnet inactivity ?’ for more information” Multiple matches inactivity inactivity-timeout Invalid String Type ‘set ip telnet inactivity ?’ for more information”

IP Commands – Setup

Command Syntax	set ip telnet inactivity-timeout <t secs>
Description	If the Telnet session is inactive for 't' secs, the connection is terminated. This functionality is applicable only if "set telnet inactivity" is enabled. (Refer to 'set ip telnet inactivity' command).
Default Value	5 min
Success	OK
Error	Too few arguments "Usage: set ip telnet inactivity-timeout <t secs> Type 'set ip telnet inactivity-timeout ?' for more information" Multiple matches <i>inactivity</i> and <i>inactivity-timeout</i> Invalid timeout value "error: 't secs' range : 0 – 300 Type 'set ip telnet inactivity-timeout ?' for more information"

Command Syntax	set ip telnet-port <port_num >
Description	This Telnet-port corresponds to the port number that the MultiConnect IP will wait on for configuring the box. Default port number is TCP 23. You have the option to change this number. Note: Invoking this command terminates the current Telnet session.
Default Value	23
Success	OK
Error	Too few arguments "Usage: set ip telnet-port <port-num> Type 'set ip telnet-port ?' for more information" Invalid port-num "error: Invalid port number Type 'set ip telnet-port ?' for more information"

Command Syntax	set ip telnet raw-mode <enable/disable>
Description	This is a global setting of raw-mode for the Telnet application. This setting is applicable for both Telnet auto-dialout, serial auto-dial-in.
Default Value	Disabled
Success	OK
Error	Too few arguments "Usage: set ip telnet raw-mode <enable/disable> Type 'set ip telnet raw-mode ?' for more information" Invalid String ERROR

Command Syntax	set ip tftp <enable/disable >
Description	Enables/disables the TFTP Server. When the TFTP Server is enabled, the network administrator can upload the firmware to the flash.
Default Value	Enabled
Success	OK
Error	Too few arguments "Usage: set ip tftp <enable/disable> Type 'set ip tftp ?' for more information" Invalid string error: Invalid string Type 'set ip tftp ?' for more information"

Serial Setup Commands

Command Syntax	set serial auto-telnet <enable/disable>
Description	This command globally enables serial auto dial-in support. Notes: This feature provides a Telnet session to the serial device connected to S0 through the IP-enabled modem port (S1) Also, Telnet can be used only after PPP is up and has acquired an IP address on the modem's (S1) port.
Default Value	Disabled
Success	OK
Error	1. Too few arguments “Usage: set serial auto-telnet <enable/disable> Type ‘set serial auto-telnet ?’ for more information” 2. Invalid string error: Invalid string Type ‘set serial auto-telnet ?’ for more information

Command Syntax	set serial <serial-interface> escape-monitor <enable/disable>
Description	Sets a “monitor” flag that enables/disables the scanning of escape sequence.
Default Value	Enable
Success	OK
Error	1. Too few arguments “Usage: set serial s0/s1 escape-monitor <enable/disable> Type ‘set serial s0/s1 escape-monitor ?’ for more information” 2. Multiple matches escape-monitor escape-string 3. Invalid string error: Invalid string Type ‘set serial s0/s1 escape-monitor ?’ for more information”

Command Syntax	set serial <serial-interface> escape-string <string>
Description	The Telnet client scans for this escape sequence and transfers the control to the command parser. By default, the Telnet client scans for “+++inet”.
Default Value	+++ inet<serial-interface>
Success	OK
Error	1. Too few arguments “Usage: set serial s0/s1 escape-string <string> Type ‘set serial s0/s1 escape-string ?’ for more information” 2. Multiple matches escape-monitor escape-string

Command Syntax	hangup [serial interface] Valid serial interface – Modem port S1
Description	When this command is issued, the established live link is brought down. This command is only valid only for modem port (S1)
Default Value	-
Success	If physical link is brought down, OK and Physical link is successfully brought down messages are given
Error	1. Too few arguments "Usage: hangup [S1] Type 'hangup [S1] ?' for more information" 2. "error: Link could not be brought down" message is given when link could not be brought down

Command Syntax	linkup [serial interface] Valid serial interface – Modem port S1
Description	Establishes a physical link and PPP on the modem port. This command is relevant only when the serial interface is a dialing end with dialing-trig-mode configured as " command "
Default Value	-
Success	If physical link is established OK and CONNECT 14400 LAPM COMPRESSED (i.e., CONNECT message from the modem) are given
Error	1. Too few arguments "Usage: linkup [S1] Type 'linkup [S1]' for more information" 2. "error: Link cannot be brought up" message is given when dialing-trig-mode is not "command" 3. "error: Link is not established" message is given when link is not established (in case PPP fails to get the logical link up) 4. "error: Link is already up" message is given when link is established and this command will not tear down and bring up the link 5. "error: NO CARRIER / NO DIALTONE / NO ANSWER" or any error return code from the modem

Command Syntax	set serial [s0] auto-dialin <enable/disable>
Description	Enables/disables the device port to Internet connectivity for the serial port S0. This command is valid only for device port S0
Default Value	Disabled
Success	OK
Error	1. Too few arguments “Usage: set serial s0 auto-dialin <enable/disable> Type ‘set serial s0 auto-dialin ? for more information” 2. Multiple matches auto-dialin auto-dialin-protocol auto-dialout-protocol auto-dialin-ipaddress auto-dialout auto-dialin-port auto-dialout-port 3. Invalid string “error: Invalid string Type ‘set serial s0 auto-dial-in ? for more information” 4. If “set serial s1 auto-dialin <enable/disable>” is given “error: Command not supported on the modem port s1”

Command Syntax	set serial [s0] auto-dialin-ipaddress <ipaddr>
Description	Specifies the auto dial-in IP address. Note: When a connection is established from serial, a session is established to the IP address mentioned above. This command is valid only for device port S0.
Default Value	NULL
Success	OK
Error	1. Too few arguments “Usage: set serial s0 auto-dialin-ipaddress <ipaddr> Type ‘set serial s0 auto-dialin-ipaddress ? for more information” 2. Multiple matches auto-dialin auto-dialin-protocol auto-dialout-protocol auto-dialin-ipaddress auto-dialout auto-dialin-port auto-dialout-port 3. Invalid IP Address “error: Invalid IP address Type ‘show serial s0 auto-dialin-ipaddress ? for more information” 4. If “set serial s1 auto-dialin-ipaddress 192.168.2.2” is given “error: Command not supported on the modem port s1”

Command Syntax	set serial [s0] auto-dialin-port [port_num]
Description	Command to specify the auto dial-in port number. Note: [port_num] is optional here. If port_num is not specified, the standard port 23 of the Telnet protocol shall be used. This command is valid only for device port S0
Default Value	23
Success	OK
Error	1. Too few arguments “Usage: set serial s0 auto-dialin-port [port_num] Type ‘set serial s0 auto-dialin-port ? for more information” 2. Multiple matches auto-dialin auto-dialin-ipaddress auto-dialin-port auto-dialin-protocol auto-dialout auto-dialout-port auto-dialout-protocol 3. Invalid port “error: Invalid port number Type ‘set serial s0 auto-dialin-port ? for more information” 4. If “set serial s1 auto-dialin-port 23” is given “error: Command not supported on modem port s1”

Command Syntax	set serial [s0] auto-dialin-protocol <telnet>
Description	By default, Telnet is the protocol used to establish the serial-to-Internet connectivity. Note: This syntax provides for future extensibility (SSH Client, etc.) This command is valid only for device port S0<ftp protocol setting is not yet implemented>
Default Value	Telnet
Success	OK
Error	1. Too few arguments “Usage: set serial s0 auto-dialin-protocol <telnet/ftp> Type ‘set serial s0 auto-dialin-protocol ? for more information” 2. Multiple matches auto-dialin auto-dialin-protocol auto-dialout-protocol auto-dialin-ipaddress auto-dialout auto-dialin-port auto-dialout-port 3. Invalid protocol selected “error: Selected protocol not supported Type ‘set serial s0 auto-dialin-protocol ? for more information” 4. If “set serial s1 auto-dialin-protocol telnet” is given “error: Command not supported on modem port s1”

Command Syntax	set serial [s0] auto-dialin trig-mode <char/ dtr/ dtr-char/ none>								
Description	This mode is applicable only when auto dial-in is enabled on the serial port S0. This command is valid only for device port S0. Parameter Description char Initiate a session (Telnet) to the auto-dialin-ipaddress, only on a reception of a character on the serial port S0. dtr Initiate a session (Telnet) to the auto-dialin-ipaddress, only on seeing a DTR signal on the serial port S0 dtr-char Initiate a session (Telnet) to the auto-dialin-ipaddress, either on reception of a character (OR) seeing the DTR signal on the serial port S0. none Initiate a Telnet session to the auto-dialin-ipaddress on module boot-up.								
Default Value	dtr-char								
Success	OK								
Error	1. Too few arguments Too few arguments. Possible argument(s) are <table> <tr> <td>char</td> <td>dtr-char</td> </tr> <tr> <td>dtr</td> <td>none</td> </tr> </table> 2. Invalid string “Invalid string “string” Valid arguments are <table> <tr> <td>char</td> <td>dtr-char</td> </tr> <tr> <td>dtr</td> <td>none</td> </tr> </table> 3. If “set serial s1 auto-dialin trig-mode <char/dtr/dtr-char/none>” is given “error: Command not supported on modem port s1”	char	dtr-char	dtr	none	char	dtr-char	dtr	none
char	dtr-char								
dtr	none								
char	dtr-char								
dtr	none								

Command Syntax	set serial [s0] auto-dialout <enable/disable>
Description	Enables/disables connectivity to the serial device from the IP-enabled built-in modem serial interface. This command is valid only for device port S0.
Default Value	Enabled
Success	OK
Error	1. Too few arguments “Usage: set serial s0 auto-dialout <enable/disable> Type ‘set serial s0 auto-dialout ?’ for more information” 2. Multiple matches auto-dialin auto-dialin-ipaddress auto-dialin-port auto-dialin-protocol auto-dialout auto-dialout-port auto-dialout-protocol 3. Invalid string error: Invalid string Type ‘set serial s0 auto-dialout ?’ for more information” 4. If “set serial s1 auto-dialout <enable/disable>” is given “error: Command not supported on modem port s1”

Serial Commands – Setup

Command Syntax	set serial [s0] auto-dialout-port <port_num>
Description	If auto-dialout is enabled, specifies the auto dialout-port on which the client can connect. Default is 5000. Note: The port number should be other than standard TCP ports. This command is valid only for device port S0.
Default Value	5000
Success	OK
Error	1. Too few arguments “Usage: set serial s0 auto-dialout-port <port_num> Type ‘set serial s0 auto-dialout-port ? for more information” 2. Multiple matches auto-dialin auto-dialin-protocol auto-dialout-protocol auto-dialin-ipaddress auto-dialout auto-dialin-port auto-dialout-port 3. Invalid Port Number “error: Invalid port number Type ‘set serial s0 auto-dialout-port ? for more information” 4. If “set serial s1 auto-dialout-port 5000” is given “error: Command not supported on modem port s1”

Command Syntax	set serial [s0] auto-dialout-protocol <telnet/>
Description	Note: This syntax gives a provision for future extensibility. <SSH Server, etc>. This command is valid only for device port S0.
Default Value	Telnet
Success	OK
Error	1. Too few arguments “Usage: set serial s0 auto-dialout-protocol <telnet/> Type ‘set serial s0 auto-dialout-protocol ?’ for more information” 2. Multiple matches auto-dialin auto-dialin-protocol auto-dialout-protocol auto-dialin-ipaddress auto-dialout auto-dialin-port auto-dialout-port 3. Invalid string error: Invalid parameter Type ‘set serial s0 auto-dialout-protocol ?’ for more information” 4. If “set serial s1 auto-dialout-protocol telnet” is given “error: Command not supported on modem port s1”

Command Syntax	set serial [s0/s1] baud-rate <baud>
Description	Sets the serial baud rate.
Default Value	115200
Success	OK
Error	1. Too few arguments “Usage: set serial s0/s1 baud-rate <baud> Type ‘set serial s0/s1 baud-rate ?’ for more information” 2. Invalid baud-rate “error: baud-rate range : [300,.....] Type ‘set serial s0/s1 baud-rate ?’ for more information”

Serial Commands – Setup

Command Syntax	set serial [s0/s1] buffer-datasize <0/d bytes>
Description	This command primarily buffers the data.
Default Value	0 – No buffering.
Success	OK
Error	1. Too few arguments “Usage: set serial s0/s1 buffer-datasize <0/d bytes> Type ‘set serial s0/s1 buffer-datasize ?’ for more information” 2. Multiple matches buffer-datasize buffer-time 3. Datasize range “error: Buffer data-size range : [1 - 1500] bytes Type ‘set serial s0/s1 buffer-datasize ?’ for more information”

Command Syntax	set serial [s0/s1] buffer-time <0/t secs>
Description	This command is related to the ‘set serial s0/s1 buffer-datasize’ command. The buffering of data shall either wait for datasize configured (in the previous command) or time t secs. Example: <pre> SI Buffer-datasize Buffer-time (secs) Descriptions 1 0 - Default 0 - Default No buffering. Passes the data to the serial application on the reception of a character on the serial application. 2 10 0 Buffer till it reaches buffer-datasize (10); then passes it to the serial application. 3 0 10 No buffering. Pass the data to the serial application on the reception of a character on the serial. 4 10 10 Buffer the characters till it reaches the buffer-datasize (10) (OR) wait for the buffer-time (10Secs). The data is passed on to the serial application depending on which condition is satisfied first. </pre>
Default Value	0 – No buffering
Success	OK
Error	1. Too few arguments “Usage: set serial s0/s1 buffer-time <0/t secs> Type ‘set serial s0/s1 buffer-time ?’ for more information” 2. Multiple matches buffer-datasize buffer-time 3. Time limit “error: Time limit supported : <1 – 60 secs> Type ‘set serial s0/s1 buffer-time ?’ for more information”

Serial Commands – Setup

Command Syntax	set serial [s0/s1] chat-script <line-num> <expect-string> <send-string>
Description	Sets <i>expect</i> and <i>send</i> strings for the chat script to act on the modem. Triggers for a reboot upon save. Important Note: Use double quotes if more than one word is used in the <expect-string>/<send-string>.
Default Value	NA
Success	OK
Error	1. Too few arguments "Usage: set serial s0/s1 chat-script <line-num> <expect-string> <send-string> Type 'set serial s0/s1 chat-script ?' for more information"

Command Syntax	Set serial [s0/s1] connect-type <direct/modem>
Description	Sets the connect type of the serial port to direct/modem connect. Note: Modem port (S1) will always have connect-type as <i>modem</i> since it is a built-in modem
Default Value	Direct
Success	OK
Error	1. Too few arguments "Usage: set serial s0/s1 connect-type <direct/modem> Type 'set serial s0/s1 connect-type ?' for more information" 2. Invalid string "error: Invalid string Type 'set serial s0/s1 connect-type ?' for more information" 3. If "set serial s1 connect-type direct" is given error: modem port s1 is a built-in modem interface; it cannot be set to direct

Command Syntax	set serial [s0/s1] connect-state <answering/dialing/both>
Description	Sets the connect state of the serial port to <i>answering/dialing/both</i> state.
Default Value	Both
Success	OK
Error	1. Too few arguments "Usage: set serial s0/s1 connect-state <answering/dialing/both> Type 'set serial s0/s1 connect-state ?' for more information" 2. Invalid string "error: Invalid string Type 'set serial s0/s1 connect-state ?' for more information"

Command Syntax	set serial [s0/s1] data-bits <7/8>
Description	Set the data-bits.
Default Value	8
Success	OK
Error	1. Too few arguments "Usage: set serial s0/s1 data-bits <7/8> Type 'set serial s0/s1 data-bits ?' for more information" 2. Invalid data-bit setting "error: Data-bits range supported: [7/8] Type 'set serial s0/s1 data-bits ?' for more information"

Serial Commands – Setup

Command Syntax	Set serial [s0/s1] flow-control <none/rts-cts>
Description	Set the flow-control of the serial port. By default flow-control is disabled on the serial port.
Default Value	rts-cts
Success	OK
Error	1. Too few arguments "Usage: set serial s0/s1 flow-control <none/rts-cts> Type 'set serial s0/s1 flow-control ?' for more information" 2. Invalid flow-control setting "error: flow-control supported: [none/rts-cts] Type 'set serial s0/s1 flow-control ?' for more information"

Command Syntax	set serial [s0] host-interaction-mode <enable/disable>
Description	This parameter is set by the host to enable the host-interactive-mode. When this mode is set, the host/serial device can use SMTP client, POP3 client, and HTTP server. Host interaction mode is valid only for device port S0. Note: Telnet Auto-Dialout and PPP cannot be enabled when this mode is enabled.
Default Value	Disable
Success	OK
Error	1. Too few arguments "Usage: set serial s0 host-interaction-mode <enable/disable> Type set serial s0 host-interaction-mode ?" 2. Invalid string Type set serial s0 host-interaction-mode ?" 3. Port used by Auto-dialout "ERROR: Port used by Auto-dialout" 4. "set serial s1 host-interaction-mode s1" is given "error: Command not supported on modem port s1"

Command Syntax	set serial [s0/s1] modem connect-string <connect-str>
Description	Sets the Modem Connect string. Triggers for a reboot upon save. Note: The configured modem strings takes precedence over the MODEM.CNF
Default Value	CONNECT
Success	OK
Error	1. Too few arguments "Usage: set serial s0/s1 modem connect-string <connect-str> Type 'set serial s0/s1 modem connect-string ?' for more information"

Command Syntax	set serial [s0/s1] modem dial-number <phone-num>
Description	Sets the dial-number to be dialed.
Default Value	NA
Success	OK
Error	1. Too few arguments "Usage: set serial s0/s1 modem dial-number <phone-num> Type 'set serial s0/s1 modem dial-number ?' for more information"

Serial Commands – Setup

Command Syntax	set serial [s0/s1] modem dial-prefix <dialprefix>
Description	Sets the Modem Dial-Prefix. Triggers for a reboot upon save. Note: The configured modem strings takes precedence over the MODEM.CNF
Default Value	ATDT
Success	OK
Error	1. Too few arguments "Usage: set serial s0/s1 modem dial-prefix <dialprefix> Type 'set serial s0/s1 modem dial-prefix ?' for more information"

Command Syntax	Set serial [s0/s1] modem dial-suffix <dialsuffix>
Description	Sets the Modem Dial-suffix. Triggers for a reboot upon save. Note: The configured modem strings takes precedence over the MODEM.CNF
Default Value	^M
Success	OK
Error	1. Too few arguments "Usage: set serial s0/s1 modem dial-suffix <dialsuffix> Type 'set serial s0/s1 modem dial-suffix ?' for more information"

Command Syntax	Set serial [s0/s1] modem dialing-method <configuration/chat-script>
Description	Sets the modem dialing method. 1. Configuration method: The user shall provide only the dial-number to reach. 2. Choosing the 'chat' as the dialing-method, the user can write his/her own script by providing an Expect and a Send sequence. Refer to: 'set serial s0/s1 chat-script ?' for providing an "Expect" and a "Send" sequence. Triggers for a reboot upon save.
Default Value	Configuration
Success	OK
Error	1. Too few arguments "Usage: set serial s0/s1 modem dialing-method <configuration/chat-script> Type 'set serial s0/s1 modem dialing-method ?' for more information"

Serial Commands – Setup

Command Syntax	set serial [s1] modem dialing-trig-mode <none/dtr/command>
Description	Sets the dialing trigger mode for the modem port S1. If dialing trig mode is none: The serial interface will initialize the modem and dial as per the configured parameters. If dialing trig mode is dtr: As soon as a serial device is connected to S0 (DTR goes high), the S1 serial interface will initialize the modem and dial as per the configured parameters. If dialing trig mode is command: The serial interface will dial only on demand. The possible commands that can trigger the link are: • "linkup s1" command is issued • Application trigger (SMTP, POP3 Client, etc) Note: This command triggers a reboot upon save.
Default Value	Command
Success	OK
Error	1. Too few arguments "Usage: set serial s1 modem dialing-trig-mode <none/dtr/command> Type 'set serial s1 modem dialing-trig-mode ?' for more information" 2. Invalid string "error: Invalid string Type 'set serial s1 modem dialing-trig-mode ?' for more information"

Command Syntax	set serial s1 modem country-code <value>
Description	Sets the modem country code value to <value>. This command is valid only for port S1.
Default Value	-
Success	OK
Error	1. Too few arguments "Usage: set serial s1 modem country-code value <value> Type 'set serial s1 modem country-code value ?' for more information"

Command Syntax	set serial [s0/s1] modem hangup-string <hangup-str>
Description	Sets the Modem hang-up string. Triggers for a reboot upon save.
Default Value	+++ATH0
Success	OK
Error	1. Too few arguments "Usage: set serial s0/s1 modem hangup-string <hang-str> Type 'set serial s0/s1 modem hangup-string ?' for more information"

Serial Commands – Setup

Command Syntax	set serial [s0/s1] modem init-string <init-num> <init-str>
Description	Configures the modem initial strings. Init-num can range from 1-5. Triggers for a reboot upon save. Example: Set serial s0 modem init-string 1 ATZ Set serial s0 modem init-string 1 "ATZ AT&F" Important Note: Use double quotes if more than one word is used in the <init-str>. Refer to example 2 above. This holds true for all the following commands that need a string as a parameter.
Default Value	Init-string 1 is set to 'ATZ' Init-string 2 is set to '' Init-string 3 is set to '' Init-string 4 is set to '' Init-string 5 is set to ''
Success	OK
Error	1. Too few arguments "Usage: set serial s0/s1 modem init-string <init-num> <init-str> Type 'set serial s0/s1 modem init-string ?' for more information" Invalid init-num "ERROR: init-num range supported : [1-5]"

Command Syntax	set serial [s0/s1] modem ok-string <ok-str>
Description	Sets the modem OK string. Triggers for a reboot upon save.
Default Value	OK
Success	OK
Error	1. Too few arguments "Usage: set serial s0/s1 modem ok-string <ok-str> Type 'set serial s0/s1 modem ok-string ?' for more information"

Command Syntax	set serial [s0/s1] modem ring-string <ring-str>
Description	Sets the modem ring string. Triggers for a reboot upon save.
Default Value	RING
Success	OK
Error	1. Too few arguments "Usage: set serial s0/s1 modem ring-string <ring-str> Type 'set serial s0/s1 modem ring-string ?' for more information"

Command Syntax	set serial [s0/s1] parity <even/odd/none>
Description	Sets parity to even/odd/none.
Default Value	None
Success	OK
Error	1. Too few arguments "Usage: set serial s0/s1 parity <even/odd/none> Type 'set serial s0/s1 parity ?' for more information" 2. Invalid parity setting "error: parity supported: [even/odd/none] Type 'set serial s0/s1 parity ?' for more information"

Command Syntax	set serial [s0] login-string <login-string>
Description	Sets a login-string to the serial port. This command is valid only for port S0. The Login string can be of length maximum 8 characters. Upon module boot-up, Login is displayed on the console only if the characters entered match the login-string configured. Note: This is applicable only if the " set serial s0 auto-dialin trig-mode " is char
Default Value	""
Success	OK
Error	Too few arguments "Usage: set serial s0 login-string <login-string> Type 'set serial s0 login-string ? for more information'" Invalid string "ERROR: Invalid string Type 'set serial s0 login-string ? for more information'" - If 'set serial s1 login-string <login-string>' is given "error: Command not supported on modem port s1"

Command Syntax	set serial [s0] raw-dialin <enable/disable>
Description	Enables/disables raw mode support for serial auto dial-in on the device port S0.
Default Value	Disabled
Success	OK
Error	Too few arguments "Usage: set serial s0 raw-dialin <enable/disable> Type 'set serial s0 raw-dialin ? for more information'" Multiple matches raw-dialin raw-dialout Invalid string "ERROR: Invalid string Type 'set serial s0 raw-dialin ? for more information' If 'set serial s1 raw-dialin <enable/disable>' is given "error: Command not supported on modem port s1"

Command Syntax	set serial [s0] raw-dialout <enable/disable>
Description	Enables/disables raw mode support for auto dialout on the device port S0.
Default Value	Disabled
Success	OK
Error	Too few arguments "Usage: set serial s0/s1 raw-dialout <enable/disable> Type 'set serial s0/s1 raw-dialout ? for more information'" Multiple matches raw-dialin raw-dialout Invalid string "error: Invalid string Type 'set serial s0/s1 raw-dialout ? for more information'" - If 'set serial s1 raw-dialout <enable/disable>' is given "error: Command not supported on modem port s1"

Serial Commands – Setup

Command Syntax	set serial [s0/s1] stop-bits <1/1.5/2>
Description	Sets the stop bits.
Default Value	1
Success	OK
Error	1. Too few arguments “Usage: set serial s0/s1 stop-bits <1/1.5/2> Type ‘set serial s0/s1 stop-bits ?’ for more information” 2. Invalid stop-bit setting “ERROR: Stop-bit supported : [1, 1.5, 2] Type ‘set serial s0/s1 stop-bits ?’ for more information”

Serial Commands – Show

Command Syntax	show serial [s0/s1] chat-script
Description	Displays the Expect and Send sequence for the serial port S0 or S1.
Default Value	NA
Success	OK
Error	1. Too few arguments Possible value(s) are statistics modem-configuration configuration chat-script

Command Syntax	show serial [s0/s1] configuration
Description	Displays serial S0/S1 configuration.
Default Value	-
Success	OK
Error	1. Too few arguments Possible value(s) are statistics modem-configuration configuration chat-script

Command Syntax	show serial [s0/s1] modem-configuration
Description	Displays the modem-related configuration for serial port S0 or S1.
Default Value	NA
Success	OK
Error	1. Too few arguments Possible value(s) are statistics modem-configuration configuration chat-script

Serial Commands – Show

Command Syntax	show serial [s0/s1] statistics
Description	Displays Serial Statistics. • Status (If serial is used by any application) • Rx Bytes • Rx Errors • Tx Bytes • Tx Errors • Status of EIA signals (CTS, DSR, DCD, RTS, DTR). Important Note: Serial statistics are only for the current session. Rx Bytes, Tx Bytes will be reset for every session opened on the serial.
Default Value	-
Success	OK
Error	1. Too few arguments Possible value(s) are statistics modem-configuration configuration chat-script

Command Syntax	show serial modem country code This command is supported on S1 only.
Description	Displays the supported country codes for this product.
Default Value	-
Success	OK
Error	1. Too few arguments Possible value(s) are statistics modem-configuration chat-script configuration country-code

PPP Setup Commands

Note: All PPP Commands use the ppp0 interface, which corresponds to the modem port S1.

Command Syntax	set ppp <interface> authentication <enable/disable>
Description	Enables/disables PPP Authentication.
Default Value	Disabled
Success	OK
Error	Too few arguments Possible argument(s) are <i>disable</i> and <i>enable</i> Invalid string Invalid argument. Valid argument(s) are <i>disable</i> and <i>enable</i> Multiple matches: <i>auth-type</i> and <i>authentication</i>

Command Syntax	set ppp <interface> auth-type <pap/chap/pap-chap>
Description	Sets the protocol to authenticate the remote peer: PAP/CHAP/PAP-CHAP
Default Value	PAP
Success	OK
Error	Too few arguments Too few argument(s). Possible argument(s) are: chap, pap, and pap-chap Invalid authentication type Invalid argument. Valid argument(s) are chap, pap, and pap-chap Multiple matches: <i>auth-type</i> and <i>authentication</i>

Command Syntax	set ppp <interface> compression <enable/disable>
Description	Enables/disables CCP compression.
Default Value	Disabled
Success	OK
Error	Too few arguments Possible argument(s) are <i>disable</i> and <i>enable</i> Invalid string Invalid argument. Valid argument(s) are <i>disable</i> and <i>enable</i>

Command Syntax	set ppp <interface> comp-type <both/bsd/deflate>
Description	Sets the compression type to BSD, DEFLATE or BOTH. In the case of NON-RAWMODE: When both is configured as the compression type, the module tries to negotiate DEFLATE first. In the event of failure, the BSD is negotiated. In case of RAW-MODE: Compress-type both is not supported in RAW-MODE, since there are no negotiations between MultiConnect IP Modules.
Default Value	Deflate
Success	OK
Error	Too few arguments Too few argument(s). Possible argument(s) are <i>both</i>, <i>bsd</i>, <i>deflate</i> Invalid string Invalid argument "<i>string</i>" Valid argument(s) are <i>both</i>, <i>bsd</i>, <i>deflate</i>

PPP Commands – Setup

Command Syntax	set ppp <interface> dialing-max-retries <0-100>
Description	Configures the maximum number of dialing retries. Maximum dialing retry is 100
Default Value	5
Success	OK
Error	Too few arguments “Usage: set ppp ppp0 dialing-max-retries [0-100](times) Type ‘set ppp ppp0 dialing-max-retries ?’ for more information” Multiple matches <i>dialing-max-retries</i> and <i>dialing-retry-interval</i> Retry range “error: dialing-max-retries range : [0 - 100] Type ‘set ppp ppp0 dialing-retry-interval ?’ for more information”

Command Syntax	set ppp <interface> dialing-retry-interval <0-300>
Description	Configures the interval for the port to retry dialing. Maximum dialing retry is 300 .
Default Value	15
Success	OK
Error	Too few arguments “Usage: set ppp ppp0 dialing-retry-interval [0-300](secs) Type ‘set ppp ppp0 dialing-retry-interval ?’ for more information” Multiple matches <i>dialing-max-retries</i> and <i>dialing-retry-interval</i> Retry range “error: dialing-retry-interval range : [0 - 300] Type ‘set ppp ppp0 dialing-retry-interval ?’ for more information”

Command Syntax	set ppp <interface> idle-timeout <0-900>
Description	Configures the dial-on-demand idle timeout value . Maximum dialing retry is 900 secs
Default Value	600 secs
Success	OK
Error	Too few arguments “Usage: set ppp ppp0 idle-timeout <0-900> Type set ppp ppp0 idle-timeout ?’ for more information” Idle timeout range “error: dod-idle-timeout range : [0 - 900] Type ‘set ppp ppp0 idle-timeout ?’ for more information”

Command Syntax	set ppp <interface> ipcp-mode <client-only/client-or-lan>
Description	Sets the IPCP mode-to-client-only or client or LAN.
Default Value	client-only
Success	OK
Error	Too few arguments Possible argument(s) are <i>client-only</i> and <i>client-or-lan</i> Invalid string Invalid argument. Valid argument(s) are <i>client-only</i> and <i>client-or-lan</i>

PPP Commands – Setup

Command Syntax	set ppp <interface> local-ip-addr <ipaddr> mask <ipmask>
Description	During IPCP negotiations, the configured IP address is sent for the local interface. In the case where the peer is requested to provide the IP address, it can be configured as 0.0.0.0
Default Value	0.0.0.0 255.255.255.0
Success	OK
Error	1. Too few arguments Possible arguments are <i>IP Address</i> and <i>Mask</i> 2. Invalid IP address/Mask Invalid argument

Command Syntax	set ppp <interface> password <password >
Description	Sets the password that remote peers will use for authentication.
Default Value	Ipmodule
Success	OK
Error	1. Password Length Password should have minimum of 8 characters

Command Syntax	set ppp <interface> remote-ip-addr <ipaddr> mask <ipmask>
Description	During IPCP negotiations, this configured IP address is sent for the remote interface. In the case of the peer being requested to provide the IP address, it can be configured as 0.0.0.0
Default Value	0.0.0.0 255.255.255.0
Success	OK
Error	1. Too few arguments Possible arguments are <i>IP Address</i> and <i>Mask</i> 2. Invalid IP address/Mask Invalid argument

Command Syntax	set ppp <interface> username <username>
Description	Sets the user name that the remote peer will use for authentication.
Default Value	Ipmodule
Success	OK
Error	1. Too few arguments Possible value(s) are valid user name

PPP Commands – Show

Command Syntax	show ppp ppp0 configuration
Description	Displays: PPP Status (enabled/disabled) Authentication status Authentication type Username and password for authentication Compression status Compression type IPCP Mode Local IP Address Remote IP Address
Default Value	NA
Success	OK
Error	1. Too few arguments Possible argument(s) are configuration ip-addr statistics link-status 2. Invalid argument Invalid argument Valid argument(s) are configuration ip-addr statistics link-status

Command Syntax	show ppp <interface> ip-addr
Description	Displays: Local IP Address Remote IP Address
Default Value	NA
Success	OK
Error	1. Too few arguments Possible argument(s) are configuration ip-addr statistics link-status 2. Invalid argument Invalid argument Valid argument(s) are configuration ip-addr statistics link-status

Command Syntax	show ppp <interface> link-status
Description	Displays the link status on ppp interface.
Default Value	-
Success	OK Up / Down
Error	1. Too few arguments Possible argument(s) are configuration ip-addr statistics link-status 2. Invalid argument Invalid argument Valid argument(s) are configuration ip-addr statistics link-status

PPP Commands – Show

Command Syntax	show ppp <interface> statistics								
Description	Displays PPP Statistics.								
Default Value	-								
Success	OK								
Error	1. Too few arguments Possible argument(s) are <table> <tr> <td>configuration</td> <td>ip-addr</td> </tr> <tr> <td>statistics</td> <td>link-status</td> </tr> </table> 2. Invalid argument Invalid argument Valid argument(s) are: <table> <tr> <td>configuration</td> <td>ip-addr</td> </tr> <tr> <td>statistics</td> <td>link-status</td> </tr> </table>	configuration	ip-addr	statistics	link-status	configuration	ip-addr	statistics	link-status
configuration	ip-addr								
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HTTP Server Commands

The commands in this section are listed in the order in which they might be used.

Command Syntax	set ip http-page <default/serial>
Description	This parameter is used by the http server to host the default HTML index or host-defined http-serial-S0 HTML page.
Default Value	Default
Success	OK
Error	1. Too few arguments "Usage: set ip http-page <default/serial> Type set ip http-page ?" 2. Invalid string Type "set ip http-page ?"

Command Syntax	set ip http <enable/disable>
Description	This enables the http server on the MultiConnect IP to listen on Port 80.
Default Value	Disable
Success	OK
Error	1. Too few arguments "Usage: set "ip http <enable/disable> Type 'set ip http ?' for more information" 2. Invalid string "ERROR: Invalid string Type 'set ip http ?' for more information"

Command Syntax	set ip http-port <port>
Description	Sets the HTTP server to listen on the specified port.
Default Value	80
Success	OK
Error	1. Too few arguments "Usage: set ip http-port <port> Type set 'ip http-port ?' for more information" 2. Invalid port number "ERROR: Invalid port number Type set 'ip http-port ?' for more information"

Command Syntax	set device-parameter P<n> <value> where n = 0 to 99.
Description	Sets the value of the parameter from the host/serial device.
Default Value	Value in the default parameter list file uploaded through TFTP.
Success	OK
Error	1. Too few arguments "Usage: set device P<n> <value> Type 'set device P<n> ?' for more information" 2. Invalid string "ERROR: Invalid string Type 'set device P<n> ?' for more information"

HTTP Server Commands – Setup

Command Syntax	save param
Description	Invoking this command will save the host parameters into the flash. The “/var/apps” directory is gun zipped to apps.tar.gz and written into flash. (APPS_SECTOR)
Default Value	-
Success	OK
Error	1. Too few arguments “ERROR: Too few arguments Type 'save ?' for more information”

HTTP Server Commands – Show

Command Syntax	show http configuration
Description	Displays the HTTP related configurations.
Default Value	-
Success	OK
Error	1. Too few arguments “ERROR: Too few arguments Type 'show http configuration ?' for more information”

Command Syntax	show device-parameter P<n> where n = 0 to 99.
Description	Displays the value of the requested parameter from MultiConnect IP.
Default Value	-
Success	OK
Error	1. Too few arguments “ERROR: Too few arguments Type 'show device-parameter ?' for more information”

Command Syntax	show device-parameter modified
Description	Displays the status of the host parameters; for example, whether they are changed by the browser. Returns “Device parameters changed” when values are changed by the remote browser. Returns “Device parameters not changed” when values are not changed.
Default Value	-
Success	OK
Error	1. Too few arguments “ERROR: Too few arguments Type 'show device-parameter ?' for more information”

SMTP Client Commands

The commands in this section are listed in the order in which they might be used.

Command Syntax	set send-mail smtp-server-name <name/ip-address>
Description	Sets the SMTP server name or IP address. Server names must be such that they can be resolved by the DNS.
Default Value	NULL
Success	OK
Error	1. Too few arguments “Usage: set send-mail smtp-server-name <name/ip-address> Type 'set send-mail smtp-server-name ?' for more information” 2. Invalid name/IP address “ERROR: Invalid SMTP Server Name/IP Address”

Command Syntax	set send-mail smtp-server-port <port>
Description	Sets the SMTP Server port.
Default Value	25
Success	OK
Error	1. Too few arguments “Usage: set send-mail smtp-server-port <port> Type 'set send-mail smtp-server-port ?' for more information”

Command Syntax	set send-mail host-name <host name>
Description	Sets the SMTP Client host name.
Default Value	NULL
Success	OK
Error	1. Too few arguments “Usage: set send-mail host-name <host name> Type 'set send-mail host-name ?' for more information”

Command Syntax	set send-mail from-address-identity <name>
Description	Sets the ‘From:’ description in the email header as <name>.
Default Value	NULL
Success	OK
Error	1. Too few arguments “Usage: set send-mail from-address-identity <name> Type 'set send-mail from-address-identity ?' for more information”

Command Syntax	set send-mail from-address <email-address>
Description	Sets the email-address as the Default From address information.
Default Value	NULL
Success	OK
Error	1. Too few arguments “Usage: set send-mail from-address <email-address> Type 'set send-mail from-address ?' for more information”

SMTP Client Commands – Setup

Command Syntax	set send-mail to-address <n> <email-address> where n = 1 to 5.
Description	Sets the email-address as one of the primary addressee. This is the default email address to which email messages are sent.
Default Value	NULL
Success	OK
Error	1. Too few arguments “Usage: set send-mail to-address <n> <email-address> Type 'set send-mail to-address <n> ?' for more information” 2. Invalid to-address number “ERROR: to-address numbers supported: [1 to 5] Type 'set send-mail to-address <n> ?' for more information”

Command Syntax	set send-mail cc-address <n> <email-address> where n = 1 to 5.
Description	Sets the email-address as the alternate addressee (carbon copy). This is the default email address that the primary addressee's email messages are copied.
Default Value	NULL
Success	OK
Error	1. Too few arguments “Usage: set send-mail cc-address <n> <email-address> Type 'set send-mail cc-address <n> ?' for more information” 2. Invalid to-address number “ERROR: cc-address numbers supported: [1 to 5] Type 'set send-mail cc-address <n> ?' for more information”

Command Syntax	set send-mail reply-to-address <email-address>
Description	Sets the email address to be used when the recipient uses the reply-to button.
Default Value	NULL
Success	OK
Error	1. Too few arguments “Usage: set send-mail reply-to-address <email-address> Type 'set send-mail reply-to-address ?' for more information”

Command Syntax	set send-mail subject <data>
Description	Sets the email header subject field to the given data.
Default Value	NULL
Success	OK
Error	1. Too few arguments “Usage: set send-mail subject <data> Type 'set send-mail subject ?' for more information”

SMTP Client Commands – Setup

Command Syntax	send-mail [-b] [-t <email-address1, email-address2, ...>] [-c <email-address1, email-address2, ...>] [-s <data>] [-d <msg body>]
Description	Triggers the SMTP Client application. The application enters the interactive mode or sends the mail according to the command arguments. Notes: All the arguments are optional. This implies that an email can be sent by specifying the parameter(s) in the command line (or) entering them in the order prompted by MultiConnect IP. Usage: -b : binary mode {default is text mode} -t : To addresses -c : CC addresses -s : Subject Data -d : Message Body
Default Value	-
Success	Email Sent Successfully OK
Error	1. Too few arguments Usage: send-mail [<-b>] [-t <email-address, ...>] [-c <email-address, >] [-s <data>] [-d <msg body>] ... Type 'send-mail ?' for more information"

Command Syntax	show send-mail configuration
Description	Displays the SMTP configuration.
Default Value	-
Success	OK
Error	1. Too few arguments "Usage: show send-mail configuration Type 'show send-mail ?' for more information"

POP3 Client Commands

Command Syntax	set recv-mail server-name <server-name>
Description	This parameter is set by the host to establish the POP3 connection for receiving the email from the remote server. This also needs DNS to be enabled on the MultiConnect IP.
Default Value	None
Success	OK
Error	1. Too few arguments Usage: set recv-mail server-name <server-name> Type 'set recv-mail server-name ?' for more information 2. Invalid string Type 'set recv-mail server-name ?' for more information

Command Syntax	set recv-mail server-port <server-port>
Description	This parameter is set by the host to establish the POP3 connection for receiving email from the remote server.
Default Value	110
Success	OK
Error	1. Too few arguments Usage: set recv-mail server-port <server-port> Type 'set recv-mail server-port ?' for more information 2. Invalid string Type 'set recv-mail server-port ?' for more information

Command Syntax	set recv-mail mailbox-name <mailbox-name>
Description	Sets the mail box user name for POP3 server authentication.
Default Value	None
Success	OK
Error	1. Too few arguments Usage: set recv-mail mailbox-name <mailbox-name> Type 'set recv-mail mailbox-name ?' for more information 2. Invalid string Type 'set recv-mail mailbox-name ?' for more information

Command Syntax	set recv-mail mailbox-password <mailbox-password>
Description	Sets the mail box password for POP3 server authentication.
Default Value	None
Success	OK
Error	1. Too few arguments Usage: set recv-mail mailbox-password <mailbox-password> Type 'set recv-mail mailbox-password ?' for more information 2. Invalid string Type 'set recv-mail mailbox-password ?' for more information

POP3 Client Commands – Setup

Command Syntax	set recv-mail leave-on-server <enable/disable>
Description	Set the variable “leave a copy of message on server” flag, which tells the POP3 server not to delete the emails from it once the emails are received.
Default Value	Disable
Success	OK
Error	1. Too few arguments

Command Syntax	recv-mail list [index]
Description	This command retrieves list of emails from the mailbox. Displays the list of emails in the order below: <index of the mail> <size in bytes> or Mailbox is empty
Default Value	-
Success	OK
Error	1. Too few arguments Usage: recv-mail list [index] Type 'recv-mail ?' for more information

Command Syntax	recv-mail header [index]
Description	This command receives the header information of all the emails present in the mailbox if index is not issued. If index is issued, the mail header corresponding to the index is retrieved.
Default Value	-
Success	OK
Error	1. Too few arguments Usage: recv-mail header [index] Type 'recv-mail ?' for more information

Command Syntax	recv-mail mail [index]
Description	This command retrieves all the pending emails present in the mailbox if index is not given. If index is issued, the email corresponding to the index is retrieved.
Default Value	-
Success	OK
Error	1. Too few arguments Usage: recv-mail mail [index] Type 'recv-mail ?' for more information

Command Syntax	recv-mail delete <index>
Description	Deletes the email corresponding to the index. The emails will not be deleted until the “ recv-mail quit ” command is executed.
Default Value	-
Success	OK
Error	1. Too few arguments Usage: recv-mail delete <index> Type 'recv-mail ?' for more information

POP3 Client Commands – Setup

Command Syntax	recv-mail top <index> <n>
Description	Displays the first <n> lines of the mail corresponding to index. If n is greater the email size then the whole message is displayed.
Default Value	-
Success	OK
Error	1. Too few arguments Usage: recv-mail top [index] Type 'recv-mail top' for more information

POP3 Client Commands – Show

Command Syntax	recv-mail unique-id-listing [index]
Description	Displays the unique ID listing from the server in the order below: <index of the mail> <unique id>. If index is specified, only the corresponding unique ID is displayed. If index is not specified, all unique IDs in the mail box are displayed.
Default Value	-
Success	OK
Error	1. Too few arguments Usage: recv-mail unique-id-listing [index] Type 'recv-mail ?' for more information

Command Syntax	recv-mail stat [index]
Description	Displays the statistics of an email or emails for a given index.
Default Value	-
Success	OK
Error	1. Too few arguments Usage: recv-mail stat [index] Type 'recv-mail ?' for more information

Command Syntax	show recv-mail configuration
Description	Displays the recv-mail related configuration.
Default Value	-
Success	OK
Error	1. Too few arguments Possible value(s) are configuration

FTP Client Commands

Command Syntax	set ftp device <default/ip-address/host-name> login <username> [password <password>] [account <account password >]
Description	Sets/clears the device login name, password and account password details that will be used by FTP for automatic authentication. The Password is an optional parameter and can be configured along with the machine and login names only The Account Password is an optional parameter and can be configured along with device login name and password only. The IP module prompts for login name and password if these details are NULL. Note: "set ftp machine" resets all these parameters to NULL
Default Value	NULL
Success	OK
Error	Invalid arguments "error: Login name cannot be null Type set ftp ? for more information" Invalid arguments error: Password cannot be null Type set ftp ? for more information" Invalid arguments error: Account Password cannot be null Type set ftp ? for more information" Invalid arguments error: Invalid usage Type set ftp ? for more information" Too few arguments "Usage: set ftp machine <default/ip-address/hostname (1-40)> login <username (1-20)> [password <password (1-20)>] [account <account password (1-20)>] Type set ftp ? for more information"

Command Syntax	ftp <Ftp Server-ip-addr>
Description	The FTP client on board connects to the remote FTP server. Upon successful connection, the Send and Receive commands of the FTP can be used to perform the required operation.
Default Value	NA
Success	OK
Error	Too few arguments Possible argument(s) are: IP-address Invalid IP address error: invalid ipaddress. When invoked from Command shell connected through TELNET This command is not supported through Telnet

FTP Client Commands – Setup

Command Syntax	ftp < [-l] [-t] [-r] > [-p] <ip-address/host-name>
Description	Triggers the FTP client to establish the FTP session with the remote server and to perform the required action according to the specified option. -p : Opens the Data connection in Passive mode. (If this option is not given, the data connection will be opened in Active mode by default). -l : Requests for the directory and lists the contents of the specified directory in the server. -t : Requests for the filename and filesize to be transmitted and reads the data from the host device and transmits to the server. -r : Requests for the remote filename to be received. It informs the host device about the size of the file and retrieves the data from the server when serial device is ready. Note: 1. FTP session can be aborted by issuing Ctrl+C at any given time.
Default Value	NULL
Success	OK
Error	1. Invalid arguments ftp < [-l] [-t] [-r] > [-p] <ip-address/hostname> Type set ftp ? for more information” 2. Too few arguments “Usage: ftp < [-l] [-t] [-r] > [-p] <ip-address/hostname> Type set ftp ? for more information”

FTP Client Commands – Show

Command Syntax	show ftp configuration
Description	Displays the FTP profile configured in the MultiConnect IP.
Default Value	NULL
Success	OK
Error	1. Too few arguments Possible value(s) are configured.

SNTP Client Commands

Command Syntax	set sntp client <enable/disable>
Description	Starts the SNTP Client to contact the configured server on UDP port 123 and set the local time.
Default Value	Disable
Success	OK
Error	Too few arguments "Usage: set sntp-client <enable/disable> Type set sntp-client ? for more information"

Command Syntax	set sntp-client ntp-server-name <ip-address>
Description	Sets the NTP server IP address to which the SNTP Client has to contact to update the time.
Default Value	0.0.0.0
Success	OK
Error	Invalid arguments "error: Invalid IP address" Type set sntp-client ? for more information" Too few arguments "Usage: set sntp-client ntp-server-name <ip-address> Type set sntp-client ntp-server-name ? for more information"

Command Syntax	set sntp-client time-zone <string (0-3)>
Description	Sets the time zone.
Default Value	UTC
Success	OK
Error	Invalid arguments "error: Invalid Time Zone" Too few arguments "Usage: set sntp-client time-zone <string (0-3)> Type set sntp-client time-zone ? for more information"

Command Syntax	set sntp-client time-zone-offset <+/-hh:mm> where hh = 00 to 23 mm = 00 to 59
Description	Sets the offset time from UTC.
Default Value	+00:00
Success	OK
Error	Invalid arguments "error: Invalid Offset" Too few arguments "Usage: set sntp-client time-zone-offset <+/-hh:mm> Type set sntp-client time-zone-offset ? for more information"

SNTP Client Commands – Setup

Command Syntax	set sntp-client polling-time <value> where value = 2 to 1440
Description	Sets the polling time at which SNTP client requests the server to update the time.
Default Value	300
Success	OK
Error	Invalid arguments "error: Invalid Polling time" Too few arguments "Usage: set sntp-client polling-time <value> Type set sntp-client polling-time ? for more information"

Command Syntax	set sntp-client daylight-saving <enable/disable>
Description	Enables/Disables the Day Light Saving Mode.
Default Value	Enable
Success	OK
Error	Invalid arguments "error: Invalid parameter" Too few arguments "Usage: set sntp-client daylight-saving <enable/disable> Type set sntp-client daylight-saving ? for more information"

Command Syntax	set sntp-client daylight-saving offset <+/-value> where value = 0 to 120 minutes
Description	Sets the offset to use during the Day Light Saving Mode.
Default Value	60
Success	OK
Error	Invalid arguments "error: Invalid offset value" Too few arguments "Usage: set sntp-client daylight-saving offset <value> Type set sntp-client daylight-saving offset ? for more information"

Command Syntax	set sntp-client daylight-saving start-ordinal <string> where string = first/second/third/forth/last
Description	Sets the start ordinal to use during the Day Light Saving Mode.
Default Value	First
Success	OK
Error	Invalid arguments "error: Invalid start ordinal" Too few arguments "Usage: set sntp-client daylight-saving start-ordinal <string> Type set sntp-client daylight-saving start-ordinal ? for more information"

SNTP Client Commands – Setup

Command Syntax	set sntp-client daylight-saving start-weekday <dayofweek> where dayofweek = sunday, monday ... Saturday
Description	Sets the start weekday to use during the Day Light Saving Mode.
Default Value	Sunday
Success	OK
Error	Invalid arguments "error: Invalid start day of the week" Too few arguments "Usage: set sntp-client daylight-saving start-weekday <dayofweek> Type set sntp-client daylight-saving start-weekday ? for more information"

Command Syntax	set sntp-client daylight-saving start-month <month> where month = january, february December
Description	Sets the start month to use during the Day Light Saving Mode.
Default Value	April
Success	OK
Error	Invalid arguments "error: Invalid start month" Too few arguments "Usage: set sntp-client daylight-saving start-month <month> Type set sntp-client daylight-saving start-month ? for more information"

Command Syntax	set sntp-client daylight-saving start-time <hh:mm> where hh = 00 to 23 mm = 00 to 59
Description	Sets the start time to use during the Day Light Saving Mode.
Default Value	02:00
Success	OK
Error	Invalid arguments "error: Invalid start time" Too few arguments "Usage: set sntp-client daylight-saving start-time <hh:mm> Type set sntp-client daylight-saving start-time ? for more information"

Command Syntax	set sntp-client daylight-saving end-ordinal <string> where string = first/second/third/forth/last
Description	Sets the end ordinal to use during the Day Light Saving Mode.
Default Value	Last
Success	OK
Error	Invalid arguments "error: Invalid end ordinal" Too few arguments "Usage: set sntp-client daylight-saving end-ordinal <string> Type set sntp-client daylight-saving end-ordinal ? for more information"

SNTP Client Commands – Setup

Command Syntax	set sntp-client daylight-saving end-weekday <dayofweek> where dayofweek = Sunday, Monday ... Saturday
Description	Sets the end weekday to use during the Day Light Saving Mode.
Default Value	Sunday
Success	OK
Error	Invalid arguments „error: Invalid end day of the week“ Too few arguments “Usage: set sntp-client daylight-saving end-weekday <dayofweek> Type set sntp-client daylight-saving end-weekday ? for more information”

Command Syntax	set sntp-client daylight-saving end-month <month> where month = january, ...december
Description	Sets the end month to use during the Day Light Saving Mode.
Default Value	October
Success	OK
Error	Invalid arguments „error: Invalid end month“ Too few arguments “Usage: set sntp-client daylight-saving end-month <month> Type set sntp-client daylight-saving end-month ? for more information”

Command Syntax	set sntp-client daylight-saving end-time <hh:mm> where hh = 00 to 23 mm = 00 to 59
Description	Sets the end time to use during the Day Light Saving Mode.
Default Value	02:00
Success	OK
Error	Invalid arguments „error: Invalid end time“ Too few arguments “Usage: set sntp-client daylight-saving end-time <hh:mm> Type set sntp-client daylight-saving end-time ? for more information”

SNTP Client Commands – Show

Command Syntax	show sntp configuration
Description	Displays the SNTP configuration
Default Value	NA
Success	OK
Error	Too few arguments Possible value(s) are <i>configuration</i>

Chapter 5 – Setting Country or Region Codes Using the CLI

The Default Country or Region Code is B5.

If You Want to Change the Country or Region Code, Use the Command Line Interface:

Command Syntax	set serial s1 modem country-code value <value>
Description	Sets the modem country code value to <value>. This command is valid only for port S1. Applicable only if the country-code type is set to code .
Default Value	-
Success	OK
Error	1. Too few arguments "Usage: set serial s1 modem country-code value <value> Type 'set serial s1 modem country-code value ?' for more information" Notes: There is no validation on the country code value.

To View Country or Region Code:

Command Syntax	show serial modem country code This command is supported on S1 only.
Description	Displays the supported country codes for this product.
Default Value	-
Success	OK
Error	1. Too few arguments Possible value(s) are statistics country-code configuration chat-script modem-configuration

Country or Region Codes – The list below is an example of the country or region code settings for the countries or regions that Multi-Tech currently supports. For your country or region code, please check with Multi-Tech Technical Support

Country/Region	Value (Country Code)
Argentina	07
Australia	09
Austria	FD
Belgium	FD
Brazil	16
Canada	B5
China	B5
Cyprus	FD
Czech Republic	FD
Denmark	FD
Finland	FD
France	FD
Germany	FD
Greece	FD
Hong Kong	99
Hungary	FD
Iceland	FD
Indonesia	99
Ireland	FD

Country/Region	Value (Country Code)
Italy	FD
Japan	00
Korea	B5
Liechtenstein	FD
Luxembourg	FD
Mexico	B5
Netherlands	FD
New Zealand	7E
Norway	FD
Philippines	B5
Portugal	FD
Slovak Republic	FD
Spain	FD
Sweden	FD
Switzerland	FD
Taiwan	FE
United Kingdom	FD
United States	B5

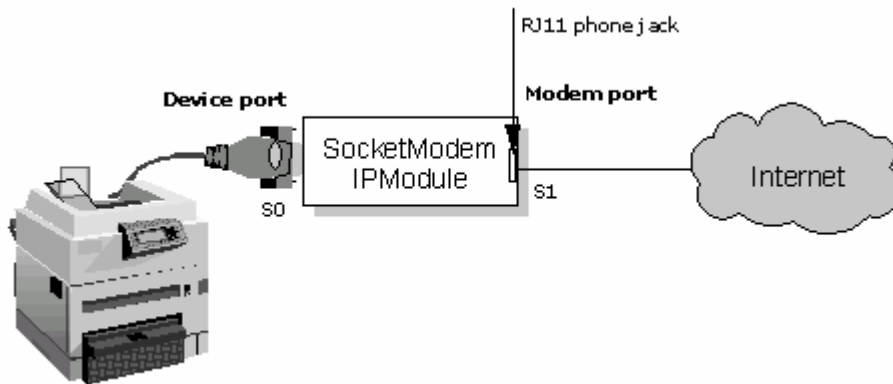
Chapter 6 – Prerequisite Configurations

This chapter covers prerequisite tasks, those tasks or configurations that must be completed before you can set up certain operating scenarios.

Other prerequisite tasks related to specific operating scenarios are described throughout the rest of this document.

1. MultiConnect IP Communication Interfaces and Conventions

The Serial Interface ports, S0 and S1, correspond to **Device Port** and **Modem Port** respectively. This convention is used throughout this document.



Serial Ports

1. **S0 - Device Port** - RS-232 port connects to the Host/Serial device.
2. **S1 - Modem Port** - RJ-11 phone jack port dials the Service Provider, obtains an IP Address, and provides the IP ability to reach the Host/Serial devices connected over the device port.

2. MultiConnect IP Modes of Operation

The MultiConnect IP can function in two modes:

- **Transparent Mode**

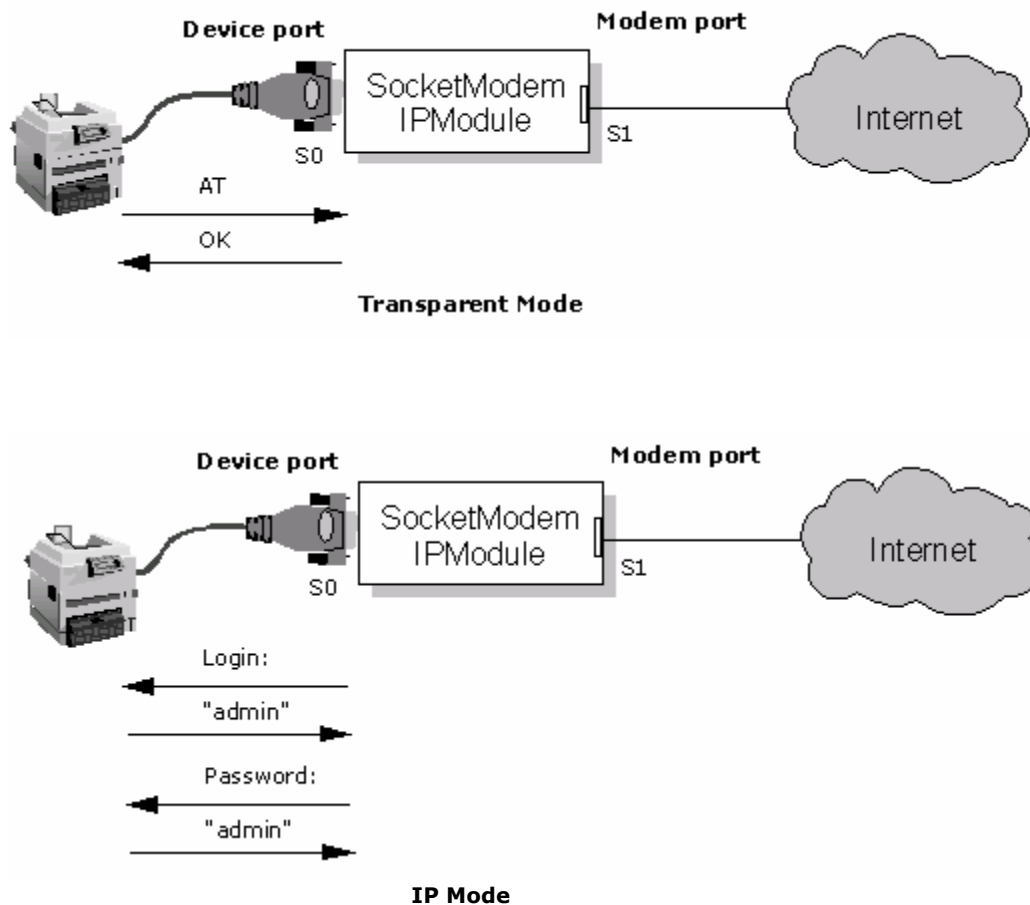
When the MultiConnect IP is configured to function in the **modem** operation mode, it functions as a modem. The Host/Serial device connected on the **device port** can use the MultiConnect IP as a modem in transparent mode.

Refer to **Chapter 9** for application examples that use Transparent Mode.

- **IP Mode**

When the MultiConnect IP is configured to function in the IP operation mode, it provides an IP ability to reach the Hosts/Serial devices connected over the device port. Application such as SMTP Client, POP3 Client, Telnet Client, Telnet Server, FTP Client, etc. provide this IP ability to reach the Host/Serial devices.

The figure below depicts the two modes of operation. The modes can be configured through the Command Line Interface (CLI). By default the MultiConnect IP is set to operate in the **IP Mode**.



3. Physical Link Established over the Modem Port

For any application such as SMTP Client, HTTP Server, POP3 Client, etc. to function, the PPP link must be opened up on the modem port.

MultiConnect IP implementation provides three mechanisms for establishing the physical link over the modem port:

- Dialing-trig-mode NONE
- Dialing-trig-mode DTR
- Dialing-trig-mode Command

Choose the method you desire by configuring the physical link through the Command Line Interface (CLI). Use the following command to configure the **Physical Link Establishment Method**:

```
# set serial [serial-interface] modem dialing-trig-mode
<none/dtr/command>
```

Note: The modem port is set to **modem-answering** by default.

The command **dialing-trig-mode** can be used to set the modem port to **dial**.

Dialing-trig-mode	Functionality
None	Upon boot-up, the modem starts dialing using the set of configured parameters.
DTR	Upon boot-up, the modem is set to the answering state by default. When the DTR goes high on the device port S0, the modem starts to dial on the modem port.
Command	Link establishment and link termination is at your discretion. Command to establish the physical link: <pre># linkup [serial-interface]</pre> Notes: • This command is valid only for modem port S1 and is invalid for device port S0. • This command can be issued only when the dialing-trig-mode is command. Examples: <pre># linkup s1 ERROR: 'dialing-trig-mode is not set to command.' # linkup s1 OK: 'CONNECT 14400 LAPM COMPRESSED' # linkup s1 ERROR: 'NO DIALTONE' # linkup s1 ERROR: 'NO CARRIER' # linkup s1 ERROR: 'NO ANSWER'</pre> Command to terminate the physical link: <pre># hangup [serial-interface]</pre> Notes: • This command is valid only for modem port S1 and is invalid for device port S0 • This command can be issued only when the dialing-trig-mode is command. Example: <pre># hangup s1 OK This hangs up the physical link</pre>

Chapter 7 – Telnet Dialout

Introduction

Telnet Dialout Feature

The Telnet feature allows you to access the serial port and establish two-way traffic between the Telnet/RAW-TCP client and the serial device.

This chapter provides examples of a Telnet client on an IP network (over the modem port) connecting to a remote serial device. The MultiConnect IP acts as a Terminal Server using the Telnet dialout feature.

Features

The MultiConnect IP, acting as a Terminal Server, accommodates the following features:

- Authenticates the serial port.
- Monitors and waits for activity on the standard Telnet port (23) or user-defined RAW-Socket.
- Opens the serial port from the command prompt (manual dialout) .
- Opens the serial port directly (auto dialout) using a TCP Client according to the configured port-number.
- Switches between the command prompt and a dial-out session when the session is in Telnet mode.

Prerequisites

Mandatory Configuration Settings

The following items must be configured in order to use the dial-out feature:

- Disable the Host Interaction Mode to restrict Telnet-Dial-Out and PPP.
set serial s0 host-interaction-mode disable
- Enable Auto dial-out globally on all the serial ports.
set ip telnet auto-dialout enable
- Enable Auto dial-out on the serial port S0.
set serial s0 auto-dialout enable
- Set the Auto dialout port for the serial port S0.
set serial s0 auto-dialout-port <port_number>
- Set the Auto dialout protocol for the serial port S0.
set serial s0 auto-dialout-protocol telnet

An ERROR message displays if any of the above details are not configured or are not valid.

Optional Configuration Commands

(Return to Scenario 1 - Setup Manual Dialout [Notes:](#))

(Return to Scenario 2 - Auto Dialout [Prerequisites](#))

(Return to Scenario 3 - Auto Dial-out in RAW-Mode [Notes:](#))

The following commands can be used for optional configurations:

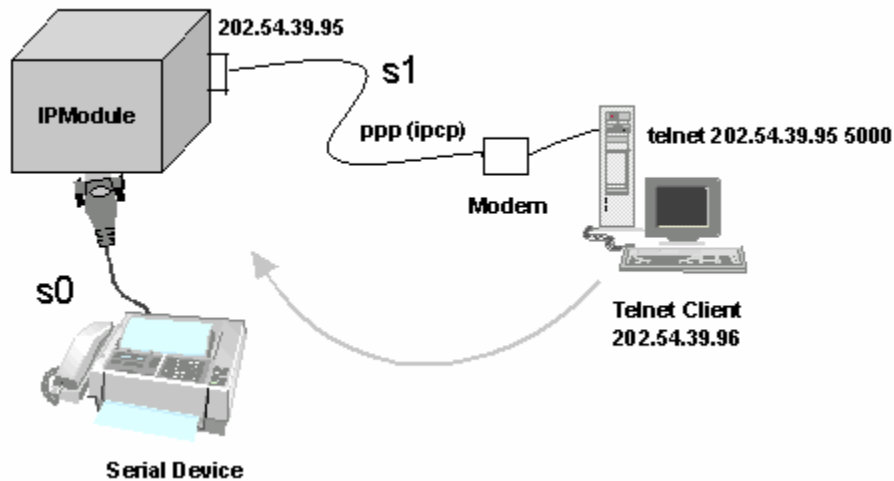
- Enable/Disable the Authentication for Dial-out session
set login auto-dialout-login <enable/disable>
- Enable/Disable the Switching-between-Dialout & Command Prompt feature
set ip telnet escape-monitor <enable/disable>
- Set the Escape-Monitor-String to switch between Dialout and Command Prompt sessions.
set ip telnet escape-string "+++inet"
- Enable/Disable the RAW mode globally for all Dial-out sessions.
set ip telnet raw-mode <enable/disable>
- Enable/Disable the RAW mode for the serial port S0.
set serial s0 raw-dialout <enable/disable>
- Set the Baud rate for the serial port S0 to be taken for a Dialout session.
set serial s0 baud-rate <Baud-rate>
- Set the Flow control for the serial port S0 to be taken for a Dialout session.
set serial s0 flow-control <rts-cts/none>
- Set the Parity for the serial port S0 to be taken for a Dialout session.
set serial s0 parity <even/odd/none>
- Set the Data bits for the serial port S0 to be taken for a Dialout session.
set serial s0 data-bits <7/8>
- Set the Stop bits for the serial port S0 to be taken for a Dialout session.
set serial s0 stop-bits <1/1.5/2>
- Set the Flow control for the serial port S1 to be taken for a PPP session
set serial s1 flow-control <rts-cts/none>
- Set the Parity for the serial port S1 to be taken for a PPP session
set serial s1 parity <even/odd/none>
- Set the Data bits for the serial port S1 to be taken for a PPP session
set serial s1 data-bits <7/8>
- Set the Stop bits for the serial port S1 to be taken for a PPP session
set serial s1 stop-bits <1/1.5/2>

Scenario 1 – Manual Dialout

Connect to the MultiConnect IP using a Telnet Client on port 23 (configuration port).

At the command prompt, invoke **# dialout serial s0**. Once the session is opened successfully, there can be two-way traffic between the Telnet client and the serial device.

- You can switch from Command Prompt to Dialout session using the **restore session** command.
- You can switch from Dialout session to Command Prompt using **<escape-monitor-string>**.



Manual Dialout Feature Through the Command Shell

MultiConnect IP Manual Dialout Setup Commands

```
# set serial s0 stop-bits 1
# set serial s0 baud-rate 115200
# set serial s0 data-bits 8
# set serial s0 parity none
# set serial s0 flow-control rts-cts

# set serial s1 stop-bits 1
# set serial s1 baud-rate 115200
# set serial s1 data-bits 8
# set serial s1 parity none
# set serial s1 flow-control rts-cts
# set serial s1 connect-type modem
# set serial s1 modem dial-number 123

# set serial s1 modem dialing-trig-mode none
(Refer to Chapter 6 - Prerequisite Configurations - Physical Link Established over the Modem Port for more details)

# set ppp ppp0 ipcp-mode client-only
# set ppp ppp0 username "MultiConnect"
# set ppp ppp0 password "MultiConnect"
# save
```

Enable Authentication for PPP Commands

```
# set ppp ppp0 authentication enable
# set ppp ppp0 authentication-type <pap/chap/pap-chap>
```

Enable PPP Compression (on both the PPP peers) Commands

```
# set ppp ppp0 compression enable
# set ppp ppp0 comp-type <both/bsd/deflate>
```

The Authentication and Compression variations can be used while bringing up the PPP logical link in all the scenarios (except for Transparent Mode)

Once the physical link is up and PPP interface has acquired an IP address, the MultiConnect IP is ready to accept a Dial-Out connection.

Use a remote Telnet client and connect to 202.54.39.95 on port 23 (refer to the figure above). On successful login, at the MultiConnect IP command prompt, invoke

```
# dial-out serial s0
```

(The serial port now opens for use.)

Notes:

1. Only one dialout session can be open at a time.
2. The Dialout session is closed when the Telnet session is closed, thereby releasing the serial port.
3. When the Dialout session authentication is enabled as specified in the [Optional Configuration Commands](#) list, the session prompts for the user name and password before opening the session successfully. (Enabled by default).
4. The serial port is opened with the current serial configuration.
5. When **escape-monitor** is enabled, care should be taken during file transfer that the **escape-monitor-string** is not part of the data.

Scenario 2 – Auto Dialout

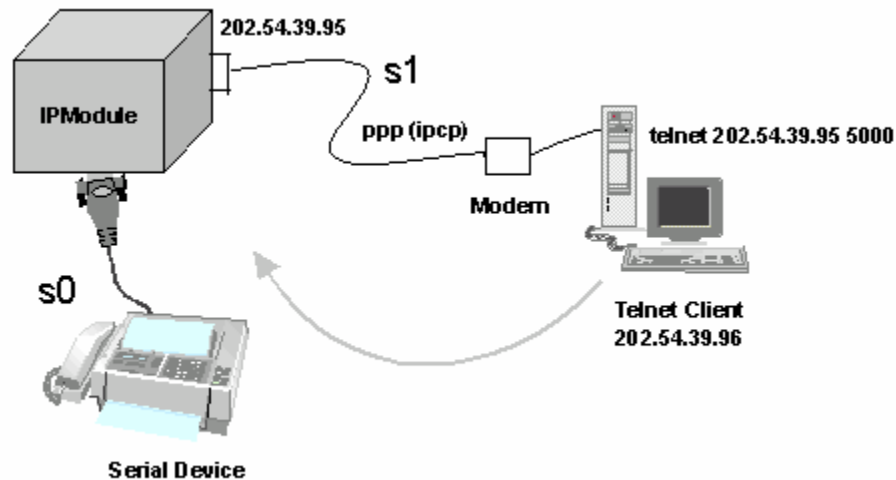
In this scenario, the Auto Dialout session in Telnet mode is opened using a Telnet client.

Prerequisites

RAW mode (global and each port) **MUST BE DISABLED** using the [Optional Configuration Commands](#).

A Telnet client can open an auto Dialout session by specifying the configured auto-dialout port.

- Once the session is opened successfully, there can be two-way traffic between the Telnet session and the remote serial device.



Auto Dialout Feature in Telnet Mode

MultiConnect IP Auto Dialout in Telnet Mode Setup Commands

```
# set ip telnet auto-dialout enable
# set serial s0 auto-dialout enable
# set serial s0 auto-dialout-port 5000
# set serial s0 auto-dialout-protocol telnet

# set serial s0 baud-rate 115200
# set serial s0 data-bits 8
# set serial s0 parity none
# set serial s0 stop-bits 1
# set serial s0 flow-control rts-cts

# set serial s1 baud-rate 115200
# set serial s1 data-bits 8
# set serial s1 parity none
# set serial s1 stop-bits 1
# set serial s1 flow-control rts-cts
# set serial s1 connect-type modem
# set serial s1 modem dial-number 123

# set serial s1 modem dialing-trig-mode none
(Refer to Chapter 6 – Prerequisite Configurations - Physical Link Established over the
Modem Port for more details)

# set ppp ppp0 ipcp-mode client-or-lan
# set ppp ppp0 authentication enable
# set ppp ppp0 auth-type pap
# set ppp ppp0 username "MultiConnect"
# set ppp ppp0 password "MultiConnect"
# set ppp ppp0 local-ip-addr 202.54.39.95 mask 255.255.255.255
# set ppp ppp0 remote-ip-addr 202.54.39.96 mask 255.255.255.255
# save
```

Once the physical link is up and PPP interface has acquired an IP address the MultiConnect IP is ready to accept an auto-dialout connection.

Use a Telnet client and connect to 202.54.39.95 on port 5000. This eventually establishes a Telnet auto-dialout session between the MultiConnect IP and the serial device.

Closing the Telnet client closes the serial port in use.

Notes:

1. Only one dialout session to the same port can be opened at one time.
2. When a dialout session authentication is enabled as specified in the optional commands, the session prompts for a user name and password before opening the session successfully. (Enabled by default).
3. The serial port is opened with the current serial configuration.

Scenario 3 – Auto Dialout in RAW Mode

In this scenario, the Auto-Dialout session in RAW mode is opened using a RAW-TCP client.

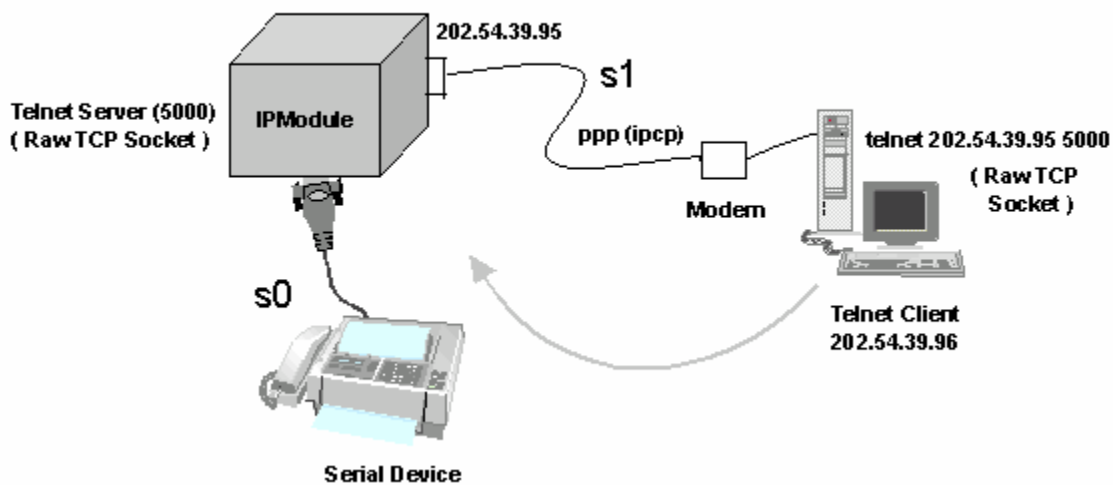
Prerequisites

RAW mode (Global and each port) **MUST BE ENABLED** using the [Optional Configuration Commands](#).

The Auto Dialout session can be opened by a RAW-TCP client by specifying the auto-dialout configured port. Once the session is opened successfully, there can be two-way traffic between the Telnet session and the remote serial device.

Important

You cannot switch between the Command Prompt and the Dialout session in RAW-mode.



Auto Dialout Feature in RAW Mode

Commands to Setup Auto Dial-out in RAW-Mode for MultiConnect IP

```
# set ip telnet auto-dialout enable
# set ip telnet raw-mode enable

# set serial s0 stop-bits 1
# set serial s0 baud-rate 115200
# set serial s0 data-bits 8
# set serial s0 parity none
# set serial s0 flow-control rts-cts

# set serial s0 auto-dialout enable
# set serial s0 raw-dialout enable
# set serial s0 auto-dialout-port 5000
# set serial s0 auto-dialout-protocol telnet

# set serial s1 stop-bits 1
# set serial s1 baud-rate 115200
# set serial s1 data-bits 8
# set serial s1 parity none
# set serial s1 flow-control rts-cts
# set serial s1 connect-type modem
# set serial s1 modem dial-number 123

# set serial s1 modem dialing-trig-mode none
(Refer to Chapter 6 – Prerequisite Configurations - Physical Link Established over the Modem
Port for more details)

# set ppp ppp0 ipcp-mode client-only
# set ppp ppp0 username "MultiConnect"
# set ppp ppp0 password "MultiConnect"
# save
```

Once the physical link is up and PPP interface has acquired an IP address the MultiConnect IP is ready to accept Auto dialout connection.

Use a Telnet client and connect to 202.54.39.95 on port 5000 (RAW TCP socket). This eventually establishes a Telnet auto-dial-out session (In RAWMODE) with the MultiConnect IP, thereby opening the serial port for use.

Closing the Telnet client closes the serial port in use.

Notes:

1. You cannot open more than one dialout session to the same port.
2. When the Dialout session authentication is enabled as specified in the [Optional Configuration Commands](#), the session prompts for a user name and password before opening the session successfully.
3. The serial port is opened with the current serial configuration.

Chapter 8 – Auto Dial-in Feature

Introduction

The auto dial-in feature enables the MultiConnect IP to act as a Telnet client thus facilitating the serial device to access any Telnet/terminal servers on the IP network (over the built-in modem interface). Once the session (Serial Client to Server) is opened successfully, it allows two-way traffic between the serial device and the remote server.

The MultiConnect IP, acting as a Telnet/RAW-TCP client, accommodates the following features when configured:

- Support to open the session using Telnet client (residing in the MultiConnect IP) in Telnet Mode or RAW Mode.
- Support to open the session to the specified port from a Serial Command prompt (Manual Dial-in).
- Switching between a Command prompt and a Dial-in session when the session is in Telnet mode.
- Support to open the session to the configured port directly (Serial Auto Dial-in) whenever the serial port is free.

Prerequisites

Mandatory Configuration Settings

The following items must be configured in order to use the dial-in feature:

- Enable Auto dial-in globally on all the serial ports.
set serial auto-telnet enable
- Enable Auto dial-in on the serial port S0.
set serial s0 auto-dial-in enable
- Set the Auto dial-in protocol.
set serial s0 auto-dialin-protocol telnet
- Set the Auto dial-in Server IP Address.
set serial s0 auto-dialin-ipaddress <ipaddress>
- Set the port to the one, which the Telnet client will be connected.
set serial s0 auto-dialin-port <port_number>

An ERROR message will display if any of the above details are not configured or not valid.

Optional Configuration Settings

The following commands can be used for optional configurations:

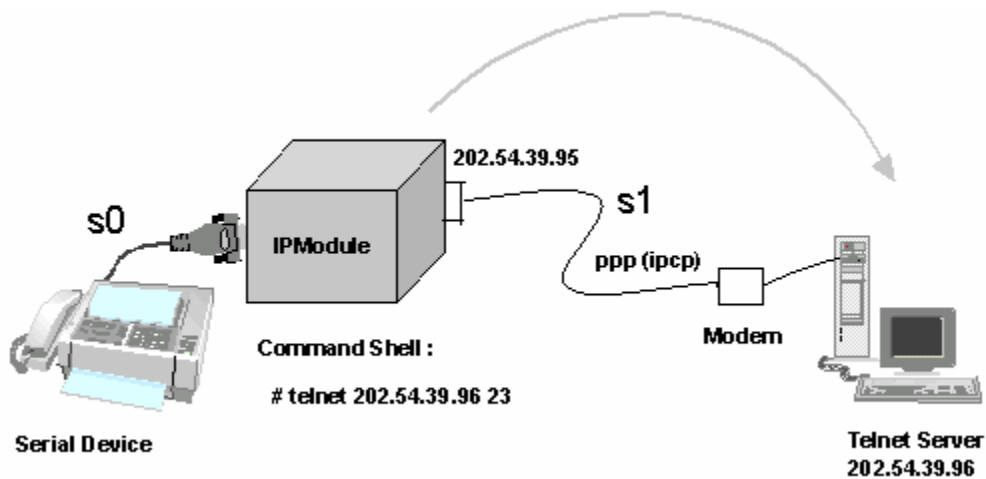
- Enable/Disable **Switching-between-Dial-in** and the Command Prompt feature.
set serial escape-monitor <enable/disable>
- Set the **Escape-Monitor-String** to switch between Dial-in and Command Prompt sessions.
set serial escape-string "+++inet"
- Set the **Serial Dial-in Trigger mode**. It dictates the criterion for establishing a connection. The options provided are on reception of <char/ dtr/ dtr-char/ none>. Refer to the command line configuration section for details about this command.
set serial s0 auto-dialin trig-mode <char/dtr/dtr-char/none>
- Enable/Disable the **RAW mode globally** for all Auto-Dial-in sessions.
set ip telnet raw-mode <enable/disable>
- Enable/Disable the **RAW mode for Auto-Dial-in** session on serial port S0.
set serial s0 raw-dial-in <enable/disable>

Scenario 1 – Manual Serial Dial-in

Login to the Command prchat-scriptompt from the serial side.

Invoke # **telnet** <ip-address> <port> at the command prompt. Once the session is opened successfully, there can be two-way traffic between the serial device and the remote server.

- You can switch from Command Prompt to Dial-in session using the **restore session** command.
- You can switch from Dial-in session to Command Prompt using <escape-monitor-string>.



Manual Dial-in Feature through the Command Shell

MultiConnect IP Manual Dial-In Setup Commands

```
# set serial s0 baud-rate 115200
# set serial s0 data-bits 8
# set serial s0 parity none
# set serial s0 stop-bits 1
# set serial s0 flow-control rts-cts
```

```
# set serial s1 baud-rate 115200
# set serial s1 data-bits 8
# set serial s1 parity none
# set serial s1 stop-bits 1
# set serial s1 flow-control rts-cts
# set serial s1 connect-type modem
# set serial s1 modem dial-number 123
```

```
# set serial s1 modem dialing-trig-mode none
```

(Refer to the Chapter 6 Prerequisite Configurations - Physical Link Established over the Modem Port for more details)

```
# set ppp ppp0 ipcp-mode client-or-lan
# set ppp ppp0 authentication enable
# set ppp ppp0 auth-type pap
# set ppp ppp0 username "MultiConnect"
# set ppp ppp0 password "MultiConnect"
# set ppp ppp0 local-ip-addr 202.54.39.95 mask 255.255.255.255
# set ppp ppp0 remote-ip-addr 202.54.39.96 mask 255.255.255.255
# save
```

Once the physical link is up and the PPP interface has acquired an IP address, the MultiConnect IP is ready to use.

Login to the module through the serial port. At the command shell invoke:

```
# telnet 202.54.39.96 23
```

The Telnet client on board in the MultiConnect IP establishes a virtual serial tunnel between the serial device and the Telnet Server.

Notes:

- You cannot open more than one dial-in session.
- The dial-in session is closed when the Telnet session is closed.
- When **escape-monitor** is enabled, care should be taken during file transfer that the **escape-monitor-string** is not part of the data.

Scenario 2 – Serial Auto Dial-in in Telnet Mode

This example shows how to setup a serial auto dial-in session in Telnet mode. The auto dial-in session is opened by Telnet client embedded in the MultiConnect IP to the configured server on a configured port. Once the session is opened successfully, there can be two-way traffic between the serial device and the remote server.

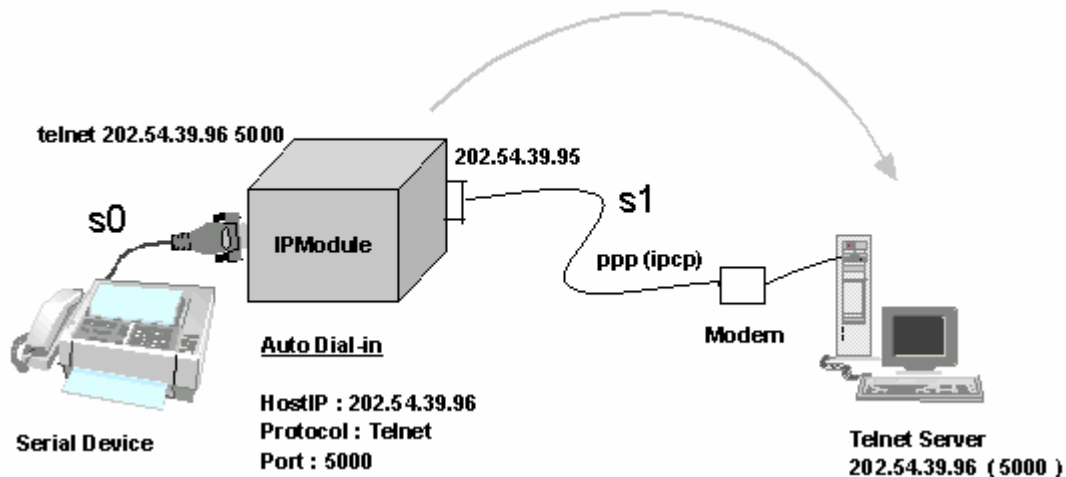
- You can switch from Command Prompt to Dial-in session using the **restore session** command.
- You can switch from Dial-in session to Command Prompt using **<escape-monitor-string>**.

Prerequisites

- RAW mode (Global and each port) **MUST BE DISABLED** using the following command:

Enable/Disable the **RAW mode globally** for all Auto-Dial-in sessions:

```
# set ip telnet raw-mode <enable/disable>
```



Auto Dial-in Feature in Telnet Mode

MultiConnect IP Auto Dial-In Setup in Telnet Mode Commands

```
# set serial auto-telnet enable
# set serial s0 auto-dialin enable
# set serial s0 auto-dialin trig-mode dtr-char
# set serial s0 auto-dialin-ipaddress 202.54.39.96
# set serial s0 auto-dialin-port 5000
# set serial s0 auto-dialin-protocol telnet

# set serial s0 stop-bits 1
# set serial s0 baud-rate 115200
# set serial s0 data-bits 8
# set serial s0 parity none
# set serial s0 flow-control rts-cts

# set serial s1 stop-bits 1
# set serial s1 baud-rate 115200
# set serial s1 data-bits 8
# set serial s1 parity none
# set serial s1 flow-control rts-cts
# set serial s1 connect-type modem
# set serial s1 modem dial-number 123

# set serial s1 modem dialing-trig-mode none
(Refer to the Chapter 6 Prerequisite Configurations - Physical Link Established over the Modem
Port for more details)

# set ppp ppp0 ipcp-mode client-only
# set ppp ppp0 username "MultiConnect"
# set ppp ppp0 password "MultiConnect"
# save
```

Once the PPP link is up with an IP address, the auto dial-in session can be probed. When detecting either a DTR signal or when any character is received from the serial device connected to the RS-232 serial port of MultiConnect IP, the Telnet client on board in the MultiConnect IP establishes a Telnet session to 202.54.39.96 on port 23.

The serial tunnel between the serial device and the Telnet Server terminates in one of the following conditions.

- The connection is broken between the serial device and the serial port of the MultiConnect IP.
- The Telnet Client on board is terminated.
- The Telnet Server terminates the session.

Notes:

1. You cannot open more than one Dial-in session.
2. The Dial-in session is closed when the configuration session is closed (if opened).
3. When **escape-monitor** is enabled, care should be taken during file transfer that the **escape-monitor-string** is not part of the data.

Scenario 3 – Auto Dial-in Session in RAW Mode

This scenario shows how to configure an auto dial-in session in RAW mode. The auto dial-in session is opened by Telnet client (embedded in the MultiConnect IP) in **RAW-mode** to the configured server on a configured port number. Once the PPP link is up with an IP address, the auto dial-in session can be probed as in the Auto Dial-In scenario below.

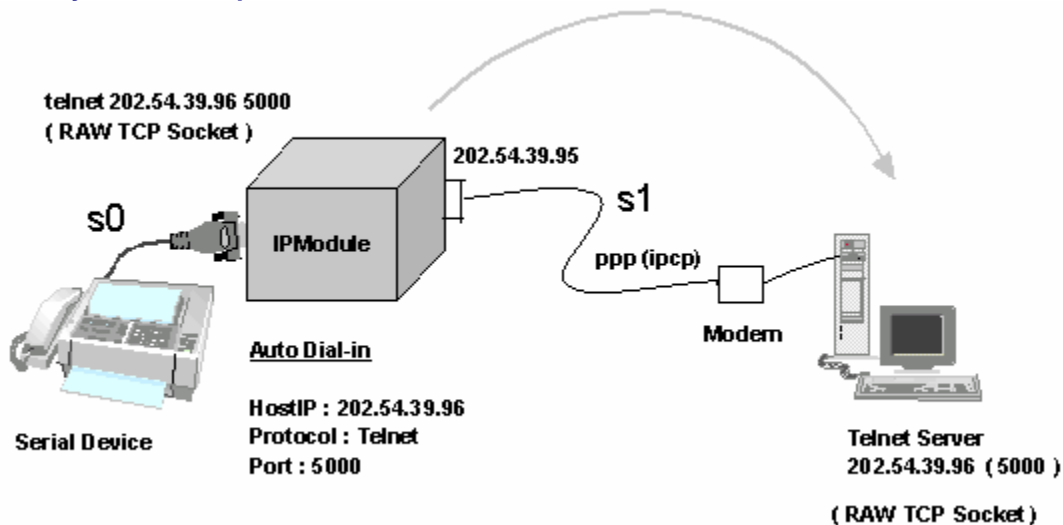
Prerequisites

RAW mode (Global and each port) **MUST BE ENABLED** using the following command:

Enable/Disable the **RAW mode globally** for all Auto-Dial-in sessions:

```
# set ip telnet raw-mode <enable/disable>
```

Important – You cannot switch between the Command Prompt and a Dial-in session in RAW-mode. Also, you cannot open more than one Dial-in session.



Auto Dial-in Feature in RAW Mode

MultiConnect IP Auto Dial-In in RAW Mode Setup Commands

```
# set ip telnet raw-mode enable
# set serial auto-telnet enable
# set serial s0 auto-dialin enable
# set serial s0 raw-dialin enable
# set serial s0 auto-dialin trig-mode dtr-char
# set serial s0 auto-dialin-ipaddress 202.54.39.96
# set serial s0 auto-dialin-port 5000
# set serial s0 auto-dialin-protocol telnet

# set serial s0 stop-bits 1
# set serial s0 baud-rate 115200
# set serial s0 data-bits 8
# set serial s0 parity none
# set serial s0 flow-control rts-cts

# set serial s1 stop-bits 1
# set serial s1 baud-rate 115200
# set serial s1 data-bits 8
# set serial s1 parity none
# set serial s1 flow-control rts-cts
# set serial s1 connect-type modem
# set serial s1 modem dial-number 123

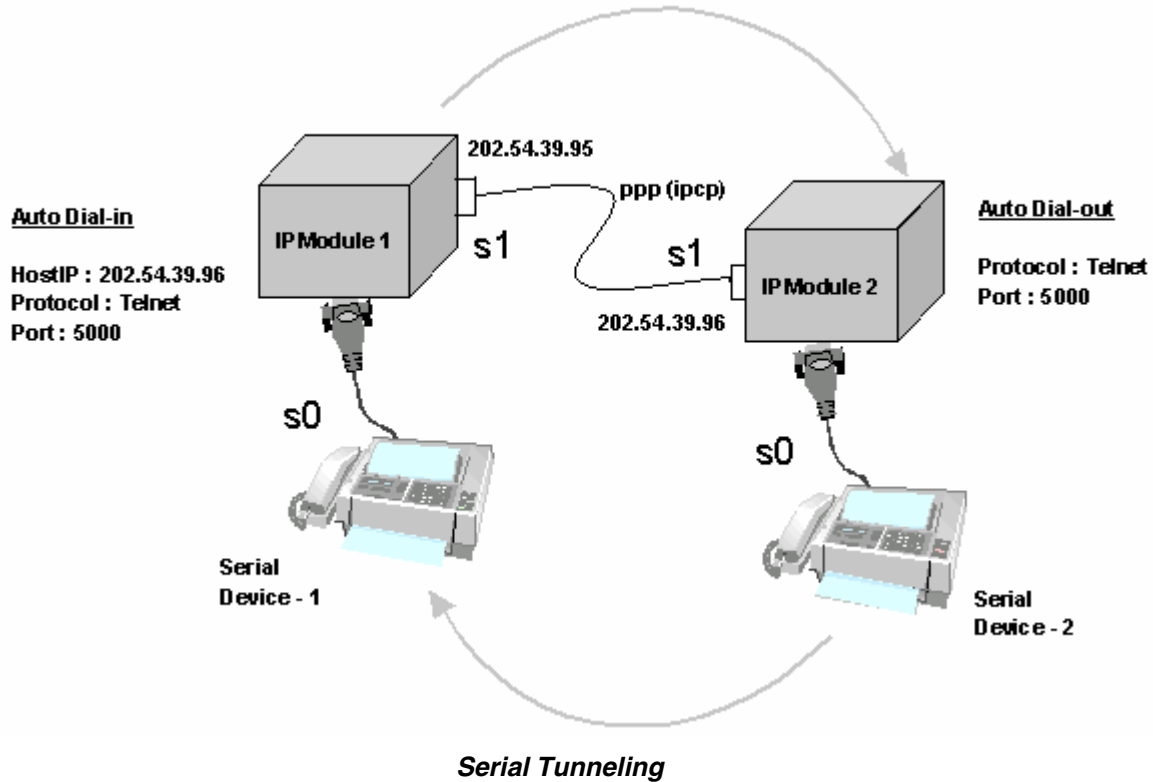
# set serial s1 modem dialing-trig-mode none
(Refer to Chapter 6 - Prerequisite Configurations - Physical Link Established over the Modem Port)

# set ppp ppp0 ipcp-mode client-only
# set ppp ppp0 username "MultiConnect"
# set ppp ppp0 password "MultiConnect"
# save
```

Scenario 4 – Serial Tunneling Mode

The scenario shows a serial tunnel established between two serial devices (Serial Device-1, Serial Device-2) using two MultiConnect IP modules, which are located apart geographically. Once the PPP link is up with an IP address on S1, the dial-in session can occur.

The Serial Devices then communicate to each other across the MultiConnect IP modules.



Commands for Serial Tunneling Setup Using Two MultiConnect IP Modules**Commands for MultiConnect IP Module 1 (Configure for Serial Auto Dial-in)**

```
# set ip telnet raw-mode enable
# set serial auto-telnet enable
# set serial s0 auto-dialin enable
# set serial s0 raw-dialin enable
# set serial s0 auto-dialin trig-mode dtr-char
# set serial s0 auto-dialin-ipaddress 202.54.39.96
# set serial s0 auto-dialin-port 5000
# set serial s0 auto-dialin-protocol telnet

# set serial s0 stop-bits 1
# set serial s0 baud-rate 115200
# set serial s0 data-bits 8
# set serial s0 parity none
# set serial s0 flow-control rts-cts

# set serial s1 stop-bits 1
# set serial s1 baud-rate 115200
# set serial s1 data-bits 8
# set serial s1 parity none
# set serial s1 flow-control rts-cts

# set serial s1 connect-type modem
# set serial s1 modem dial-number 123

# set serial s1 modem dialing-trig-mode none
(Refer to Chapter 6 – Prerequisite Configurations - Physical Link Established over the Modem Port)

# set ppp ppp0 enable
# set ppp ppp0 ipcp-mode client-or-lan
# set ppp ppp0 authentication enable
# set ppp ppp0 auth-type pap
# set ppp ppp0 username "MultiConnect"
# set ppp ppp0 password "MultiConnect"
# set ppp ppp0 local-ip-addr 202.54.39.95 mask 255.255.255.255
# set ppp ppp0 remote-ip-addr 202.54.39.96 mask 255.255.255.255
# save
```

Commands for MultiConnect IP Module 2 (Configure for Telnet Auto Dial-out)

```
# set ip telnet auto-dialout enable
# set ip telnet raw-mode enable

# set serial s0 auto-dialout enable
# set serial s0 auto-dialout-port 5000
# set serial s0 auto-dialout-protocol telnet
# set serial s0 raw-dialout enable

# set serial s0 baud-rate 115200
# set serial s0 data-bits 8
# set serial s0 parity none
# set serial s0 stop-bits 1
# set serial s0 flow-control rts-cts

# set serial s1 baud-rate 115200
# set serial s1 data-bits 8
# set serial s1 parity none
# set serial s1 stop-bits 1
# set serial s1 flow-control rts-cts
# set serial s1 connect-type modem

# set serial s1 modem dialing-trig-mode command
(The default mode is answering. This command changes the mode to answering.)

# set ppp ppp0 enable
# set ppp ppp0 ipcp-mode client-or-lan
# set ppp ppp0 authentication enable
# set ppp ppp0 auth-type pap
# set ppp ppp0 username "MultiConnect"
# set ppp ppp0 password "MultiConnect"
# set ppp ppp0 local-ip-addr 202.54.39.96 mask 255.255.255.255
# set ppp ppp0 remote-ip-addr 202.54.39.95 mask 255.255.255.255
# save
```

Chapter 9 – Modem (Transparent) Mode

Introduction

In the modem mode (also called transparent mode), raw data is communicated between serial ports 1 and 2. This means that:

- Data received on serial port S0 is transmitted on serial port S1
- Data received on serial port S1 is transmitted on serial port S0

Transparent mode can be used in the following applications:

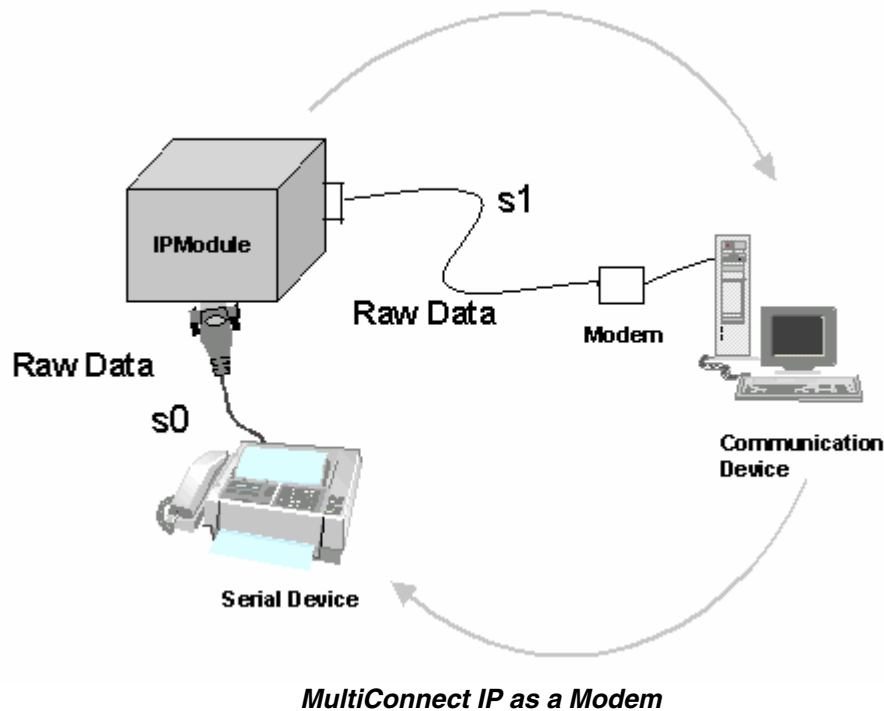
- The MultiConnect IP is used as a Modem
- Serial Tunneling

Prerequisites

- Transparent Mode must be enabled
set operation-mode modem
- Host Interaction mode must be disabled
set serial s0 host-interaction-mode disable
- Enable Switching-between Data mode and Command mode
set serial s0 escape-monitor enable
- Set the Escape-Monitor-String to switch between Data mode and Command mode
set serial s0 escape-string "+++inets0"

Scenario 1 – MultiConnect IP as a Modem

In this scenario, once the physical link is up on the built-in modem interface; i.e., by dialing or answering, the serial device connected to the RS-232 interface (S0 of the target) can communicate to the device on the built-in modem interface (S1 of the target) and vice-versa.



Commands for MultiConnect IP as a Modem

```
# set operation-mode modem
# set serial s0 escape-monitor enable
# set serial s0 escape-string "+++inets0"

# set serial s0 stop-bits 1
# set serial s0 baud-rate 115200
# set serial s0 data-bits 8
# set serial s0 parity none
# set serial s0 flow-control rts-cts

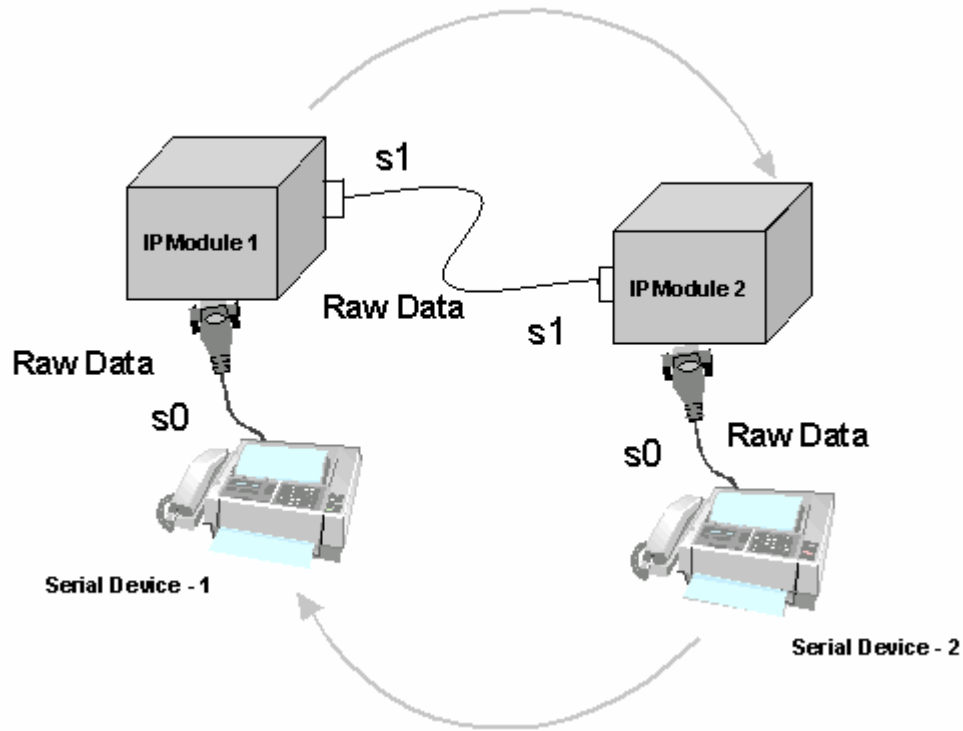
# set serial s1 stop-bits 1
# set serial s1 baud-rate 115200
# set serial s1 data-bits 8
# set serial s1 parity none
# set serial s1 flow-control rts-cts
# save
```

Notes:

- You can switch from Data mode to Command mode using the **escape-monitor-string** configuration. The control is transferred to the command prompt. Either "Login" or the command shell is prompted depending on the configuration.
- You can switch from Command mode to Data mode using the **restore session** command.
- The data session is dropped if the physical link goes down.

Scenario 2 – Serial Tunneling in Transparent Mode

In this scenario, two MultiConnect IP modules in transparent mode aid in the communication between two serial devices that are connected to the RS-232 interface (S0) of the MultiConnect IP modules. Serial tunneling is achieved in the transparent mode where raw data is communicated.



Serial Tunneling in Transparent Mode

Commands for MultiConnect IP - 1 (Dialing End)

```
# set operation-mode modem
# set serial s0 escape-monitor enable
# set serial s0 escape-string "+++inets0"

# set serial s0 stop-bits 1
# set serial s0 baud-rate 115200
# set serial s0 data-bits 8
# set serial s0 parity none
# set serial s0 flow-control rts-cts

# set serial s1 stop-bits 1
# set serial s1 baud-rate 115200
# set serial s1 data-bits 8
# set serial s1 parity none
# set serial s1 flow-control rts-cts
# save
```

Commands for MultiConnect IP - 2 (Answering End)

```
# set operation-mode modem

# set serial s0 escape-monitor enable
# set serial s0 escape-string "+++inets0"

# set serial s0 baud-rate 115200
# set serial s0 data-bits 8
# set serial s0 parity none
# set serial s0 stop-bits 1
# set serial s0 flow-control rts-cts

# set serial s1 baud-rate 115200
# set serial s1 data-bits 8
# set serial s1 parity none
# set serial s1 stop-bits 1
# set serial s1 flow-control rts-cts
# save
```

Steps for Establishing a Physical Link in Transparent Mode

1. Complete the configuration listed above.
2. At the dialing end, invoke the following commands:


```
atz
at&f
atdt <dial no>
```
3. Once the physical connection is up, the data channel between the two MultiConnect IP modules is established.

Note: Only raw data is forwarded between the MultiConnect IP modules, and no data integrity check is provided.
4. Type +++ followed by **ATH0** to hangup the modem.

Notes

- You can switch from Data mode to Command mode using the **escape-monitor-string** command. The Command mode transfers control to the **Command Shell** of MultiConnect IP.
- You can switch from Command mode to Data mode using the **restore session** command.
- The data session is dropped if the physical link goes down.

Chapter 10 – Modem Mode AT Commands, S-Registers, Result Codes

This chapter covers the V.22bis, V.32, V.34, and V.92 commands, S-Registers, and Result Codes. The AT commands are used to control the operation of your modem. They are called *AT* commands because the characters **AT** must precede each command to get the *AT*tention of the modem.

AT commands can be issued only when the modem is in command mode or online command mode. The modem is in *command mode* whenever it is not connected to another modem. The modem is in *data mode* whenever it is connected to another modem and ready to exchange data. *Online command mode* is a temporary state in which you can issue commands to the modem while connected to another modem. To put the modem into online command mode from data mode, you must issue an *escape sequence* (+++) followed immediately by the AT characters and the command, e.g., +++ to hang up the modem. To return to data mode from online command mode, you must issue the command **ATO**.

To send AT commands to the modem you must use a communications program, such as the HyperTerminal applet in Windows, or some other available terminal program. You can issue commands to the modem either directly, by typing them in the terminal window of the communications program, or indirectly, by configuring the operating system or communications program to send the commands automatically. Fortunately, communications programs make daily operation of modems effortless by hiding the commands from the user. Most users, therefore, need to use AT commands only when reconfiguring the modem, e.g., to turn autoanswer on or off.

The format for entering an AT command is **ATXn**, where **X** is the command and **n** is the specific value for the command, sometimes called the command *parameter*. The value is always a number. If the value is zero, you can omit it from the command; thus, **AT&B** is equivalent to **AT&B0**. Most commands have a *default* value, which is the value that is set at the factory.

You must press ENTER (depending on the terminal program it could be some other key) to send the command to the modem. Any time the modem receives a command, it sends a response known as a *result code*. The most common result codes are *OK*, *ERROR*, and the *CONNECT* messages that the modem sends to the computer when it is connecting to another modem. For a table of valid result codes, see “Result Codes” at the end of this chapter.

You can issue several commands in one line, in what is called a command *string*. The command string begins with **AT** and ends when you press ENTER. Spaces to separate the commands are optional; the command interpreter ignores them. The most familiar command string is the *initialization string*, which is used to configure the modem when it is turned on or reset, or when your communications software calls another modem.

Escape Code Sequence +++

When the modem has established a connection and has entered online data mode, it is possible to break into the data transmission in order to issue further commands to the modem in an online command mode. This is achieved by the DTE sending to the modem a sequence of three ASCII characters specified by S-Register S2. The default character is '+'. The maximum time allowed between receipt of the last character of the three-escape character sequence (+++) from the DTE and sending of the OK result code to the DTE is controlled by the S12 register.

Command Organization

The commands in this chapter are listed in the following order:

- First, the commands that begin with letters are listed in alphabetical order
- Then the commands that begin with symbols are listed in this order &, \, -, %, +, #, +++
- Fast Connect Commands
- V.92 Commands

Command Types

The following list should help if you are looking for a particular type of command. This list categorizes AT Commands by function.

Generic Modem Control Commands

Z	Soft Reset and Restore Profile
+VCID	Caller ID
+VRID	Report Retrieved Caller ID
\N	Operating Mode – Error Control
I	Identification
+GMI	Request Manufacturer Identification
+GMM	Request Model Identification
+GMR	Request Revision Identification
+GCAP	Request Complete Capabilities List
+GCI	Country of Installation
&F	Restore Factory Configuration (Profile)
&T	Local Analog Loopback Test
&Y	Designate a Default Profile
&W	Store Current Configuration
&Zn=x	Store Telephone Number

DTE–Modem Interface Commands

E	Command Echo
Q	Quiet Result Code Control
V	Result Code Form
W	Connect Message Control
X	Extended Result Codes
&C	RLSD (DCD) Option
&D	Data Terminal Ready (DTR) Option
&K	Flow Control
&R	RTS/CTS Option
&S	DSR Override
+IPR	Fixed DTE Rate
+IFC	DTE-Modem Local Flow Control
+ILRR	DTE-Modem Local Rate Reporting

Call Control Commands

D	Dial
T	Set Tone Dial Default
P	Set Pulse Dial Default
A	Answer
H	Disconnect (Hang-up)
O	Return to Online Data Mode
L	Speaker Volume
M	Speaker Control
&G	Select Guard Tone
&P	Select Pulse Dial Make/Break Ratio
&V	Display Current Configuration and Stored Profiles
&V1	Display Last Connection Statistics
\V	Single Line Connect Message Enable
%L	Report Line Signal Level
%Q	Report Line Signal Quality
-STE	Set Telephony Extension

Call Control Commands

+MS	Modulation Selection
+MR	Modulation Reporting Control
%E	Enable/Disable Line Quality Monitor and Auto-Retrain
%U	Select μ -Law or A-Law Codec Type
B	Communication Standard – CCITT or Bell

Error Control Commands

+ES	Error Control
+EB	Break Handling in Error Control Operation
+ESR	Selective Repeat
+EFCS	32-bit Frame Check Sequence
+ER	Error Control Reporting
+ER <type>	Report the Current Error Control
+ETBM	Call Termination Buffer Management
\B	Transmit Break to Remote
\K	Break Control
-K	MNP Extended Services

Data Compression Commands

+DS	Data Compression
+DR	Data Compression Reporting
%C	Enable/Disable Data Compression

V.8/V.8bis Commands

+A8E	V.8 and V.8bis Operation Controls
+A8I	CI Signal Indication

Diagnostic Commands

#U	Last Call Status Report
-----------	-------------------------

FastConnect Commands

\$F	FastConnect Control
------------	---------------------

V.92 +P and -Q Commands

+PCW	Call Waiting Enable
+PMH	Modem-on-Hold Enable
+PMHR	Initiate Modem-on-Hold
+PMHT	Modem-on-Hold Timer
+PIG	PCM Upstream Ignore
+PMHF	V.92 Modem-on-Hold Hook Flash
+PQC	V.92 Phase 1 and Phase 2 Control
+PSS	Use Short Sequence
-QCPC	Force Full Startup Procedure on Next Connection
-QCPS	Enable Quick Connect Profile Save

Command Detail

Command:	AT	Attention Code
Values:		n/a
Description:		The attention code precedes all command lines except for escape sequences.
Command:		ENTER Key
Values:		n/a
Description:		Press the ENTER (RETURN) key to execute most commands.
Command:	A	Answer
Values:		n/a
Description:		Answer call before final ring. The modem will go off-hook and attempt to answer an incoming call if correct conditions are met. Upon successful completion of answer handshake, the modem will go on-line in answer mode. This command may be affected by the state of Line Current Sense, if enabled. (Most countries do not require Line Current Sense.) Operation is also dependent upon country-specific requirements. The modem will enter the connect state after exchanging carrier with the remote modem. If no carrier is detected within a period specified in register S7, the modem hangs up. Any character entered during the connect sequence will abort the connection attempt.
Command:	A/	Repeat Last Command
Values:		n/a
Description:		Repeats the last command string. Do not precede this command with AT. Do not press Enter to execute.
Command:	Bn	Communication Standard Setting – ITU-T or Bell
Values:		$n = 0, 1$
Default:		0
Description:		When the modem is configured to allow either option, the modem will select Bell or ITU-T modulation for a line speed connection of 300 or 1200 bps. Any other line speed will use an ITU-T modulation standard. The parameter value, if valid, is written to S27 bit 6. B0 Selects ITU-T operation at 300 or 1200 bps during Call Establishment and a subsequent connection. B1 Selects Bell operation at 300 or 1200 bps during Call Establishment and a subsequent connection. B2 Selects V.23 half-duplex operation at 1200 bps during Call Establishment and a subsequent connection. (V.22bis only). B3 Disables V.23 half-duplex operation. (V.22bis only).
Command:	Ds	Dial
Values:		s = dial string (phone number and dial modifiers)
Default:		none
Description:		This command directs the modem to go on-line, dial according to the string entered and attempt to establish a connection. If no dial string is supplied, the modem will go on-line and attempt the handshake in originate mode. Note: If the ATD command is issued before the S1 register has cleared, the modem will respond with the NO CARRIER result code. Dial Modifiers 0-9 DTMF digits 0 to 9. * The 'star' digit (tone dialing only). # The 'gate' digit (tone dialing only). A-D Some countries may prohibit sending of these digits during dialing (tone dialing only) L Redial last number. (Must be placed immediately after ATD.)

- P** Select pulse dialing: pulse dial the numbers that follow until a "T" is encountered. Affects current and subsequent dialing. Some countries prevent changing dialing modes after the first digit is dialed.
- T** Select tone dialing: tone dial the numbers that follow until a "P" is encountered. Affects current and subsequent dialing. Some countries prevent changing dialing modes after the first digit is dialed.
- R** This command will be accepted, but not acted on.
- S=n** Dial the number stored in the directory (n = 0 to 3). (See &Z.) (S=n is not available with V.22bis).
- !** Flash: the modem will go on-hook for a time defined by the value of S29. Country requirements may limit the time imposed.
- W** Wait for dial tone: the modem will wait for dial tone before dialing the digits following "W". If dial tone is not detected within the time specified by S7 (US) or S6 (W-class), the modem will abort the rest of the sequence, return on-hook, and generate an error message.
- @** Wait for silence: the modem will wait for at least 5 seconds of silence in the call progress frequency band before continuing with the next dial string parameter. If the modem does not detect these 5 seconds of silence before the expiration of the call abort timer (S7), the modem will terminate the call attempt with a NO ANSWER message. If busy detection is enabled, the modem may terminate the call with the BUSY result code. If answer tone arrives during execution of this parameter, the modem handshakes.
- &** Wait for credit card dialing tone before continuing with the dial string. If the tone is not detected within the time specified by S7 (US models) or S6 (W-class models), the modem will abort the rest of the sequence, return on-hook, and generate an error message.
- ,** Dial pause: the modem will pause for a time specified by S8 before dialing the digits following ",".
- ;** Return to command state. Added to the end of a dial string, this causes the modem to return to the command state after it processes the portion of the dial string preceding the ";". This allows the user to issue additional AT commands while remaining off-hook. The additional AT commands may be placed in the original command line following the ";" and/or may be entered on subsequent command lines. The modem will enter call progress only after an additional dial command is issued without the ";" terminator. Use "H" to abort the dial in progress, and go back on-hook.
- ^** Toggles calling tone enable/disable: applicable to current dial attempt only.
- ()** Ignored: may be used to format the dial string.
- Ignored: may be used to format the dial string.
- <space>** Ignored: may be used to format the dial string.
- <i>** Invalid character: will be ignored.
- >** If enabled by country specific parameter, the modem will generate a grounding pulse on the EARTH relay output.

Command:	En	Echo Command
Values:		n = 0 or 1
Default:		1
Description:		The modem enables or disables the echo of characters to the DTE. The valid parameter value is written to S14 bit 1. E0 Disables echo command. E1 Enables echo command.
Command:	Hn	Disconnect (Hang Up)
Values:		n = 0 or 1
Default:		None
Description:		This command may not be available in some countries due to PTT restrictions. H0 The modem will release the line if the modem is currently online and will terminate any test (AT&T) that is in progress. Country specific, modulation specific, and error correction protocol specific (S38) processing is handled outside of the H0 command. H1 If on-hook, the modem will go off-hook and enter command mode. For US models, the modem will remain off-hook. For global models, the modem will return on-hook after a period of time determined by S7.

Command:	In	Identification (for V.22bis)
Values:		This command causes the modem to reports the requested result according to the command parameter.
Default:		$n = 0-7$
		None
		I0 Reports product code, e.g., "2400".
		I1 Reports the least significant byte of the stored checksum in decimal. Reports 255 if the prestored checksum value is FFh.
		I2 Check ROM and verify the checksum, displaying <i>OK</i> or <i>ERROR</i> .
		I3 Reports ROM Code Revision-Modulation (e.g., 2109-V90). Revision, Modulation, and Model.
		I4 Reports OEM defined identifier string.
		I5 Reports Country Code parameter (see +GCI).
		I6 Reports modem data pump and internal code revision.
		I7 Reports OK.
Command:	Ln	Monitor Speaker Volume
Values:		$n = 0, 1, 2, \text{ or } 3$
Default:		2
Description:		This command sets the speaker volume control. The parameter value, if valid, is written to S22 bits 0 and 1.
		L0 Select low volume.
		L1 Select low volume.
		L2 Select medium volume.
		L3 Select high volume.
Command:	Mn	Monitor Speaker Mode
Values:		$n = 0, 1, 2, \text{ or } 3$
Default:		1
Description:		This command selects when the speaker will be on or off. The parameter value, if valid, is written to S22 bits 2 and 3.
		M0 Speaker always off.
		M1 Speaker on until carrier signal detected.
		M2 Speaker always on when modem is off-hook.
		M3 Speaker on until carrier is detected, except while dialing, but on during answering.
Command:	On	Return to Online Data Mode
Values:		0, 4, 5
Default:		None
Description:		This command determines how the modem will enter the on-line data mode. If in the on-line command mode, the modem enters the on-line data mode with or without a retrain. If in the off-line command mode (no connection), the modem reports ERROR.
		O0 Enters on-line data mode without a retrain. Handling is determined by the Call Establishment task. Generally, if a connection exists, this command connects the DTE back to the remote modem after an escape (+++).
		O1 Enters on-line data mode with a retrain before returning to on-line data mode. Fast retrain without speed change (used for diagnostic purpose only). Renegotiate rate without speed change (used for diagnostic purpose only). (Not in V.22bis)
		O2 Fast retrain without speed change (used for diagnostic purpose only).
		O3 Renegotiate rate without speed change (used for diagnostic purpose only).
		O4 Renegotiate rate down one speed (used for diagnostic purpose only). (Not in V.22bis)
		O5 Renegotiate rate up one speed (used for diagnostic purpose only). (Not in V.22bis)

Command:	P	Set Pulse Dial Default
Values:		P, T
Default:		T
Description:		This command forces pulse dialing until the next T dial modifier of T command is received. As soon as a dial command is executed which specifies the dialing mode for that particular call (e.g., ATDT...), this command is overridden so that all future dialing will be tone dialed. (See T command). This command may not be permitted in some countries.
Command:	Qn	Quiet Result Codes Enable/Disable
Values:		$n = 0$ or 1
Default:		0
Description:		The command enables or disables the sending of result codes to the DTE. The parameter value, if valid, is written to S14 bit 2. Q0 Enables result codes to the DTE. Q1 Disables result codes to the DTE.
Command:	T	Set Tone Dial Default
Values:		P, T
Default:		T
Description:		This command forces DTMF dialing until the next P dial modifier or P command is received. The modem will set an S-Parameter bit to indicate that all subsequent dialing should be conducted in tone mode. The DP command will override this command. This command may not be permitted in some countries.
Command:	Vn	Result Code Form (Not available in V.22bis)
Values:		$n = 0$ or 1
Default:		1
Description:		This command selects the sending of short-form or long-form result codes to the DTE. V0 Enables short-form (terse) result codes. Line feed is not issued before a short-form result code. V1 Enables long-form (verbose) result codes.
Command:	Wn	Connect Message Control
Values:		$n = 0, 1,$ or 2
Default:		0
Description:		This command, in conjunction with S95 bits 0, 2, 3, and 5 (bits 2, 3, and 5 can be written directly by the host or by the +MR, +ER, and +DR commands, respectively), control the format of CONNECT messages. The actual result code messages reported reflect the W command setting and the S95 bit settings. (Also see +MR, +ER, and +DR commands.) The W parameter value, if valid, is written to S31 bits 2 and 3. W0 Upon connection, the modem reports only the DTE speed (e.g., CONNECT 19200). Subsequent responses are disabled. W1 Upon connection, the modem reports the modulation, line speed, the error correction protocol, and the DTE speed, respectively. Subsequent responses are disabled. W2 Upon connection, the modem reports the DCE speed (e.g., CONNECT 14400). Subsequent responses are disabled.

Command:	Xn	Extended Result Codes and Call Progress Information
Values:		$n = 0-4$
Default:		4
Description:		This command selects the subset of the result code messages used by the modem to inform the DTE of the results of commands. See Extended Results Code Chart in the Results Code section of this chapter. X0 Disables reporting of busy tones unless forced otherwise by country requirements; send only OK, CONNECT, RING, NO CARRIER, ERROR, and NO ANSWER result codes. Blind dialing is enabled/disabled by country parameters. If busy tone detection is enforced and busy tone is detected, NO CARRIER will be reported. If dial tone detection is enforced or selected and dial tone is not detected, NO CARRIER will be reported instead of NO DIAL TONE. The value 000b is written to S22 bits 6, 5, and 4, respectively. X1 Disables reporting of busy tones unless forced otherwise by country requirements; send only OK, CONNECT, RING, NO CARRIER, ERROR, NO ANSWER, and CONNECT XXXX (XXXX = rate). Blind dialing enabled/disabled by country parameters. If busy tone detection is enforced and busy tone is detected, NO CARRIER will be reported instead of BUSY. If dial tone detection is enforced or selected and dial tone is not detected, NO CARRIER will be reported instead of NO DIAL TONE. The value 100b is written to S22 bits 6, 5, and 4, respectively. X2 Disables reporting of busy tones unless forced otherwise by country requirements; send only OK, CONNECT, RING, NO CARRIER, ERROR, NO DIAL TONE, NO ANSWER, and CONNECT XXXX. If busy tone detection is enforced and busy tone is detected, NO CARRIER will be reported instead of BUSY. If dial tone detection is enforced or selected and dial tone is not detected, NO DIAL TONE will be reported instead of NO CARRIER. The value 101b is written to S22 bits 6, 5, and 4, respectively. X3 Enables reporting of busy tones; send only OK, CONNECT, RING, NO CARRIER, ERROR, NO ANSWER, and CONNECT XXXX. Blind dialing is enabled/disabled by country parameters. If dial tone detection is enforced and dial tone is not detected, NO CARRIER will be reported. The value 110b is written to S22 bits 6, 5, and 4, respectively. X4 Enables reporting of busy tones; send all messages. The value 111b is written to S22 bits 6, 5, and 4, respectively. (Default.)
Command:	Zn	Soft Reset and Restore Profile
Values:		$n = 0$ or 1
Default:		None
Description:		Causes the modem to perform a soft reset and restore (recall) of the factory default configuration profile. Z0 Soft reset and restore stored profile 0. Z1 Soft reset and restore stored profile 1. (Not available in V.22bis except for compatibility).
Command:	&Cn	RLSD (DCD) Option
Values:		$n = 0$ or 1
Default:		1
Description:		The modem controls the RLSD output in accordance with the parameter supplied. The parameter value, if valid, is written to S21 bit 5. &C0 RLSD remains ON at all times. &C1 RLSD follows the state of the carrier.
Command:	&Dn	Data Terminal Ready (DTR) Option
Values:		$n = 0, 1, 2,$ or 3
Default:		2
Description:		This command interprets the ON to OFF transition of the DTR signal from the DTE in accordance with the parameter supplied. The parameter value, if valid, is written to S21 bits 3 and 4. Also, see 25. &D0 - Allows operation with DTEs which do not provide DTR. &D1 - DTR drop is interpreted as if the escape sequence had been entered. The modem returns to the command state without disconnecting. &D2 - DTR drop causes the modem to hang up. Auto-answer is inhibited. (Default.) &D3 - DTR drop causes the modem to perform a soft reset as if the Z command were received. The &Y setting determines which profile is loaded.

Command:	&Fn	Restore Factory Configuration (Profile)
Values:		$n = 0$
Default:		None
Description:		The modem loads the factory default configuration (profile). The factory defaults are identified for each command and in the S-Register descriptions. A configuration (profile) consists of a subset of S-Registers. &F0 Restore factory configuration 0. &F1 Restore factory configuration 1. (Not available in V.22bis).
Command:	&Gn	Select Guard Tone
Values:		$n = 0, 1, \text{ or } 2$
Default:		0
Description:		This command causes the modem to generate the guard tone selected by this command (DPSK modulation modes only). This command may not be permitted in some countries. &G0 Disables guard tone. &G1 Disables guard tone. &G2 Set guard tone to 1800 Hz.
Command:	&Kn	Flow Control
Values:		$n = 0, 3, 4, 5$
Defaults:		3
Description:		This command defines the DTE/DCE (terminal/modem) flow control mechanism. The parameter value, if valid, is written to S39 bits 0, 1, and 2. &K0 Disables flow control. &K3 Enables RTS/ CTS flow control. &K4 Enables XON/XOFF flow control. &K5 Enables transparent XON/XOFF flow control.
Command:	&Pn	Select Pulse Dial Make/Break Ratio
Values:		$n = 0, 1, 2, 3$
Default:		Country-Dependent
Description:		This command determines the make/break ratio used during pulse dialing. It is only effective if the appropriate bit to enable this command is set through the country profile. The default is country-dependent. The parameter value, if valid, is written to S28 bits 3 and 4. &P0 Selects 39%-61% make/break ratio at 10 pulses per second. (Default in V.22bis)) &P1 Selects 33%-67% make/break ratio at 10 pulses per second. &P2 Selects 39%-61% make/break ratio at 20 pulses per second. &P3 Selects 33%-67% make/break ratio at 20 pulses per second.
Command:	&R	RTS/CTS Option
Values:		0, 1
Default:		None
Description:		This selects how the modem controls CTS. The CTS operation is modified if hardware flow control is selected (see &K command). The parameter value, if valid, is written to S21 bit 2. &R0 In sync mode, CTS tracks the state of RTS; the RTS-to-CTS delay is defined by S26. In async mode, CTS is normally ON and will turn OFF only if required by flow control. &R1 In sync mode, CTS is always ON (RTS transitions are ignored), tracks the state of RTS; In async mode, CTS is normally ON and will turn OFF only if required by flow control.
Command:	&Sn	DSR Override (&S has no functionality in V.22bis)
Values:		$n = 0, 1$
Default:		0
Description:		Selects how the modem will control DSR. The parameter value, if valid, is written to S21 bit 6. &S0 DSR is always high (ON). &S1 DSR goes high (ON) only during a connection.

Command:	&Tn	Local Analog Loopback Test
Values:		$n = 0, 1,$
Default:		None
Description:		The modem can perform the local analog loopback test if &T1 is selected. The test can be run only when the modem is operating in asynchronous mode with non-error-correction (normal). To terminate a test in progress, the escape sequence (+++) must be entered first. &T0 Stops any test in progress. Clears S16. &T1 Starts a local analog loopback, V.54 Loop 3, test. If a connection exists when this command is issued, the modem hangs up. When the test starts, a <i>CONNECT</i> message is displayed.
Command:	&V	Display Current Configuration and Stored Profiles
Values:		n/a
Description:		Displays the active configuration and the stored user profiles. Note: Only the Active Profile is available in V.22bis. Example: ACTIVE PROFILE: B1 E1 L1 M1 N0 QO T V1 W0 X4 Y0 &C1 &D2 &G0 &J0 &K3 &Q5 &R1 &S0 &T5 &X0 S00:000 S01:000 S02:043 S03:013 S04:010 S05:008 S06:002 S07:050 S08:002 S09:006 S10:014 S11:095 S12:050 S18:000 S25:005 S26:001 S36:007 S38:020 S46:138 S48:007 S95:000 STORED PROFILE 0: B1 E1 L1 M1 N0 QO T V1 W0 X4 Y0 &C1 &D2 &G0 &J0 &K3 &Q5 &R1 &S0 &T5 &X0 S00:000 S02:043 S06:002 S07:050 S08:002 S09:006 S10:014 S11:095 S12:050 S18:000 S36:007 S40:104 S41:195 S46:138 S95:000 STORED PROFILE 1: B1 E1 L1 M1 N0 QO T V1 W0 X4 Y0 &C1 &D2 &G0 &J0 &K3 &Q5 &R1 &S0 &T5 &X0 S00:000 S02:043 S06:002 S07:050 S08:002 S09:006 S10:014 S11:095 S12:050 S18:000 S36:007 S40:168 S41:195 S46:138 S95:000

Command:	&V1	Display Last Connection Statistics (&V1 has no functionality in V.22bis)
Values:	<i>n</i> = 1	
Default:	1	
Description:		Displays the last connections in the following format (shown with typical results): <pre> TERMINATION REASON..... LOCAL REQUEST LAST TX rate..... 26400 BPS HIGHEST TX rate..... 26400 BPS LAST RX rate..... 49333 BPS HIGHEST RX rate..... 49333 BPS PROTOCOL..... LAPM PROTOCOL..... LAPM COMPRESSION..... V42Bis Line QUALITY..... 038 Rx LEVEL..... 015 Highest Rx State..... 67 Highest TX State..... 67 EQM Sum..... 00B4 Min Distance..... 0000 RBS Pattern..... 00 Rate Drop..... 00 Digital Loss..... 2000 Local Rtrn Count..... 00 Remote Rtrn Count..... 00 Flex 9481814347C4 </pre> RBS Pattern: Shows which bits are being robbed in the least significant 6 bytes, e.g., 03 indicates 2 robbed bits in bit positions 0 and 1. Digital Loss: Shows if a pad is encountered and if so, what is the digital loss. 2000 means 0dB. Flex: Shows V.8bis information as follows: First byte: Octet 13 (second byte of manufacturer id, 94 = K56flex) Second byte: Octet 14 (Licensee code: 81 = Conexant) Third byte: Octet 15 (manufacturer's product capabilities) Fourth byte: Octet 16 (K56flex version number) Fifth byte: Octet 17 (Conexant pump code version number) Sixth byte: Octet 18 (x-law and controller version number) Bit 6 Forced/Not forced A-Law/μ-Law 0 = Forced A-Law/μ-Law 1 = Not forced A-Law/μ-Law Bit 5 Select A-Law or μ-Law 0 = Select A-Law 1 = Select μ-Law Bit 4:0 Controller version
Command:	&Wn	Store Current Configuration Settings (Not available in V.22bis)
Values:	<i>n</i> = 0, 1	
Default:	0	
Description:		Saves the current (active) configuration (profile), including S-Parameters, in one of the two user profiles in NVRAM as denoted by the parameter value. The current configuration is comprised of a list of storable parameters illustrated in the &V command. These settings are restored to the active configuration upon receiving a Z command or at power up (see &Y command). &W0 Store the current configuration as profile 0. &W1 Store the current configuration as profile 1.
Command:	&Y	Designate a Default Reset Profile (No available in V.22bis)
Values:	0, 1	
Default:	None	
Description:		This command selects which user profile will be used after a hard reset. &Y0 The modem will use profile 0. &Y1 The modem will use profile 1.

Command:	&Zy=x	Store Telephone Number (Not available in V.22bis)
Values:		y = 0–3 x = Dialing command
Default:		None
Description:		Stores up to four telephone numbers and each telephone number dial string can contain up to 31 digits (requires 256-byte NVRAM installed).
Command:	\Bn	Transmit Break to Remote
Values:		n = 0–9 in 100 ms units
Default:		3
Description:		In non-error correction mode, the modem will transmit a break signal to the remote modem with a length in multiples of 100 ms according to parameter specified. If a number in excess of 9 is entered, 9 is used. The command works in conjunction with the \K command. In error correction mode, the modem will signal a break through the active error correction protocol, giving no indication of the length.
Command:	\Kn	Break Control
Values:		n = 0–5
Default:		5
Description:		Controls the response of the modem to a break received from the computer, the remote modem, or the \B command. The response is different for each of three different states. The parameter value, if valid, is written to S40 bits 3, 4, and 5. Data Mode. The modem receives a break from the computer: \K0 Enter online command mode, no break sent to the remote modem. \K1 Clear data buffers and send break to the remote modem. \K2 Same as \K0. \K3 Send break immediately to the remote modem. \K4 Same as \K0. \K5 Send break to the remote modem in sequence with the transmitted data. Data Mode. The modem receives a break from the remote modem: \K0 Clear data buffers and send break to the computer. \K1 Same as \K0. \K2 Send break immediately to the computer. \K3 Same as \K2. \K4 Send break to the computer in sequence with the received data. \K5 Same as \K4. Online Command Mode. The modem receives a \Bn command from the computer: \K0 Clear data buffers and send break to the remote modem. \K1 Same as \K0. \K2 Send break immediately to the remote modem. \K3 Same as \K2. \K4 Send break to the remote modem in sequence with the transmitted data. \K5 Same as \K4.

Command:	\Nn	Operating Mode – Error Correction
Values:		<i>n</i> = 0–5
Default:		5
Description:		Controls the preferred error-correcting mode to be negotiated in a subsequent data connection.
	\N0	Selects normal speed buffered mode (disables error-correction mode).
	\N1	Serial interface selected - Selects direct mode and is equivalent to &M0 mode of operation.
	\N2	Selects reliable (error-correction) mode. The modem will first attempt a LAPM connection and then an MNP connection. Failure to make a reliable connection results in the modem hanging up. (Forces S36=4 and S48=7.)
	\N3	Selects auto-reliable mode. This operates the same as \N2 except failure to make a reliable connection results in the modem falling back to the speed buffered normal mode. (Forces S36=7 and S48=7.)
	\N4	Selects LAPM error-correction mode. Failure to make an LAPM error-correction connection results in the modem hanging up. (Forces S48=0.)
	\N5	Selects MNP error-correction mode. Failure to make an MNP error-correction connection results in the modem hanging up. (Forces S36=4 and S48=128.)
Command:	\Vn	Single Line Connect Message Enable (Not available in V.22bis)
Values:		<i>n</i> = 0, 1
Default:		1
Description:	\V0	Connect messages are controlled by the command settings X, W, and S95.
	\V1	Connect messages are displayed in the single line format described below subject to the command settings V (Verbose) and Q (Quiet). In Non-Verbose mode (V0), single line connect messages are disabled and a single numeric result code is generated for CONNECT DTE.
		When single line connect messages are enabled, there are no CARRIER, PROTOCOL (+ER:), or COMPRESSION (+DR:) messages apart from the fields described below.
		The single line connect message format is:
		CONNECT <DTE Speed>/<Modulation>/<Protocol>/<Compression>/<Line Speed>/<Voice and Data> Where:
		DTE Speed = DTE speed, e.g., 57600.
		Modulation = "V90" for V.90 modulation.
		"K56" for K56flex modulation.
		"V34" for V.34 modulation.
		"V32" for V.32 or V.32bis modulation.
		Note: Modulation is omitted for all other modulations.
		Protocol = "NONE" for no protocol.
		"ALT" for Microcom Network Protocol.
		"LAPM" for LAP-M protocol.
		Compression = "ALT" for Microcom MNP5 compression.
		"V42B" for V.42bis compression.
		Note: Compression is omitted if protocol is NONE.
		Line Speed = Asymmetric rates display as /rate:TX/rate:RX; e.g., /1200 TX/75 RX.
		Symmetric rates display as a single DCE rate, e.g., 14400.
		Voice and Data = Blank for Data mode only.
		"SVD" for AudioSpan analog simultaneous audio/voice and data.
		"DSVD" for digital simultaneous voice and data.
		"V70" for G.729A digital simultaneous voice and data.

Command: **-Kn** **MNP Extended Services** (Not available in V.22bis)
 Values: $n = 0, 1, 2$.
 Default: 0
 Description: Enables or disables conversion of a V.42 LAPM connection to an MNP 10 connection. The parameter value, if valid, is written to S40 bits 0 and 1.
 -K0 Disables V.42 LAPM to MNP 10 conversion. (Default.)
 -K 1 Enables V.42 LAPM to MNP 10 conversion.
 -K 2 Enables V.42 LAPM to MNP 10 conversion; inhibits MNP Extended Services initiation during V.42 LAPM answer mode detection phase.

Command: **-STEn** **Set Telephony Extension**
 Values: $n = 0$ or 1
 Default: 1
 Description: The -STE command enables/disables Line-In-Use, Extension Pickup, and Remote Hangup detection features.
Note: This command is supported only if enabled through firmware configuration.
Defined Values: <value> Decimal number corresponding to the selected bit-mapped options. The bit field are defined as follows:
 Bit 0 = Line-In-Use detection enable/disable.
 Bit 1 = Extension Pickup detection enable/disable.
 Bit 2 = Remote Hangup detection enable/disable.

<value> (Dec.)	Remote Hangup	Extension Pickup	Line-in-Use
0 (default)	Disabled	Disabled	Disabled
1	Disabled	Disabled	Enabled
2	Disabled	Enabled	Disabled
3	Disabled	Enabled	Enabled
4	Enabled	Disabled	Disabled
5	Enabled	Disabled	Enabled
6	Enabled	Enabled	Disabled
7	Enabled	Enabled	Enabled

Reporting Current or Selected Values

Command: -STE?
 Response: -STE: <value>
 Example: -STE: 4 Remote Hangup enabled, Extension Pickup disabled, and Line-In-Use disabled

Reporting Supported Range of Parameter Values

Command: -STE=? Show available options
 Response: -STE: 0-7
 Result Codes: OK <value> = 0-7; ERROR otherwise.

Behavior in Data Mode

When on-hook, if the line is in use and an ATDT is issued, the modem will not go off-hook and will return with the message LINE-IN-USE.

When off-hook and either an extension is picked up or a line reversal is detected, the modem will drop the connection. The disconnect reason in register S86=25 (this is also defined for #UD). The user must flash the hook in order to get a dial tone due because the remote server will be retraining.

If the local handset is picked up while the modem is off-hook, the modem will do a link-disconnect, flash the hook for 1.5 seconds, then connect the local handset to the line. At this point, the user dial tone should be on the local handset. The disconnect reason in S86=25.

Operation in Data Mode

Line-In-Use (Enabled by AT-STE=1, AT-STE=3, AT-STE=5, or AT-STE=7)

Case 1: Telephone Line is in Use

If an ATDT, ATDP or ATDL is issued while Line-In-Use detection is enabled and the telephone line is in use, the modem will immediately return the message LINE-IN-USE to the DTE without going off-hook, and then return to command mode.

Case 2: Telephone Line is in Use But Disconnected

If an ATDT, ATDP or ATDL is issued while Line-In-Use detection is enabled and the telephone line is NOT in use, the modem will go off-hook after a short pause, then respond with CONNECT or NO CARRIER message.

Case 3: Telephone Line is Not Connected to Modem

If an ATDT, ATDP or ATDL is issued while Line-In-Use detection is enabled and the telephone line is not connected, the modem will go off-hook momentarily, go back on-hook, then respond with NO DIAL TONE message.

Extension Pick-up (Enabled by AT-STE=2, AT-STE=3, AT-STE=6, or AT-STE=7):**Case 1: Modem off-hook, Local Handset Goes Off-Hook**

If the local handset goes off-hook while the modem is in a data connection, the local handset will be muted. The modem will then send a GSTN Cleardown to the remote modem and then go on-hook. The modem will then send a NO CARRIER message to the DTE. A result code of 25 will be left in S86 register. After 2 seconds, the local handset will be connected to the telephone line so the user hears the dial tone.

Case 2: Modem off-hook, Extension Pick-up

If the modem is connected and another extension goes off-hook, the modem will send a GSTN Cleardown to the remote modem and then immediately hang-up. Due to the noise possibly being added to the line when a telephone extension is picked-up, a GSTN Cleardown may or may not successfully be received by the remote mode. If the GSTN Cleardown is not received successfully by the remote modem, the remote modem may attempt a retrain until the retrain fails and the remote modem drops the line. In any case, the modem will send a NO CARRIER message to the DTE immediately after sending the GSTN Cleardown. Result code 25 will be left in the S86 register.

Because the extension is off-hook, the modem cannot flash the hook for the central office to generate a dial tone. In this case, the user must flash the extension handset to obtain a dial tone.

Remote Hang-up (enabled by AT-STE=4, AT-STE=5, AT-STE=6, or AT-STE=7):**Case 1: Modem off-hook, Remote Hang-up**

If the modem is connected (off-hook) and the remote modem/server goes hangs up, the central office may issue a line polarity reversal. If a line polarity reversal is detected, the modem will drop the call and respond with NO CARRIER. The reason for hang-up can be determined by #UD or by S86=25. A line reversal can also be simulated by simply pulling out the telephone line during a connection.

Command:	%Cn	Enable/Disable Data Compression Control (Not available in V.22 bis)
Values:		n = 0, 1, 2, 3
Default:		3
Description:		Enables or disables data compression negotiation. The modem can only perform data compression on an error-corrected link. The parameter value, if valid, is written to S41 bits 0 and 1. %C0 Disables data compression. Resets S46 bit 1. %C1 Enables MNP 5 data compression negotiation. Resets S46 bit 1. %C2 Enables V.42 bis data compression. Sets S46 bit 1. %C3 Enables both V.42 bis and MNP 5 data compression. Sets S46 bit 1. (Default.)
Command:	%En	Enable/Disable Line Quality Monitor and Auto-Retrain
Values:		n = 0, 1, 2
Default:		2 (default is 1 in V.22bis)
Description:		Controls whether or not the modem will automatically monitor the line quality and request a retrain (%E1) or fall back when line quality is insufficient or fall forward when line quality is sufficient (%E2). The parameter value, if valid, is written to S41 bits 2 and 6. If enabled, the modem attempts to retrain for a maximum of 30 seconds. %E0 Disable line quality monitor and auto-retrain (disable fallback and fall forward). %E1 Enable line quality monitor and auto-retrain (enable fallback, disable fall forward). %E2 Enable line quality monitor and fallback/fall forward (enable fallback and fall forward). (%E2 is not available in V.22bis) Fallback/Fall Forward. When %E2 is active, the modem monitors the line quality (EQM). When line quality is insufficient, the modem will initiate a rate renegotiation to a lower speed within the V.34/V.32 bis/V.32 (RC336) modulation speeds. The modem will keep falling back within the current modulation if necessary until the speed reaches 2400 bps (V.34) or 4800 bps (V.32). Below this rate, the modem will only do retrains if EQM thresholds are exceeded. If the EQM is sufficient for at least one minute, the modem will initiate a rate renegotiation to a higher speed within the current modulation speeds. The rate renegotiations will be done without a retrain if a V.32bis connection is established. Speeds attempted during fallback/fall forward are those shown to be available in the rate sequences exchanged during the initial connection. Fallback/fall forward is available in error correction and normal modes, but not in direct mode or synchronous mode with external clocks.

Command:	%Ln	Line Signal Level Report Returns a value, which indicates the received signal level. The value returned is a direct indication (DAA dependent) of the receive level at the MDP, not at the telephone line connector. For example, 009 = -9 dBm, 043 = -43 dBm, and so on.
Command:	%Qn	Line Signal Quality Report Reports the line signal quality (DAA dependent). Returns the higher order byte of the EQM value. Based on the EQM value, retrain or fallback/fall forward may be initiated if enabled by %E1 or %E2. Example: AT%Q 015
Command: Values: Default: Description	%Un	Select μ-Law or A-Law Codec Type (Not available in V.22bis) 0, 1 Country-specific This command selects μ -Law or A-Law codec type for V.90 and K56flex modulation. This command also stores the selected setting directly to NVRAM. The default value is country specific. %U0 Selects μ -Law. %U1 Selects A-Law.
Command: Values: Default: Description:	+A8E	V.8 and V.8bis Operation Controls (Not available in V.22bis) 1, 6 1 This command is defined for two conditions: as a parameter while the modem is on-hook, and as an action command while the modem is off-hook. If enabled, V.8 negotiation does not preclude simultaneous implementation of other negotiation means (e.g., V.8bis, V.18, V.32bis Annex A). On-Hook If issued while the modem is on-hook, used to precondition V.8 and V.8bis originating and answering operation. It is issued by the DTE before the Dial (D) or Answer (A) command. Off-Hook If issued while the modem is off-hook, to (re)start V.8 or V.8bis negotiation. For example, if initial V.8 negotiation failed, but subsequent T.30 negotiation indicated V.8 capability, this command may be used to initiate V.8 negotiation. <v8o>= Decimal number which enables/disables issuance of +A8x indications during modem-controlled V.8 origination negotiation. 1 Enable DCE-controlled V.8 origination negotiation without +A8x indications. 6 Enable DCE-controlled V.8 origination negotiation with +A8x indications. <v8a>= Decimal number which enables/disables issuance of +A8x indications during modem-controlled V.8 answer negotiation. 1 Enable DCE-controlled V.8 answer negotiation without +A8x indications. 5 Enable DCE-controlled V.8 answer negotiation with +A8x indications. <v8cf>= Set the V.8 CI signal call function to the hexadecimal octet XY. 00 (Default) 21 C1 <v8b>= Decimal number which enables/disables V.8bis negotiation. 0 Disable V.8bis negotiation. 1 Enable V.8bis negotiation. The ATD and ATA commands behave as specified in V.250, and +A8n indications are not generated by the modem. For subparameter values <v8o>=6 and <v8a>=5, the +A8l indications are issued during the course of the V.8 session to notify the DTE when the relevant V.8 signals are received. Reporting Current or Selected Values Command: +A8E? Reporting Supported Range of Parameter Values Command: +A8E=?

Command:	+A8I	CI Signal Indication (Not available in V.22bis) This indication is issued by an answering modem, if +A8E,<v8a> does not equal 0, to indicate detection of a V.8 CI signal, and report the recovered Call Function octet(s). Indication Syntax: +A8I:<v8cf><CR> Example +A8I:0 The modem timed out waiting for CI. +A8I:X YYY
Command:	+DR	Data Compression Report (Not available in V.22bis) 0, 1 1 This extended-format numeric parameter controls whether or not the extended-format DR: intermediate result code is transmitted from the modem to the DTE. S95 bit 5 is reset to 0 for +DR=0 and is set to a 1 for +DR=1. The more recent setting of +DR or S95 bit 5, and the W command setting, determines the actual data compression result code reporting (see S95 Parameter and W Command). +DR0 Data compression reporting disabled (no +DR result code transmitted). +DR1 Data compression reporting enabled (+DR result code transmitted). Reporting Current or Selected Values Command: +DR? Reporting Supported Range of Parameter Values Command: +DR=? +DR: <type> Intermediate Result Code The +DR: <type> reported represents the current (negotiated or renegotiated) modem-modem data compression type. If enabled, the intermediate result code is transmitted at the point after error control negotiation (handshaking) at which the modem has determined which data compression technique will be used (if any) and the direction of operation. The +DR intermediate result code, if enabled, is issued after the Error Control Report (+ER) and before the final result code (e.g., CONNECT).
Command:	+DS	Data Compression (Not available in V.22bis) 0, 3 3 This extended-format compound parameter controls the V.42bis data compression function if provided in the modem. It accepts four numeric subparameters: <direction> Specifies the desired direction(s) of operation of the data compression function from the DTE point of view. +DS0 Negotiated; no compression (V.42bis P0=0). +DS3 Both directions, accept any direction (V.42bis P0=11). <compr_neg> Specifies whether or not the modem should continue to operate if the desired result is not obtained. +DS0 Do not disconnect if V.42bis is not negotiated by the remote modem as specified in <direction>. <max_dict> Specifies the maximum number of dictionary entries (2048 entries) which should be negotiated (may be used by the DTE to limit the code word size transmitted, based on its knowledge of the nature of the data to be transmitted). <max_string> Specifies the maximum string length (32 bytes) to be negotiated (V.42bis P2). Reporting Current or Selected Values Command: +DS? Reporting Supported Range of Parameter Values Command: +DS=?

Command:	+EB	Break Handling in Error Control Operation (Not available in V.22bis)
Values:		n/a
Description:		This extended-format compound parameter controls the break handling in V.42 operation. It accepts three numeric subparameters: <break selection> Decimal number 0 specifying that break is to be ignored; i.e., not signaled to remote DCE. <timed> Decimal number 0 specifying that any transmitted V.42 L-SIGNAL will not indicate break signal length <default_length> Decimal number 0 specifying that break is not delivered to the DTE. Reporting Current or Selected Values Command: +EB? Reporting Supported Range of Parameter Values Command: +EB=?
Command:	+EFCS	32-bit Frame Check Sequence (Not available in V.22bis)
Values:		n/a
Description:		This extended-format numeric parameter controls the use of the 16-bit or 32-bit frame check sequence (FCS) option in V.42. Reporting Current or Selected Values Command: +EFCS? Reporting Supported Range of Parameter Values Command: +EFCS=?
Command:	+ER	Error Control Report (Not available in V.22bis)
Values:		0, 1
Default:		0
Description:		This extended-format numeric parameter controls whether or not the extended-format +ER: intermediate result code is transmitted from the modem to the DTE. S95 bit 3 is reset to 0 for +ER=0 and is set to a 1 for +ER=1. The more recent setting of +ER or S95 bit 3, and the W command setting, determines the actual error control result code reporting (see S95 Parameter and W Command). +ER0 = Error control reporting disabled (no +ER intermediate result code transmitted). +ER1 = Error control reporting enabled (+ER intermediate result code transmitted). Reporting Current or Selected Values Command: +ER? Reporting Supported Range of Parameter Values Command: +ER=? +ER <type> The +ER <type> reported represents the current (negotiated or renegotiated) modem-modem error control type. If enabled, the intermediate result code is transmitted at the point during error control negotiation (handshaking) at which the modem has determined which error control protocol will be used (if any), before the final result code (e.g., CONNECT) is transmitted.

Command:	+ES	Error Control Selection
Description:	This extended-format command specifies the initial requested mode of operation when the modem is operating as the originator, optionally specifies the acceptable fallback mode of operation when the modem is operating as the originator, and optionally specifies the acceptable fallback mode of operation when the modem is operating as the answerer. It accepts three numeric subparameters:	
Defined Values:	<orig_rqst> Decimal number which specifies the initial requested mode of operation when the modem is operating as the originator. The options are: 0 Initiate call with Direct Mode. 1 Initiate call with Normal Mode (also referred to as Buffered Mode) only. 2 Initiate V.42 without Detection Phase. If V.8 is in use, disable V.42 Detection Phase. 3 Initiate V.42 with Detection Phase. (Default.) 4 Initiate MNP. 7 Initiate Frame Tunneling Mode when connection is complete and Data Mode is entered. orig_fbk> Decimal number which specifies the acceptable fallback mode of operation when the modem is operating as the originator. 0 LAPM, MNP, or Normal Mode error control optional. (Default.) 1 LAPM, MNP, or Direct Mode error control optional. 2 LAPM or MNP error control required; disconnect if error control is not established. 3 LAPM error control required; disconnect if error control is not established. 4 MNP error control required; disconnect if error control is not established. <ans_fbk> Decimal number which specifies the acceptable fallback mode of operation when the modem is operating as the answerer. 0 Direct Mode. 1 Error control disabled, use Normal Mode. 2 LAPM, MNP, or Normal Mode error control optional. (Default.) 3 LAPM, MNP, or Direct Mode error control optional. 4 LAPM or MNP error control required; disconnect if error control is not established. 5 LAPM error control required; disconnect if error control is not established. 6 MNP error control required; disconnect if error control is not established. Reporting Current or Selected Values: Command: +ES? Reporting Supported Range of Parameter Values: Command: +ES=?	
Command:	+ESR	Selective Reject
Values:	n/a	
Description:	This extended-format numeric parameter controls the use of the selective reject (SREJ) option in V.42.	
	Reporting Current or Selected Values: Command: +ESR? Reporting Supported Range of Parameter Values: Command: +ESR=?	

Command:	+ETBM	Call Termination Buffer Management
Values:	n/a	
Description:	This extended-format compound parameter controls the handling of data remaining in modem buffers upon call termination. It accepts three numeric subparameters: Syntax: +ETBM=[<pending_TD>[,<pending_RD>[,<timer>]]] Defined Values: <pending_TD> Decimal number 0 specifying that disconnect will occur immediately and all buffered transmit data will be discarded when the local DTE requests call disconnection. <pending_RD> Decimal number 0 specifying that disconnect will occur immediately and all buffered receive data will be discarded when the local DTE requests call disconnection. <timer> Decimal number 0 specifying that the modem will not attempt to deliver the buffered data before abandoning the attempt and discarding remaining data. Reporting Current or Selected Values Command: +ETBM? Reporting Supported Range of Parameter Values Command: +ETBM=?	
Command:	+GCAP	Complete Capabilities List Request (Not available in V.22bis)
Values:	n/a	
Description:	This extended-format command causes the modem to transmit one or more lines of information text listing additional capabilities command +<name>s , which is intended to permit the user to identify the overall capabilities of the modem. In particular, if the modem implements a particular modem control standard that uses Extended Syntax Commands, and if that modem control standard includes command(s) that indicate general capabilities, the +<names>(s) of those commands will be reported to the modem in response to a +GCAP command. Sample Responses +GCAP: +MS, +ES, +DS, for a data modem that supports all capabilities listed. Where: +MS +M commands (Modulation Control: +MS and +MR commands) +ES +E commands (Error Control: +ES, +EB, +ER, +EFCS, +ETBM) +DS +D commands (Data Compression: +DS and +DR)	
Command:	+GMI	Manufacturer Identification Request (Not available in V.22bis)
Description:	Displays the modem product manufacturer.	
Command:	+GMM	Model Identification Request (Not available in V.22bis)
Description:	Displays the modem product model.	
Command:	+GMR	Revision Identification Request (Not available in V.22bis)
Description:	Displays the modem version, revision level, or date. This is the same as the I3 command.	

Command:	+IFC	DTE-Modem Local Flow Control
Values:	0, 1	Values defined by <modem_by_DTE> Specifies the method to be used by the DTE to control the flow of received data from the modem. +IFC0 None +IFC1 XON/XOFF on transmitted data (XON/XOFF on transmit data); do not pass XON/XOFF characters to the remote modem. +IFC2 Circuit 133 (Ready for Receiving). +IFC3 DC1/DC3 on circuit 103 (Transmitted Data) with DC1/DC3 characters being passed through to the remote DCE in addition local flow control applied. Values defined by <DTE_by_modem> Specifies the method to be used by the modem to control the flow of transmitted data from the DTE. +IFC0 None. +IFC1 XON/XOFF on received data. +IFC2 CTS/RTS. Reporting Current or Selected Values Command: +IFC? Reporting Supported Range of Parameter Values Command: +IFC=?
Command:	+ILRR	DTE-Modem Local Rate Control (Not available in V.22bis)
Values:	0, 1	
Default:	0	
Description:		This extended-format numeric parameter controls whether or not the extended-format +ILRR:<rate> information text is transmitted from the modem to the DTE. +ILRR0 Disables reporting of local port rate (+ILRR: is not transmitted). +ILRR1 Enables reporting of local port rate (+ILRR: is transmitted). Reporting Current or Selected Values Command: +ILRR? Reporting Supported Range of Parameter Values Command: +ILRR=? Reported Rate The <rate> reported represents the current (negotiated or renegotiated) DTE-modem rate. If enabled, the intermediate result code is transmitted after any modulation, error control or data compression reports are transmitted, and before any final result code (e.g., CONNECT) is transmitted. The <rate> is applied after the final result code is transmitted. The DTE-modem port rate will change only if neither buffered mode nor error controlled means are enabled (+ES=x,0) and if the negotiated carrier rate (+MRR) does not match the current DTE-modem port rate (auto-detected from the previous command line). Defined Values: <rate> Decimal value representing the current (negotiated or renegotiated) DTE-modem rate: 0, 300, 1200, 2400, 4800, 9600, 19200, 38400, 57600, 115200, or 230400 <rx_rate> Optional decimal value reporting the RXD rate, if it is different from the TXD rate: 0, 300, 1200, 2400, 4800, 9600, 19200, 38400, 57600, 115200, or 230400
Command:	+IPR	Fixed DTE Rate (Not available in V.22bis)
Values:	n/a	
Description:		This numeric extended-format parameter specifies the data rate at which the modem will accept commands during online operation. It may be used to select operation at rates at which the modem is not capable of automatically detecting the data rate being used by the DTE. Specifying a value of 0 disables the function and allows operation only at rates automatically detectable by the modem. The specified rate takes effect following the issuance of any result code(s) associated with the current command line. The <rate> specified does not apply in Online Data State if Normal Mode (Direct Mode) of operation is selected. Defined Values: <rate> Specifies the DTE-modem interface operation rate in bits/s. The available rates are: 0, 300, 1200, 2400, 4800, 9600, 19200, 38400, 57600, 115200, or 230400 If unspecified or set to 0, automatic detection is selected and the character format is also forced to auto-detect, +ICF=0. If the rate specified is not supported by the modem, an ERROR result code will be returned. Reporting Current or Selected Values Command: +IPR? Reporting Supported Range of Parameter Values Command: +IPR=?

Command:	+MR	Modulation Reporting Control (Not available in V.22bis)																						
Values:	0, 1, 2																							
Default:	0																							
Description:	This extended-format numeric parameter controls whether or not the extended-format +MCR:<carrier> and +MRR:<rate> intermediate result codes are transmitted from the modem to the DTE. If enabled, +MCR:<carrier> and +MRR:<rate> intermediate result codes represent the current (negotiated or renegotiated) modulation <carrier> and <rate> that are transmitted at the point during connect negotiation (handshaking) at which the modem has determined which modulation and rate will be used, i.e., before any Error Control or Data Compression reports are transmitted, and before any final result code (e.g., CONNECT) is transmitted. S95 bit 2 is reset to 0 for +MR=0 and is set to a 1 for +MR=1 or +MR=2. The more recent setting of +MR or S95 bit 2, and the W command setting, determines modulation result code reporting (see S95 Parameter and W Command). +MR0 Disables reporting of modulation connection (+MCR: and +MRR: are not transmitted). +MR1 Enables reporting of modulation connection (+MCR: and +MRR: are transmitted with tx rate, rx rate). +MR2 Enables reporting of modulation connection (+MCR: and +MRR: are transmitted with rx rate only). Reporting Current or Selected Values Command: +MR? Reporting Supported Range of Parameter Values Command: +MR=? Report Syntax +MCR Response: +MCR: <carrier> <carrier> Alphanumeric code corresponding to the reported carrier. Defined values are: <table><tr><td>B103</td><td>For Bell 103</td></tr><tr><td>B212</td><td>For Bell 212</td></tr><tr><td>V21</td><td>For V.21</td></tr><tr><td>V22</td><td>For V.22</td></tr><tr><td>V22B</td><td>For V.22bis</td></tr><tr><td>V23C</td><td>For V.23</td></tr><tr><td>V32</td><td>For V.32</td></tr><tr><td>V32B</td><td>For V.32bis</td></tr><tr><td>V34</td><td>For V.34</td></tr><tr><td>V90</td><td>For V.90</td></tr><tr><td>K56</td><td>For K56flex</td></tr></table> Report Syntax +MRR Response: +MRR: <tx_rate>,<rx_rate> <tx_rate> Decimal transmit rate in bits/s. <rx_rate> Decimal receive rate in bits/s. Example: +MRR: 28800, 48000		B103	For Bell 103	B212	For Bell 212	V21	For V.21	V22	For V.22	V22B	For V.22bis	V23C	For V.23	V32	For V.32	V32B	For V.32bis	V34	For V.34	V90	For V.90	K56	For K56flex
B103	For Bell 103																							
B212	For Bell 212																							
V21	For V.21																							
V22	For V.22																							
V22B	For V.22bis																							
V23C	For V.23																							
V32	For V.32																							
V32B	For V.32bis																							
V34	For V.34																							
V90	For V.90																							
K56	For K56flex																							

Command: **+MS**

Description:

Modulation Selection

This extended-format compound parameter controls the manner of operation of the modulation capabilities in the modem. It accepts six subparameters.

Table 8-1. +MS Command Supported Rates

Modulation	<carrier>	Possible (<min_rx_rate>, <min_tx_rate>, (<min_tx_rate>), and <max_tx_rate>) Rates (bps)
Bell 103	B103	300
Bell 212	B212	1200 Rx/75 Tx or 75 Rx/1200 Tx
V.21	V21	300
V.22	V22	1200
V.22 bis	V22B	2400 or 1200
V.23	V23C	1200
V.32	V32	9600 or 4800
V.32 bis	V32B	14400, 12000, 9600, 7200, or 4800
V.34	V34	33600, 31200, 28800, 26400, 24000, 21600, 19200, 16800, 14400, 12000, 9600, 7200, 4800, or 2400
56K	K56	56000, 54000, 52000, 50000, 48000, 46000, 44000, 42000, 40000, 38000, 36000, 34000, 32000
V.90	V90	56000, 54667, 53333, 52000, 50667, 49333, 48000, 46667, 45333, 44000, 42667, 41333, 40000, 38667, 37333, 36000, 34667, 33333, 32000, 30667, 29333, 28000
V.92 downstream	V92	56000, 54667, 53333, 52000, 50667, 49333, 48000, 46667, 45333, 44000, 42667, 41333, 40000, 38667, 37333, 36000, 34667, 33333, 32000, 30667, 29333, 28000
V.92 upstream	V92	48000, 46667, 45333, 44000, 42667, 41333, 40000, 38667, 37333, 36000, 34667, 33333, 32000, 30667, 29333, 28000, 26667, 25333, 24000

Note: Some <carrier> values may not be supported by certain model models. For example, modem models supporting V92 may not support K56.

Defined Values:

<carrier> A string that specifies the preferred modem carrier to use in originating or answering a connection. <carrier> values are strings of up to eight characters, consisting only of numeric digits and upper case letters. <carrier> values for ITU standard modulations take the form: <letter><1-4 digits><other letters as needed>. Defined values are listed in Table 8-1.

<automode> A numeric value which enables or disables automatic modulation negotiation (ITU-T V.32bis Annex A or V.8).
0 = Automode disabled.
1 = Automode enabled. (Default.)

<min_rx_rate> and <max_rx_rate> Numeric values which specify the lowest (<min_rx_rate>) and highest (<max_rx_rate>) rate at which the modem may establish a receive connection. May be used to condition distinct limits for the receive direction as distinct from the transmit direction. Values for this subparameter are decimal encoded, in units of bit/s. The possible values for each modulation are listed in Table 8-1. Actual values will be limited to possible values corresponding to the entered <carrier> and fall-back <carrier> as determined during operation. (Default = lowest (<min_rx_rate>) and highest (<max_rx_rate>) rate supported by the selected carrier.)

<min_tx_rate> and <max_tx_rate> Numeric values which specify the lowest (<min_tx_rate>) and highest (<max_tx_rate>) rate at which the modem may establish a transmit connection. Non-zero values for this subparameter are decimal encoded, in units of bit/s. The possible values for each modulation are listed in Table 8-3. Actual values will be limited to possible values corresponding to the entered <carrier> and fall-back <carrier> as determined during operation. (Default = lowest (<min_tx_rate>) and highest (<max_tx_rate>) rate supported by the selected carrier.)

Reporting Current or Selected Values

Command: +MS?

Reporting Supported Range of Parameter Values

Command: +MS=?

Result Code:

OK - Valid subparameter string
Otherwise ERROR

Command:	+VCID	Caller ID (CID)
Description:		Controls the reporting and presentation of data associated with the Caller ID services in the Incoming Call Line ID (ICLID) data format for the next call. (U.S. only)
Default:		0
Defined Values:		+VCID0 Disable Caller ID reporting. +VCID1 Enables Caller ID with formatted presentation to the DTE. The modem presents the data items in a <Tag><Value> pair format. The expected pairs are date, time, name, and caller code (telephone number). +VCID2 Enables Caller ID with unformatted presentation to the DTE.
Report Commands:		+VCID? Reports the Mode +VCID=? Reports Range of Parameters
Command:	+VRID	Report Retrieved Caller ID (CID)
Description:		Reports the data associated with the Caller ID services in the Incoming Caller Line (ICLID) data format for the last received call. U.S. only
Default:		None
Defined Values:		+VRID0 Reports Caller ID with formatted presentation to the DTE. The modem presents the data items in a <Tag><Value> pair format. The expected pairs are date, time, name, and caller code (telephone number). +VRID1 Reports Caller ID with unformatted presentation to the DTE.
Report Commands:		+VRID? Reports the Mode

Command:	#UD	Last Call Status Report (Not available in V.22bis)
Description:	#UD is an action command requesting logged operation events reporting. It does not take parameters and must be the last command in the command line. The modem logs aspects of their operation for each call, and saves these results until cleared by one of the following events: - Power off. - Hard reset (e.g., negate DTR with &D3 set; reset button). - Soft reset = ATZ or AT&F. - ATD command issued. - ATA command issued. - Automatic answer (e.g., set register S0>0 and ring detected). These results are NOT cleared by changing DTR, V.24 circuit 108.2, if &D0, &D1 or &D2. Data Call State Model: For purposes of this command, there are four data call states, and associated status issues: 1. Call Setup -Calling DCE: get dial tone, generate dial digits, and detect call progress signals. -Answering DCE: detect ringing, detect Caller ID, etc. 2. Negotiation -V.25 calling tone/answer tone exchanges -V.8 or V.8bis call function negotiations -V-series modem carrier detection and training -Modem-to-modem protocols (e.g., V.42, V.42bis). 3. Data Transfer -Bit-error rates, for each direction -Rate renegotiation -Retraining 4. Call Termination -protocol disconnect signals -carrier disconnect signals -loss of carrier -excessive error rates	

Command Syntax:

In response to this command, the modem will report one or more lines of information text as defined below. Information text format conforms to V.250; each line is preceded by a <CR><LF> pair, and terminated by <CR><LF>. (CR and LF characters may be changed by writing new values to the contents of registers S3 and S4, respectively.)

The modem may generate a single line or multiple lines, followed by **OK** result code. For example, if call setup failed, only that result is useful. Each information text line is formatted as follows, including one or more key=value pairs:

Response: DIAG <token key=value [[key=value] [key=value]] ...>

Defined Values: DIAG 5 hexadecimal characters (44h, 49h, 41h, 47h, 20h)

<	Left angle bracket (less than sign) (3Ch) token Unique 32-bit hexadecimal string 2A4D3263(32h, 4h1, 34h, 44h, 33h, 32h, 36h, 33h)
space	space character (20h)
Key	One- or two-digit hexadecimal number (see Key in Table 8-2)
=	Equal sign (3Dh)
Value	Any string as defined below (Table 8-2 - Table 8-7 as appropriate)
>	Right angle bracket (greater than sign) (3Eh)

Unless otherwise noted, all values are hexadecimal numbers. Any numeric values from tables in ITU V.58 are converted to hexadecimal. Multi-digit values are reported MSD first. Leading 0's may be deleted. See examples in Table 4-13.

Monitoring an Active Connection

This command is intended for use after call termination. However, codes are defined so that a modem can respond before the first call is placed, and during a call for live monitoring purposes. For example, key 60, call termination, has value 1 defined, indicating that the call is still in progress.

There are at least two ways to do this. First, the DTE could switch the modem to online command state, issue the command, capture the responses, and then issue an ATO command. For smoother online monitoring, in-band means defined in ITU V.80 are recommended if available in the modem. If V.80 methods are used, each response line shall be a separate extended in-band message.

Notes for AT#UD Tables

1. The modem may insert a delay (e.g., 10 ms) between information text lines.
2. The code tables include values for data and fax calls. Some of the codes are applicable only to data calls (e.g., data compression), some to call origination (e.g., busy, answering signal detection), and some to the answering modem (e.g., calling signal detection).
3. **callCleared codes from 3.6.4/V.58-1994** – callCleared: indicates that the DCE has gone on-hook and that the previously existing network connection has been cleared. These values are hex values, converted from decimal in V.58. callCleared codes are described in Table 8-10.

Table 8-2. AT#UD Last Call Status Report Format

Key	Value(s)	Definition
0	2 digits	Diagnostic Command Specification revision number, digit.digit
1	Table 8-3	Call Setup Result code
2	Table 8-4	Multi-media mode
3	Table 8-5	DTE-DCE interface mode
4	String	V.8 CM octet string, same format as V.250, in quotes
5	String	V.8 JM octet string, same format as V.250, in quotes
10	0-2F	Received signal power level, in -dBm (0-43)
11	0-1F	Transmit signal power level, in -dBm (e.g., 0-17)
12	0-64	Estimated noise level, in -dBm (e.g., 10-90)
17	0-FFF	Round Trip delay, in units of ms
18	Table 8-6	V.34 INFO bit map
20	Table 8-7	Transmit Carrier Negotiation Result
21	Table 8-7	Receive Carrier Negotiation Result
22	0-1F40	Transmit Carrier symbol rate (0-8000) in symbol/s
23	0-1F40	Receive Carrier symbol rate (0-8000) in symbol/s
24	0-FA0	Transmit Carrier frequency (0-4000) in Hz
25	0-FA0	Receive Carrier frequency (0-4000) in Hz
26	0-FA00	Initial transmit carrier data rate (0-64000) in bit/s
27	0-FA00	Initial receive carrier data rate (0-64000) in bit/s
30	0-FF	Temporary carrier loss event count
31	0-FF	Carrier Rate re-negotiation event count
32	0-FF	Carrier Retrains requested
33	0-FF	Carrier Retrain requests granted
34	0-FA00	Final transmit carrier data rate in bit/s
35	0-FA00	Final receive carrier data rate in bit/s
40	Table 8-8	Protocol Negotiation Result
41	0-400	Error Control frame size in bytes
42	0-FF	Error control link timeouts in transmission
43	0-FF Error	control link NAKs received
44	Table 8-9	Compression Negotiation Result
50	0-2	Transmit flow control: 0=off; 1=DC1/DC3; 2=V.24 circuit 106/133
51	0-2	Receive flow control: 0=off; 1=DC1/DC3; 2=V.24 circuit 106/133
52	0-FFFFFFFF	Transmit characters sent from DTE
53	0-FFFFFFFF	Received characters sent to DTE
54	0-FFFF	Transmit characters lost (data overrun errors from DTE)
55	0-FFFF	Received characters lost (data overrun errors to DTE)
56	0-FFFFFFFF	Transmit I-Frame count, if error control protocol running
57	0-FFFFFFFF	Received I-Frame count, if error control protocol running
58	0-FFFF	Transmit I-Frame error count, if error control protocol running
59	0-FFFF	Received I-Frame error count, if error control protocol running
60	Table 8-10	Termination Cause
61	0-FF Call	Waiting event count

Table 8-3. Call Setup Result Codes

Code	Definition
0	No previous call (modem log has been cleared since any previous calls)
1	No dial tone detected
2	Reorder signal detected, network busy
3	Busy signal detected
4	No recognized signal detected (e.g., no signal, or nothing recognizable)
5	Voice detected * if this is a voice modem (V.253) in voice mode
7	Data Answering signal detected (e.g., V.25 ANS, V.8 ANSam)
8	Data Calling signal detected (e.g., V.25 CT, V.8 CI)
9	Fax Answering signal detected (e.g., T.30 CED, DIS)
A	Fax Calling signal detected (e.g., T.30 CNG)
B	V.8bis signal detected

Table 8-4. Multimedia Modes

Code	Definition
0	Data Only
1	Fax Only
2	Voice
9	Video-telephony, H.324
A	Other V.80 call

Table 8-5. DTE-DCE modes

Code	Definition
0	Async data
1	V.80 transparent synchronous mode
2	V.80 framed synchronous mode

Table 8-6. V.34 INFO bit report

Bits Source bits	Definition
31-30	INFO0 bit 20; 0
20-29	INFOc bits 79-88
16-19	INFOc bits 26-29 or 35-38 or 44- 47 or 53-56- or 62-65 or 71-74
Pre-emphasis field, selected by the symbol rate chosen	
12-15	INFOa bits 26-29
10-11	MP bit 50; 0
0-9	INFOa bits 40-49

Table 8-7. gsmModulationSchemeActive from 3.7.2/V.58

Value	Description
0	V.17 (G3 Fax call)
1	V.21
2	V.22
3	V.22bis
4	V.23 Constant Carrier (1200/75)
8	V.27ter (G3 Fax call)
9	V.29 HD (G3 Fax call)
A	V.32
B	V.32bis
C	V.34
E	V.90 and V.92
81	56K
84	Bell 212A
85	Bell 103

Table 8-8. errorControl Active from 3.5.2/V.58

Value	Description
0	Disable/none
1	V.42 LAPM
2	V.42 Alternative protocol (MNP™)
80	MNP10™

Table 8-9. compressionActive from 3.2.2/V.58

Value	Description
0	None
1	V.42bis and V.44
80	MNP5™

Table 8-10. callCleared codes from 3.6.4/V.58-1994

Value	Description	Notes
0	CauseUnidentified	Call setup issues
1	No Previous call	Not in V.58
2	Call is still in progress	Not in V.58
3	Call Waiting signal detected	Not in V.58, only if modem can detect it
4	Delayed	Same as value 2A, CallAttemptsLimitExceeded
19	InactivityTimerExpired	
1F	cct108isOffInhibitsDial	DTR low
20	cct108turnedOff	DTR drop
29	BlacklistedNumber	
2A	CallAttemptsLimitExceeded	Same as “Delayed”, see ETS 300 001
2B	ExtensionPhoneOff-hook	If extension detection supported
2C	CallSetupFailTimerExpired	e.g., S7 timeout
2D	IncomingCallDetected	If incoming call while sending dial command.
2E	LoopCurrentInterrupted	
2F	NoDial tone	
31	ReorderTone	Fast busy
33	EngagedTone	Busy
34	LongSpaceDisconnect	And if modem program to abort on long space
3C	CarrierLost	Signal Converter
3D	TrainingFailed	
3E	NoModulationinCommon	
3F	RetrainFailed	
40	RetrainAttemptCountExceeded	
41	GstnClearedReceived	
42	FaxDetected	If this was not a fax call attempt
46	InTestMode	Test
50	AnyKeyAbort	Call Control
51	DteHangupCommand	If ATH was used to terminate the previous call.
52	DteResetCommand	If ATZ was used to terminate the previous call.
5A	FrameReject	Error Control
5B	NoErrorControlEstablished	Error control was required
5C	ProtocolViolation	
5D	n400exceeded LAPM retransmission Count Timer	
5E	NegotiationFailed	
5F	DisconnectFrameReceived	
60	SabmeFrameReceived	
64	LossOfSynchronization	Data Compression

Example Modem Response and Usage

Example #UD command response are shown in Table 8-11.

Table 8-11. Completed Data Call, with some errors and rate retrain during the call

Modem Response Line	Description
DIAG <2A4D3263 0=09>	This is version 0.9
DIAG <2A4D3263 1=06 2=0 3=0>	Data Answer signal detected; Data only; Character async
DIAG <2A4D3263 5="C14513902A" 6="A145">	V.8 Call Menu indicates: V.8 Joint Menu selects:
DIAG <2A4D3263 10=1F 11=0C 12=52>	Receive level = -31 dBm; transmit level = -12 dBm; noise level = -82 dBm
DIAG <2A4D3263 14=03 15=05 16=10>	Far end echo delay in milliseconds; Far end echo loss in dB; Near end echo loss = 16 dB
DIAG <2A4D3263 20=C 22=780 24=0C80 26=79E0>	Transmitter: V.34 training completed; V.34 carrier frequency = 1920; V.34 symbol rate = 3200; initial transmit rate is 31200 bit/s
DIAG <2A4D3263 21=D 25=1F40 27=DAC0>	Receiver: V.90 training completed; V.90 symbol rate = 8000; initial receive rate is 56000 bit/s
DIAG <2A4D3263 30=00 31=03 32=01 33=01>	No carrier loss events, 3 carrier rate renegotiations attempted; 1 carrier retrain requested; 1 carrier retrain granted
DIAG <2A4D3263 34=7080 35=CB20>	Final transmit rate is 28800 bit/s; final receive rate is 52000 bit/s
DIAG <2A4D3263 40=1 41=100>	LAPM negotiation completed; frame size = 256
DIAG <2A4D3263 42=0 43=0>	No error control timeout or link NAKs
DIAG <2A4D3263 44=1 45=400>	V.42bis data compression used; dictionary size = 1024
DIAG <2A4D3263 50=2 51=2>	Hardware transmit and receive flow control
DIAG <2A4D3263 52=343CC 54=0>	213964 DTE characters transmitted, w/o underrun
DIAG <2A4D3263 53=7230E6 55=47>	7483622 DTE characters received, 71 characters lost due to receive data overrun
DIAG <2A4D3263 56=29D 58=0001>	597 (decimal) frames transmitted, with 1 frame error
DIAG <2A4D3263 58=2A4B 59=0004>	10827 (decimal) frames received, with 4 frame errors
DIAG <2A4D3263 60=51>	Local PC initiated hangup

Command: **+++<CR> Escape Sequence**

Values: n/a

Description: When the modem has established a connection and has entered online data mode, it is possible to break into the data transmission in order to issue further commands to the modem in an online command mode. This is achieved by the DTE sending to the modem a sequence of three ASCII characters specified by register S2. The default character is +. The maximum time allowed between receipt of the last character of the three escape character sequence from the DTE and sending of the OK result code to the DTE is controlled by the S12 register.

FastConnect Commands

Command:	\$F	FastConnect Control
Description:		Allows configuring of the client modem to connect to a central site modem that supports non-standard V.22 and V.22 bis FastConnect protocols. Specifies the initial requested mode of operation when the modem is operating as the originator. The options are:
Defined Values:		\$F0 Normal connection (Default) \$F1 FastConnect without answer tone \$F2 Reserved \$F3 FastConnect with answer tone

V.92 Commands (+P and –Q Commands)

This section describes the +P (PCM DCE) and –Q commands and parameters used to control the V.92 Mode operation.

Command:	+PCW	Call Waiting Enable
Description:		Controls the operation of the modem in the presence of call waiting.
Defined Values:		+PCW0 Request modem-on-hold if enabled by +PMH and collect caller ID information if enabled by +VRID. Toggle V.24 circuit 125. (Default.) +PCW1 Hang-up. +PCW2 Ignore call waiting.
Result Codes:		OK ERROR
Report Commands:		+PCW? Reports Selected Value(s). +PCW=? Reports Supported Range of Parameter Values
Command:	+PMH	Modem-on-Hold Enable
Description:		Controls the selection of modem-on-hold in the modem. The action of the modem in response to modem-on-hold events is determined by the state of this command as well as the state of a negotiated handshake with a V.92-compliant server in V.92 Mode.
Defined Values:		+PMH0 Modem-on-hold enabled in V.92 Mode. (Default.) +PMH1 Disabled modem-on-hold.
Result Codes:		OK 0 or 1 in V.92 Mode (see the +MS command) ERROR
Report Commands:		+PMH? Reports Current or Selected Value. +PMH=? Reports Supported Range of Parameter Values.
Command:	+PMHR	Initiate Modem-on-Hold
Description:		Requests the modem to initiate or to confirm a modem-on-hold procedure. The modem will return ERROR if modem-on-hold is not enabled or if the modem is in an idle condition. The modem will return the string response +PMHR: <value> where <value> is a decimal value corresponding to the status of the modem's hold exchange procedure as defined below. This response may be delayed depending upon the context under which the +PMHR command is made, i.e., if the +PMHR is in response to an incoming modem-on-hold or if it is initiating a request. Note: If modem-on-hold is enabled but the remote server does not support V.92 then the modem will always report 0 to show that the hold request is denied.
Response:		+PMHR:<value> The value corresponds to the maximum hold time the server or hold-granting modem will allow. +PMHR0 V.92 MOH request denied or not available. +PMHR1 MOH with 10-second timeout Granted. +PMHR2 MOH with 20-second timeout Granted. +PMHR3 MOH with 30-second timeout Granted. +PMHR4 MOH with 40-second timeout Granted. +PMHR5 MOH with 1-minute timeout Granted. +PMHR6 MOH with 2-minute timeout Granted. +PMHR7 MOH with 3-minute timeout Granted. +PMHR8 MOH with 4-minute timeout Granted. +PMHR9 MOH with 6-minute timeout Granted. +PMHR10 MOH with 8-minute timeout Granted. +PMHR11 MOH with 12-minute timeout Granted. +PMHR12 MOH with 16-minute timeout Granted. +PMHR13 MOH with indefinite timeout Granted.
Result Codes:		OK 0-13 in V.92 Mode (+MS=V92) ERROR

Command:	+PMHT	Modem-on-Hold Timer
Description:		Controls whether or not the modem will grant or deny a modem-on-hold (MOH) request as well as setting the MOH Timeout value.
Defined Values:		+PMHT0 Deny V.92 modem-on-hold Request (Default.) +PMHT1 Grant MOH with 10-second timeout +PMHT2 Grant MOH with 20-second timeout +PMHT3 Grant MOH with 30-second timeout +PMHT4 Grant MOH with 40-second timeout +PMHT5 Grant MOH with 1 minute timeout +PMHT6 Grant MOH with 2 minute timeout +PMHT7 Grant MOH with 3 minute timeout +PMHT8 Grant MOH with 4 minute timeout +PMHT9 Grant MOH with 6 minute timeout +PMHT10 Grant MOH with 8 minute timeout +PMHT11 Grant MOH with 12 minute timeout +PMHT12 Grant MOH with 16 minute timeout +PMHT13 Grant MOH with indefinite timeout
Result Codes:		OK 0-13 in V.92 Mode (+MS=V92) ERROR
Report Commands:		+PMHT? Reports Current or Selected Values. +PMHT=? Reports Supported Range of Parameter Values.
Command:	+PIG	PCM Upstream Ignore
Description:		Controls the selection of PCM upstream in the modem. The actual state of PCM upstream is determined by the state of this command as well as the state of a negotiated handshake with a V.92-compliant server in V.92 Mode.
Defined Values:		+PIG0 Enable PCM upstream negotiation. +PIG1 Disable PCM upstream negotiation. (Default.)
Result Codes:		OK 0 or 1 in V.92 Mode (+MS=V.92) ERROR
Report Commands:		+PIG? Reports Selected Value(s). +PIG=? Reports Supported Range of Parameter Values.
Command:	+PMHF	V.92 Modem-on-Hold Hook Flash
Description:		Causes the modem to initiate the flash hook sequence when in the modem-on-hold procedure. This enables switching to the second call (incoming or outgoing). This command applies only to V.92 modem-on-hold. There are no parameters associated with this command.
Result Code:		OK When the modem completes the flash hook sequence. ERROR If this command is initiated and the modem is not on hold.
Command:	+PQC	V.92 Phase 1 and Phase 2 Control
Description:		Controls the global enabling or disabling of the V.92 shortened Phase 1 and Phase 2 startup procedures. This command is used in conjunction with the +PSS command.
Defined Values:		+PQC0 Enable Short Phase 1 and Short Phase 2. (Default.) +PQC1 Enable Short Phase 1 only. +PQC2 Not supported. +PQC3 Disable Short Phase 1 and Short Phase 2.
Result Codes:		OK 0, 1, or 3 in V.92 Mode (+MS=V.92) ERROR
Report Commands:		+PQC? Reports Selected Values. +PQC=? Reports Supported Range of Parameter Values.

Command:	+PSS	Use Short Sequence
Description:		Causes a calling modem to force either a V.92 short or full startup sequence as defined by the +PQC command on the next and subsequent connections.
Defined Values:		+PSS0 The modems decide whether or not to use the short startup procedures. The short startup procedures can only be used if enabled by the +PQC command. (Default.) +PSS1 Reserved. +PSS2 Forces the use of the full startup procedures on the next and subsequent connections independent of the setting of the +PQC command.
Result Codes:		OK 0 - 2 in V.92 Mode (+MS=V.92) ERROR
Report Commands:		+PSS? Reports Selected Values. +PSS=? Reporting Supported Range of Parameter Values
Command:	-QCPC	Force Full Startup Procedure on Next Connection
Description:		Causes the modem to use full startup procedures on the next connection attempt regardless of the setting of the +PQC command. After this attempt, the modem will select the startup procedure as defined by the +PQC command. If a shortened startup procedure is enabled by the +PQC command, then the quick connect profile will also be updated on the next connection attempt.
Result Code:		OK In V.92 Mode (+MS=V.92) ERROR
Command:	-QCPS	Enable Quick Connect Profile Save
Description:		This command controls whether or not the modem will save the generated quick connect profile.
Defined Values:		-QCPS0 Do not allow the quick connect profile to be saved. -QCPS1 Allow the quick connect profile to be saved. (Default.)
Result Codes:		OK in V.92 Mode (+MS=V.92) and quick connect is enabled (+PSS = 0) ERROR
Report Commands:		-QCPS? Reports Selected Value(s). -QCPS=? Reports Supported Range of Parameter Values.

S-Registers

This section covers S-Register descriptions and their default values (which may be loaded at any time by using the Z command). Registers or register fields quoted as “reserved” are reserved for current or future use by the firmware, or are permanently overridden by PTT limitations.

All bit-mapped registers are read-only. The appropriate AT command, which controls the relevant bits in the S-Register, should be used to change the value..

S - Read/Write S-Register

The modem selects an S-Register, performs an S-Register read or write function, or reports the value of an S-Register.

n Establishes S-Register ***n*** as the last register accessed.

n=v Sets S-Register ***n*** to the value ***v***.

n? Reports the value of S-Register ***n***.

The parameter ***n*** can be omitted, in which case the last S-Register accessed will be assumed. The S can be omitted for AT= and AT?, in which case the last S-Register accessed will be assumed. For example:

ATS7 establishes S7 as the last accessed register.

AT=40 sets the contents of the last register accessed to 40.

ATS=20 sets the contents of the last register accessed to 20.

If the number ***n*** is outside the range of the S-Register available, the modem will return the ERROR message. If the value ***v*** is outside the range permitted for a given S-Register, the modem will return the ERROR message. Input and output are always in decimal format. Note that some S-Registers are read-only.

In some cases, writing to the S-Register will appear to be accepted but the value will not actually be written.

Due to country restrictions, some commands will be accepted, but the value may be limited and replaced by a maximum or minimum value.

Minimum, maximum, and default values for S-Parameters may be altered by inserting a country profile using patch code.

Certain modem values are stored in memory locations called S-Registers. Use the **S** command to read or to alter the contents of S-Registers (see previous section).

Table of S-Registers

<u>Register</u>	<u>Unit</u>	<u>Range</u>	<u>Default</u>	<u>Description</u>
S0	1 ring	0–255	0	Number of Rings to Auto-Answer: Sets the number of rings until the modem answers. ATS0=0 disables autoanswer completely. *
S1	1 ring	0–255	0	Ring Counter. Counts the rings that have occurred. S1 is cleared if no rings occur over eight-second intervals.
S2	decimal	0–255	43 (+)	Escape Character. Holds the decimal value of the ASCII character used as the escape character. The default value corresponds to an ASCII '+'. A value over 127 disables the escape process, e.g., no escape character will be recognized.*
S3	decimal	0–127	13 (^M)	Carriage Return Character. Sets the command line and result code terminator character. Pertains to asynchronous operation only.
S4	decimal	0–127	10 (^J)	Line Feed Character. Sets the character recognized as a line feed. Pertains to asynchronous operation only. The Line Feed control character is output after the Carriage Return control character if verbose result codes are used.
S5	decimal	0–255	8 (^H)	Backspace Character. Sets the character recognized as a backspace. Pertains to asynchronous operation only. The modem will not recognize the Backspace character if it is set to a value that is greater than 32 ASCII. This character can be used to edit a command line. When the echo command is enabled, the modem echoes back to the local DTE the Backspace character, an ASCII space character and a second Backspace character; this means a total of three characters are transmitted each time the modem processes the Backspace character.

<u>Register</u>	<u>Unit</u>	<u>Range</u>	<u>Default</u>	<u>Description</u>
S6	seconds	2–255	2	Wait Time Before Blind Dialing or for Dial Tone. 1. Sets the length of time, in seconds, that the modem will wait before starting to dial after going off-hook when blind dialing. This operation, however, may be affected by some ATX options according to country restrictions. The “Wait for Dial Tone” call progress feature (W dial modifier in the dial string) will override the value in register S6. (When configured for US). 2. Sets the length of time, in seconds, that the modem will wait for dial tone when encountering a “W” dial modifier before returning NO DIAL TONE result code. (W class). Default is country-dependent. The modem always pauses for a minimum of 2 seconds, even if the value of S6 is less than 2 seconds.*
S7	seconds	1–255*	50	Wait Time for Carrier, Silence, or Dial Tone. 1. Sets the length of time, in seconds, that the modem will wait for carrier before hanging up. The timer is started when the modem finishes dialing (originate), or 2 seconds after going off-hook (answer). In originate mode, the timer is reset upon detection of answer tone if allowed by country restrictions. 2. Sets the length of time, in seconds, that modem will wait for silence when encountering the @ dial modifier before continuing with the next dial string parameter. 3. Sets the length of time, in seconds, that the modem will wait for dial tone when encountering a “W” dial modifier before continuing with the next dial string parameter. (US model.) The default is country dependent. *
S8	seconds	2–255	2	Pause Time for Dial Delay. Sets the time, in seconds, that the modem must pause when the “,” dial modifier is encountered in the dial string. *
S9	0.1 s	1–255	6	Carrier Detect Response Time. Supported for backward compatibility only. No value can be written. Responds with default value. *
S10	0.1 s	1–255	14	Lost Carrier to Hang Up Delay. Sets the length of time, in tenths of a second, that the modem waits before hanging up after a loss of carrier. This allows for a temporary carrier loss without causing the local modem to disconnect. When register S10 is set to 255, the modem functions as if a carrier is always present. * The actual interval the modem waits before disconnecting is the value in register S10 minus the value in register S9. Therefore, the S10 value must be greater than the S9 value or else the modem disconnects before it recognizes the carrier. Note: For Call Waiting detection, if the modem is set to US country code and S10 >=16, then the modem will detect the Call Waiting tone and hang-up the line. If S10 <16, the modem will not detect Call Waiting tone.
S11	0.001 s	50–255	95	DTMF Tone Duration. 1. For US models, S11 sets the duration of tones in DTMF dialing (has no effect on pulse dialing). 2. For other countries, S11 is a country parameter. The default is country dependent. *
S12	0.02 s	0–255	50	Escape Prompt Delay (EPD). Defines the maximum period, in fiftieths of a second, allowed between receipt of the last character of the three escape character sequence from the DTE and sending of the OK result code to the DTE. If any characters are detected during this time, the OK will not be sent. Sending of the OK result code does not affect entry into command mode. *

<u>Register</u>	<u>Unit</u>	<u>Range</u>	<u>Default</u>	<u>Description</u>
S14		138 (8Ah)		General Bit-Mapped Options Status. Indicates the status of command options. Bit 0 This bit is ignored. Bit 1 Command echo (En) 0 = Disabled (E0) 1 = Enabled (E1) (Default.) Bit 2 Quiet mode (Qn) 0 = Send result codes (Q0) (Default.) 1 = Do not send result codes (Q1) Bit 3 Result codes (Vn) 0 = Numeric (V0) 1 = Verbose (V1) (Default.) Bit 4 Reserved Bit 5 Tone (T)/Pulse (P) 0 = Tone (T) (Default.) 1 = Pulse (P) Bit 6 Reserved Bit 7 Originate/Answer 0 = Answer 1 = Originate (Default.)
S16		0		Test Mode Bit-Mapped Options Status. Indicates the test in progress status. Bit 0 Local analog loopback 0 = Disabled (Default.) 1 = Enabled (&T1) Bits 1-7 Not used
S19 and S20				Reserved
S21		52 (34h)		V.24/General Bit-Mapped Options Status. Indicates the status of command options. Bits 0 - 1 Reserved (0) Bit 2 CTS behavior (&Rn) 0 = CTS tracks RTS (&R0) 1 = CTS always on (&R1) (Default.) Bits 3-4 DTR behavior (&Dn) 0 = &D0 selected 1 = &D1 selected 2 = &D2 selected (Default.) 3 = &D3 selected Bit 5 RLSD (DCD) behavior (&Cn) 0 = &C0 selected 1 = &C1 selected (Default.) Bit 6 DSR behavior (&Sn) 0 = &S0 selected (Default.) 1 = &S1 selected Bit 7 Long space disconnect (Yn) 0 = Y0 (Default.) 1 = Y1

<u>Register</u>	<u>Unit</u>	<u>Range</u>	<u>Default</u>	<u>Description</u>
S22			117 (75h)	Speaker/Results Bit-Mapped Options Status. Indicates the status of command options. Default: 117 (75h) (01110101b) Bits 0-1 Speaker volume (Ln) 0 = Off (L0) 1 = Low (L1) (Default.) 2 = Medium (L2) 3 = High (L3) Bits 2-3 Speaker control (Mn) 0 = Disabled (M0) 1 = Off on carrier (M1) (Default.) 2 = Always on (M2) 3 = On during handshake (M3) Bits 4-6 Limit result codes (Xn) 0 = X0 4 = X1 5 = X2 6 = X3 7 = X4 (Default.) Bit 7 Reserved
S23			0	General Bit-Mapped Options Status. Indicates the status of command options. Bits 0-6 Not used Bits 6-7 Guard tone (&Gn) 0 = None (&G0) (Default.) 1 = None (&G1) 2 = 1800 Hz (&G2)
S24	seconds	0–255	0	Sleep Inactivity Timer. Sets the length of time, in seconds, that the modem will operate in normal mode with no detected telephone line or DTE line activity before entering low-power sleep mode. The timer is reset upon any DTE line or telephone line activity. If the S24 value is zero, neither DTE line nor telephone inactivity will cause the modem to enter the sleep mode.
S25	0.01 s	0–255	5	Delay to DTR OFF. Sets the length of time that the modem will ignore DTR for taking the action specified by &Dn. Its units are seconds for synchronous modes and one hundredths of a second for other modes.
S26	0.01 s	0–255	1	RTS-to-CTS Delay. Sets the time delay, in hundredths of a second, before the modem turns CTS ON after detecting an OFF-to-ON transition on RTS when &R0 is commanded. Pertains to synchronous operation only.

<u>Register</u>	<u>Unit</u>	<u>Range</u>	<u>Default</u>	<u>Description</u>
S27			73 (49Ah)	General Bit-Mapped Options Status. Indicates the status of command options. Default: 73 (49h) (01001001b) Bit 2 Leased line control (&Ln) 0 = Dial up line (&L0) (Default.) Bits 4 - 5 Internal clock select (&Xn) 0 = Internal clock (&X0) (Default.) 1 = External clock (&X1) 2 = Slave clock (&X2) Bit 6 CCITT/Bell mode select (Bn) 0 = CCITT mode (B0) 1 = Bell mode (B1) (Default.) Bit 7 - Reserved
S28			0	General Bit-Mapped Options Status. Indicates bit mapped options status. Default: 0 Bits 0 - 1 Reserved Bit 2 Reserved (always 0). Bits 3 - 4 Pulse dialing (&Pn) 0 = 39%-61% make/break ratio at 10 pulses per second (&P0) 1 = 33%-67% make/break ratio at 10 pulses per second (&P1) 2 = 39%-61% make/break ratio at 20 pulses per second (&P2) 3 = 33%-67% make/break ratio at 20 pulses per second (&P3) Bit 5-7 Reserved
S29	10 ms	0–255	70	Flash Dial Modifier Timer. Sets the length of time, in units of 10 ms, that the modem will go on-hook when it encounters the flash (!) dial modifier in the dial string. S29 is a country dependent parameter. The S29 value cannot be changed using S29=XX. Default: 70 (700 ms) for U.S.
S30	10 s	0–255	0	Disconnect Inactivity Timer. Sets the length of time, in tens of seconds, that the modem will stay online before disconnecting when no data is sent or received. In error-correction mode, any data transmitted or received will reset the timer. In other modes, any data transmitted will reset the timer. The timer is inoperative in synchronous mode.
S31			192 (C0h)	General Bit-Mapped Options Status. Indicates bit mapped options status. Default: 192 (C0h) (11000000b) Bit 0 Single line connect message enable/disable (\Vn) 0 = Messages controlled by S95, Wn and Vn (\V0) (Default.) 1 = Single line connect message (\V1) Bit 1 Reserved (0) Bits 2-3 Error correction progress messages (Wn) 0 = DTE speed only (W0) (Default.) 1 = Full reporting (W1) 2 = DCE (line) speed only (W2) Bits 4-5 Caller ID (+VCID) 0 = Caller ID disabled (+VCID=0) (Default.) 1 = Short (formatted) Caller ID enabled (+VCID=1) 2 = Long (unformatted) Caller ID enabled (+VCID=2) Bits 6-7 Reserved (Default = 11b)

<u>Register</u>	<u>Unit</u>	<u>Range</u>	<u>Default</u>	<u>Description</u>
S36			7	LAPM Failure Control. This value indicates what should happen upon a LAPM failure. These fallback options are initiated immediately upon connection if S48=128. If an invalid number is entered, the number is accepted into the register, but S36 will act as if the default value has been entered. * Default: 7 (00000111b) Bits 0-2 0 = Modem disconnects. 1 = Modem stays on-line and a Direct mode connection is established. 2 = Reserved. 3 = Modem stays on-line and a Normal mode connection is established. 4 = An MNP connection is attempted and if it fails, the modem disconnects. 5 = An MNP connection is attempted and if it fails, a Direct mode connection is established. 6 = Reserved. 7 = An MNP connection is attempted and if it fails, a Normal mode connection is established. (Default.) Bits 3-7 Reserved
S37 (V.22bis only)			0	Specifies Desired Line Connection Speed. Bits 0-3 Desired line connection speed. This is linked with the Fn command. If an invalid number is entered, the number is accepted into the register, but S37 will act as if the default value has been entered. 0 = Attempt automode connection (F0). (Default.) 1-3 = Attempt to connect at 300 bps (F1). 4 = Reserved. 5 = Attempt to connect at V.22 1200 bps (F4). 6 = Attempt to connect at V.22bis 2400 bps (F5). 7 = Attempt to connect at V.23 (F3). Bits 4-7 Reserved
S38	seconds	0–255	20	Delay Before Forced Hang Up. Specifies the delay between the modem's receipt of the H command to disconnect (or ON-to-OFF transition of DTR if the modem is programmed to follow the signal), and the disconnect operation. Applicable to error-correction connection only. This parameter can be used to ensure that data in the modem buffer is sent before the modem disconnects. If S38 is set to a value between 0 and 254, the modem will wait that number of seconds for the remote modem to acknowledge all data in the modem buffer before disconnecting. If time expires before all data is sent, the NO CARRIER result code will be issued to indicate that data has been lost. If all data is transmitted prior to time-out, the response to the H0 command will be OK. If S38 is set to 255, the modem does not time-out and continues to attempt to deliver data in the buffer until the connection is lost or the data is delivered.
S39			3	Flow Control Bit-Mapped Options Status. Default: 3 (00000011b) Bits 0-2 Status of command options 0 = No flow control 3 = RTS/CTS (&K3) (Default.) 4 = XON/XOFF (&K4) 5 = Transparent XON (&K5) 6 = Both methods (&K6) Bits 3-7 Reserved

<u>Register</u>	<u>Unit</u>	<u>Range</u>	<u>Default</u>	<u>Description</u>												
S40		104 (68h)		General Bit-Mapped Options Status. Indicates the status of command options. Default: 104 (68h) (01101000b) Bits 0-1 MNP Extended Services (-Kn) 0 = Disable extended services (-K0) (Default.) 1 = Enable extended services (-K1) 2 = Enable extended services (-K2) Bit 2 Reserved Bits 3-5 Break Handling (\Kn) 0 = \K0 1 = \K1 2 = \K2 3 = \K3 4 = \K4 5 = \K5 (Default.) Bits 6-7 Reserved*												
S41		195 (C3h)		General Bit-Mapped Options Status. Indicates the status of command options.* Default: 13 (C3h) (00001101b) Bits 0-1 Reserved in V.22bis Bits 0 -1 Compression selection (%Cn) 0 = Disabled (%C0) 1 = MNP 5 (%C1) 2 = V.42 bis (%C2) 3 = MNP 5 and V.42 bis (%C3) (Default.) Bits 2, 6 Auto retrain and fallback/fall forward (%En) <table><tr><th><u>Bit 6</u></th><th><u>Bit 2</u></th><th><u>Meaning</u></th></tr><tr><td>0</td><td>0</td><td>Retrain and fallback/fall forward disabled (%E0)</td></tr><tr><td>0</td><td>1</td><td>Retrain enabled (%E1)</td></tr><tr><td>1</td><td>0</td><td>Fallback/fall forward enabled (%E2) (Default.)</td></tr></table> Bit 3 Reserved Bits 4-5 Reserved Bit 7 Reserved	<u>Bit 6</u>	<u>Bit 2</u>	<u>Meaning</u>	0	0	Retrain and fallback/fall forward disabled (%E0)	0	1	Retrain enabled (%E1)	1	0	Fallback/fall forward enabled (%E2) (Default.)
<u>Bit 6</u>	<u>Bit 2</u>	<u>Meaning</u>														
0	0	Retrain and fallback/fall forward disabled (%E0)														
0	1	Retrain enabled (%E1)														
1	0	Fallback/fall forward enabled (%E2) (Default.)														
S46		138		Data Compression Control. Controls selection of compression.* The following actions are executed for the given values: S46=136 Execute error correction protocol with no compression. S46=138 Execute error correction protocol with compression. (Default.) S46 is not available in V.22bis.												
S48		7		V.42 Negotiation Control. Negotiation process determines the capabilities of the remote modem. However, when the capabilities of the remote modem are known and negotiation is unnecessary, this process can be bypassed if so desired. Range: 0, 7, or 128 If an invalid number is entered, it is accepted into the S-Register, but S48 will act as if 128 has been entered. S48=0 Disable negotiation; bypass the detection and negotiation phases; and proceed with LAPM. S48=7 Enable negotiation. (Default.) S48=128 Disable negotiation; bypass the detection and negotiation phases; and proceed at once with the fallback action specified in S36. Can be used to force MNP.												

<u>Register</u>	<u>Unit</u>	<u>Range</u>	<u>Default</u>	<u>Description</u>
S82 (V.22bis only)		3, 7, or 128	128	Break Handling Options Break Signals provide a way for the user to get the attention of the remote modem. The break type depends on the speed application. LAPM specifies three methods of break signal handling; in sequence, expedited, and destructive. If an invalid number is entered, it is accepted into the S-Register, but S82 will act as if the default value has been entered. S82 = 3 Expedited: Modem sends a break immediately; data integrity is maintained both ahead of and after the break. S82 = 7 Destructive: Modem sends a break immediately; data being processed by each modem at the time of the break is destroyed. S82 =128 In sequence: Modem sends a break in sequence with any transmitted data; data integrity is maintained both ahead of and after the break (default)
S86		0–26	21	Call Failure Indication. When the modem issues a NO CARRIER result code, a value is written to S86 Register to help determine the reason for the failed connection. S86 records the first event that contributes to a NO CARRIER message. The code definitions are: S86=0 Normal hangup, no error occurred. S86=1 Reserved. S86=2 Reserved. S86=3 Call Waiting caused disconnect. S86=4 Physical carrier loss. S86=5 No error correction at the other end. S86=6 No response to feature negotiation. S86=7 This modem is async only; the other modem is sync only. S86=8 No framing technique in common. S86=9 No protocol in common. S86=10 Bad response to feature negotiation. S86=11 No sync information from the remote modem. S86=12 Normal hangup initiated by the remote modem. S86=13 Retransmission limit reached. S86=14 Protocol violation occurred. S86=15 Lost DTR. S86=16 Received GSTN cleardown. S86=17 Inactivity timeout. S86=18 Speed not supported. S86=19 Long space disconnect. S86=20 Key abort disconnect. S86=21 Clears previous disconnect reason. S86=22 No connection established. S86=23 Disconnect after three retrains. S86=24 Call Waiting tone detected. S86=25 Extension pickup detected. S86=26 Remote hangup detected.
S91	dBm	0–15	10	PSTN Transmit Attenuation Level. In non-PCM modes (V.90 or K56flex are PCM modes), S91 sets the transmit attenuation level from 0 to 15 dBm for the PSTN mode, resulting in a transmit level from 0 to -15 dBm. In some countries, the transmit level may not be changed and there are checks to prevent transmit attenuation level change. The default is country dependent.

<u>Register</u>	<u>Unit</u>	<u>Range</u>	<u>Default</u>	<u>Description</u>																												
S95			0	Extended Result Codes Control. A bit set to a 1 in this parameter, in conjunction with the W command, will enable the corresponding extended result code. * The +MR, +ER, and +DR settings also control S95 bits 2, 3, and 5, respectively. The more recent settings of +MR, +ER, and +DR, or host writing of S95 bits 2, 3, and 5, along with the W command setting, determine the corresponding actual result code reporting (see +MR, +ER, DR, and W commands). Bit 0 CONNECT result code indicates DCE speed instead of DTE speed. Bit 1 Append/ARQ to CONNECT XXXX result code in error-correction mode (XXXX = rate). Bit 2 Enable +MCR: XXXX result code (XXXX = modulation) and +MRR: XXXX result code (XXXX = rate). (Also see +MR.) Bit 3 Enable +ER: XXXX result code (XXXX = protocol identifier). Bit 4 Reserved. Bit 5 Enable +DR: XXXX result code (XXXX = compression type). Bits 6-7 Reserved. Note: Bits 2-5 are reserved in V.22bis.																												
S210		0–255	13 (0Dh)	V.34 Symbol Rate. The bits in this parameter control V.34 symbols rates and enable/disable V.34 asymmetric rates. This parameter is used for diagnostic purposes only. Default: 13 (0Dh) (00001101b) Bits 0 -2 Selects the range of allowed V.34 symbol rates. <table><tr><th><u>2</u></th><th><u>1</u></th><th><u>0</u></th><th><u>Symbol Rates (baud)</u></th></tr><tr><td>0</td><td>0</td><td>0</td><td>2400 only</td></tr><tr><td>0</td><td>0</td><td>1</td><td>2400 only (no 2734)</td></tr><tr><td>0</td><td>1</td><td>0</td><td>2400, 2800</td></tr><tr><td>0</td><td>1</td><td>1</td><td>2400, 2800, 3000</td></tr><tr><td>1</td><td>0</td><td>0</td><td>2400, 2800, 3000, 3200</td></tr><tr><td>1</td><td>0</td><td>1</td><td>2400, 2800, 3000, 3200, 3429 (Default.)</td></tr></table> Bit 3 Enable/disable V.34 asymmetric rates. 0 = Disable asymmetric rates 1 = Enable asymmetric rates (Default.) Bits 4-7 Reserved. Examples S210=13 Enable asymmetric rates with all symbol rates available (Default.). S210=5 Disable asymmetric rates with all symbol rates available. S210=8 Enable asymmetric rates with only 2400 baud available. S210=11 Enable asymmetric rates with 2400 to 3000 baud available.	<u>2</u>	<u>1</u>	<u>0</u>	<u>Symbol Rates (baud)</u>	0	0	0	2400 only	0	0	1	2400 only (no 2734)	0	1	0	2400, 2800	0	1	1	2400, 2800, 3000	1	0	0	2400, 2800, 3000, 3200	1	0	1	2400, 2800, 3000, 3200, 3429 (Default.)
<u>2</u>	<u>1</u>	<u>0</u>	<u>Symbol Rates (baud)</u>																													
0	0	0	2400 only																													
0	0	1	2400 only (no 2734)																													
0	1	0	2400, 2800																													
0	1	1	2400, 2800, 3000																													
1	0	0	2400, 2800, 3000, 3200																													
1	0	1	2400, 2800, 3000, 3200, 3429 (Default.)																													

* Register value may be stored on one of two user profiles with the **&W** command in all except V.22bis.

Result Codes

The modem responds to commands from the DTE and to activity on the line by signaling to the DTE in the form of result codes.

Two forms of each result code are available:

- Short-form – a data-like numeric response (included in parentheses following the long-form). The short-form is terminated by < CR> only with no preceding sequence.
- Long-form – a "verbose" response, preceded and terminated by the sequence < CR> < LF>.

If result messages are suppressed, nothing is returned to the DTE.

The long-form result codes can be modified by the OEM through the .INF file.

The Verbose response may differ in some instances. Some modems may use V.90 terminology and some may use V.92 terminology; however, the meaning of the message is the same:

V.92 Terminology	V.90 Terminology
+MRR	Carrier
+DR	Compression
+ER	Protocol
+MCR	Connect

Note: An asterisk (*) in the Short Form column means that this Result Code is not active in V.22bis modems.

Table of Result Codes

Short Form	Long Form	Description
+F4 *	+FCERROR	Fax data speed. High speed fax data (V.27, V.29, V.33, or V.17) is expected but a V.21 signal is received.
0	OK	Command executed. A command has been executed.
1	CONNECT	Modem connected to the line. For X command values specifying no speed reporting, the modem has connected to the line and either the line speed is 300 bps and line speed is enabled, or the DTE speed is 300 bps and DTE speed reporting is enabled.
2	RING	Ring signal detected. An incoming ring signal is detected on the line. What qualifies as a ring signal is determined by country-dependent parameters, modifiable through patch code.
3	NO CARRIER	Carrier signal lost/not detected. Sent when attempting to establish a call if: 1. Ringback is detected and later ceases but no carrier is detected within the period of time determined by register S7, or 2. No ringback is detected within the period of time determined by register S7. Also sent when the modem auto-disconnects due to loss of carrier. For X0, sent for the following conditions: 1. If busy tone detection is enforced, busy or circuit busy has been detected. 2. If dial tone detection is enforced or selected, dial tone has not been detected.
4	ERROR	Invalid command. Sent during an attempt to execute a command line if any of the following conditions occur: 1. The command line contains a syntax error. 2. The modem cannot execute a command contained in the command line, i.e., the command does not exist or is not supported. 3. A command parameter within the command line is outside the permitted range. For X0, X1, X2, and X3, this message is sent instead of DELAYED and BLACKLISTED.
5	CONNECT1200	Connected at 1200 bps. The modem has connected to the line and either the line speed is 1200 bps and DCE speed reporting is enabled, or the DTE speed is 1200 bps and DTE speed reporting is enabled.
6	NO DIAL TONE	No dial tone detected. For X2 and X4, the modem has been instructed to wait for dial tone during dialing but none is received.
7	BUSY	Busy signal detected. For X3 and X4, if busy tone detection is enforced, the busy signal is detected on the line when the modem is attempting to originate a call.
8	NO ANSWER	No answer at remote end. The modem is attempting to originate a call if a continuous ringback signal is detected on the line until the expiration of the timer S7.
9	CONNECT 600	Connected at 600 bps; speed reporting enabled. The modem has connected to the line, the DTE speed is 600 bps, and DTE speed reporting is enabled.
10	CONNECT 2400	Connected at 2400 bps; speed reporting enabled. The modem has connected to the line and either the line speed is 2400 bps and DCE or DTE speed reporting is enabled.

Short Form	Long Form	Description
11	CONNECT 4800	Connected at 4800 bps and speed reporting enabled. The modem has connected to the line, the DTE speed is 4800 bps and DTE speed reporting is enabled.
12	CONNECT 9600	Connected at 9600 bps and speed reporting enabled. The modem has connected to the line, the DTE speed is 9600 bps and DTE speed reporting is enabled.
13	CONNECT 7200	Connected at 7200 bps and speed reporting enabled. The modem has connected to the line, the DTE speed is 7200 bps and DTE speed reporting is enabled.
14	CONNECT 12000	Connected at 12000 bps and speed reporting enabled. The modem has connected to the line the DTE speed is 12000 bps and DTE speed reporting is enabled.
15	CONNECT 14400	Connected at 14400 bps and speed reporting enabled. The modem has connected to the line, the DTE speed is 14400 bps and DTE speed reporting is enabled.
16	CONNECT 19200	Connected at 19200 bps and speed reporting enabled. The modem has connected to the line, the DTE speed is 19200 bps and DTE speed reporting is enabled.
17 *	CONNECT 38400	Connected at 38400 bps and speed reporting enabled. The modem has connected to the line, the DTE speed is 38400 bps and DTE speed reporting is enabled.
18 *	CONNECT 57600	Connected at 57600 bps and speed reporting enabled. The modem has connected to the line, the DTE speed is 57600 bps and DTE speed reporting is enabled.
19 *	CONNECT 115200	Connected at 115200 bps and speed reporting enabled. The modem has connected to the line, the DTE speed is 115200 bps and DTE speed reporting is enabled.
20 *	CONNECT 230400	Connected at 230400 bps and speed reporting enabled. The modem has connected to the line, the DTE speed is 230400 bps and DTE speed reporting is enabled.
22	CONNECT 75TX/1200RX	V.23 connection and line speed reporting enabled. The modem has established a V.23 originate connection and line speed reporting is enabled.
23	CONNECT 1200TX/75RX	V.23 connection and line speed reporting enabled. The modem has established a V.23 answer connection and line speed reporting is enabled.
24	DELAYED	Delay is in effect for the dialed number. For X4, sent when a call fails to connect and the number dialed is considered 'delayed' due to country blacklisting requirements.
32	BLACKLISTED	Dialed number is blacklisted. For X4, sent when a call fails to connect and the number dialed is considered 'blacklisted'.
33 *	FAX	Connected in fax mode. Modem connection is established in a facsimile mode.
35 *	DATA	Connected in data mode. Modem connection is established in a data mode.
40 *	+MRR: 300	Connected at 300 bps and carrier reporting enabled. Modem connects to the line at 300 bps and carrier reporting is enabled. (See S95 and Xn.)
44 *	+MRR: 1200/75	V.23 backward channel. V.23 backward channel carrier is detected; carrier reporting is enabled. (See S95, Xn.)
45 *	+MRR: 75/1200	V.23 forward channel. V.23 forward channel carrier is detected; carrier reporting is enabled. (See S95, Xn.)
46 *	+MRR: 1200	Connected at 1200 bps and carrier reporting enabled. Modem connects to the line at 1200 bps and carrier reporting is enabled. (See S95, Xn.)
47 *	+MRR: 2400	Connected at 2400 bps and carrier reporting enabled. Modem connects to the line at 2400 bps and carrier reporting is enabled. (See S95, Xn.)
48 *	+MRR: 4800	Connected at 4800 bps and carrier reporting enabled. Modem connects to the line at 4800 bps and carrier reporting is enabled. (See S95, Xn.)
49 *	+MRR: 7200	Connected at 7200 bps and carrier reporting enabled. Modem connects to the line at 7200 bps and carrier reporting is enabled. (See S95, Xn.)
50 *	+MRR: 9600	Connected at 9600 bps and carrier reporting enabled. Modem connects to the line at 9600 bps and carrier reporting is enabled. (See S95, Xn.)
51 *	+MRR: 12000	Connected at 12000 bps and carrier reporting enabled. Modem connects to the line at 12000 bps; carrier reporting is enabled. (See S95, Xn.)
52 *	+MRR: 14400	Connected at 14400 bps and carrier reporting enabled. Modem connects to the line at 14400 bps; carrier reporting is enabled. (See S95, Xn.)
53 *	+MRR: 16800	Connected at 16800 bps and carrier reporting enabled. Modem connects to the line at 16800 bps; carrier reporting is enabled. (See S95, Xn.)
54 *	+MRR: 19200	Connected at 19200 bps and carrier reporting enabled. Modem connects to the line at 19200 bps; carrier reporting is enabled. (See S95, Xn.)
55 *	+MRR: 21600	Connected at 21600 bps and carrier reporting enabled. Modem connects to the line at 21600 bps; carrier reporting is enabled. (See S95, Xn.)
56 *	+MRR: 24000	Connected at 24000 bps and carrier reporting enabled. Modem connects to the line at 24000 bps; carrier reporting is enabled. (See S95, Xn.)
57 *	+MRR: 26400	Connected at 26400 bps and carrier reporting enabled. Modem connects to the line at 26400 bps; carrier reporting is enabled. (See S95, Xn.)
58 *	+MRR: 28800	Connected at 28800 bps and carrier reporting enabled. Modem connects to the line at 28800 bps; carrier reporting is enabled. (See S95, Xn.)

Short Form	Long Form	Description
59	CONNECT 16800	Connected at 16800 bps and DTE speed reporting enabled. The modem has connected to the line, the DTE speed is 16800 bps and DTE speed reporting is enabled.
60 61	CONNECT 21600	Connected at 21600 bps and DTE speed reporting enabled. 60 is the Result Code is V.92, V.34, and V.32: 61 is the Result Code in V.22bis for: The modem has connected to the line, the DTE speed is 21600 bps and DTE speed reporting is enabled.
62	CONNECT 24000	Connected at 24000 bps and DTE speed reporting enabled. The modem has connected to the line, the DTE speed is 24000 bps and DTE speed reporting is enabled.
63	CONNECT 26400	Connected at 26400 bps and DTE speed reporting enabled. The modem has connected to the line, the DTE speed is 26400 bps and DTE speed reporting is enabled.
64	CONNECT 28800	Connected at 28800 bps and line speed reporting enabled. The modem has connected to the line, the DTE speed is 28800 bps and DTE speed reporting is enabled.
66 *	+DR: A LT	Connected in MNP Class 5 data compression. Modem connects to the line in MNP Class 5 and +DR: message reporting is enabled. (See S95, Wn, Xn.)
67 *	+DR: V 42B	Connected in V.42 bis data compression. Modem connects to the line in V.42 bis and +DR: message reporting is enabled. (See S95, Wn, Xn.)
69 *	+DR: NONE	Connected without data compression. Modem connects to the line without data compression and +DR: message reporting is enabled. (See S95, Wn, Xn.)
70 *	+ER: NONE	Connected without any protocol. Modem connects to the line without any form of error correction and +ER: message reporting is enabled. (See S95, Wn, Xn.)
77 *	+ER: L APM	Connected in V.42 LAPM mode. Modem connects to the line in V.42 LAPM error correction mode. +ER: message reporting is enabled. (See S95, Wn, Xn.)
78 *	+MRR: 31200	Connected at 31200 bps; carrier reporting enabled. Modem connects to the line at 31200 bps and carrier reporting is enabled. (See S95, Xn.)
79 *	+MRR: 33600	Connected at 33600 bps; carrier reporting enabled. Modem connects to the line at 33600 bps and carrier reporting is enabled. (See S95, Xn.)
80 *	+ER: A LT	Connected in MNP mode. Sent when the modem connects in MNP mode of error correction. +ER: message reporting has been enabled. (See S95, Wn, Xn.)
83	LINE-IN-USE	Line in use. The modem attempted to go off-hook when an extension was already occupying the line.
84	CONNECT 33600	Connected at 33600 bps. The modem has connected to the line, the DTE speed is 33600 bps and the DTE speed reporting is enabled.
91	CONNECT 31200	Connected at 31200 bps. The modem has connected to the line DTE speed is 31200 bps and the modem is to report the DTE speed upon connecting.
134 *	+MCR: B 103	Connected with Bell 103 modulation. Modem connects to the line with Bell 103 modulation and modulation reporting is enabled. (See +MR, S95, Xn.)
135 *	+MCR: B 212	Connected with Bell 212 modulation. Modem connects to the line with Bell 212 modulation and modulation reporting is enabled. (See +MR, S95, Xn.)
136 *	+MCR: V 21	Connected with ITU-T V.21. Modem connects to the line with ITU-T V.21 modulation and modulation reporting is enabled. (See +MR, S95, Xn.)
137 *	+MCR: V 22	Connected with ITU-T V.22. Modem connects to the line with ITU-T V.22 modulation and modulation reporting is enabled. (See +MR, S95, Xn.)
138 *	+MCR: V 22B	Connected with ITU-T V.22B. Modem connects to the line with ITU-T V.22B modulation and modulation reporting is enabled. (See +MR, S95, Xn.)
139 *	+MCR: V 23	Connected with ITU-T V.23. Modem connects to the line with ITU-T V.23 modulation and modulation reporting is enabled. (See +MR, S95, Xn.)
140 *	+MCR: V 32	Connected with ITU-T V.32. Modem connects to the line with ITU-T V.32 modulation and modulation reporting is enabled. (See +MR, S95, Xn.)
141 *	+MCR: V 32B	Connected with ITU-T V.32B. Modem connects to the line with ITU-T V.32B modulation and modulation reporting is enabled. (See +MR, S95, Xn.)
142 *	+MCR: V 34	Connected with ITU-T V.34. Modem connects to the line with ITU-T V.34 modulation and modulation reporting is enabled. (See +MR, S95, Xn.)
144 *	+MCR: K 56	
145 *	+MCR: V 90	Connected with ITU-T V.90. Modem connects to the line with ITU-T V.90 modulation and modulation reporting is enabled. (See +MR, S95, Xn.)
150 *	+MRR: 32000	Connected at 32000 bps. Modem connects to the line at 32000 bps and carrier reporting is enabled. (See S95, Xn.)
151 *	+MRR: 34000	Connected at 34000 bps. Modem connects to the line at 34000 bps and carrier reporting is enabled. (See S95, Xn.)
152 *	+MRR: 36000	Connected at 36000 bps. Modem connects to the line at 36000 bps and carrier reporting is enabled. (See S95, Xn.)

Short Form	Long Form	Description
153 *	+MRR: 38000	Connected at 38000 bps. Modem connects to the line at 38000 bps and carrier reporting is enabled. (See S95, Xn.)
154 *	+MRR: 40000	Connected at 40000 bps. Modem connects to the line at 40000 bps and carrier reporting is enabled. (See S95, Xn.)
155 *	+MRR: 42000	Connected at 42000 bps. Modem connects to the line at 42000 bps and carrier reporting is enabled. (See S95, Xn.)
156 *	+MRR: 44000	Connected at 44000 bps. Modem connects to the line at 44000 bps and carrier reporting is enabled. (See S95, Xn.)
157 *	+MRR: 46000	Connected at 46000 bps. Modem connects to the line at 46000 bps and carrier reporting is enabled. (See S95, Xn.)
158 *	+MRR: 48000	Connected at 48000 bps. Modem connects to the line at 48000 bps and carrier reporting is enabled. (See S95, Xn.)
159 *	+MRR: 50000	Connected at 50000 bps. Modem connects to the line at 50000 bps and carrier reporting is enabled. (See S95, Xn.)
160 *	+MRR: 52000	Connected at 52000 bps. Modem connects to the line at 52000 bps and carrier reporting is enabled. (See S95, Xn.)
161 *	+MRR: 54000	Connected at 54000 bps. Modem connects to the line at 54000 bps and carrier reporting is enabled. (See S95, Xn.)
162 *	+MRR: 56000	Connected at 56000 bps. Modem connects to the line at 56000 bps and carrier reporting is enabled. (See S95, Xn.)
165 *	CONNECT 32000	Connected at 32000 bps. Modem connects to the line at 32000 bps and DCE SPEED reporting is enabled.
166 *	CONNECT 34000	Connected at 34000 bps. Modem connects to the line at 34000 bps and DCE SPEED reporting is enabled.
167 *	CONNECT 36000	Connected at 36000 bps. Modem connects to the line at 36000 bps and DCE SPEED reporting is enabled.
168 *	CONNECT 38000	Connected at 38000 bps. Modem connects to the line at 38000 bps and DCE SPEED reporting is enabled.
169 *	CONNECT 40000	Connected at 40000 bps. Modem connects to the line at 40000 bps and DCE SPEED reporting is enabled.
170 *	CONNECT 42000	Connected at 42000 bps. Modem connects to the line at 42000 bps and DCE SPEED reporting is enabled.
171 *	CONNECT 44000	Connected at 44000 bps. Modem connects to the line at 44000 bps and DCE SPEED reporting is enabled.
172 *	CONNECT 46000	Connected at 46000 bps. Modem connects to the line at 46000 bps and DCE SPEED reporting is enabled.
173 *	CONNECT 48000	Connected at 48000 bps. Modem connects to the line at 48000 bps and DCE SPEED reporting is enabled.
174 *	CONNECT 50000	Connected at 50000 bps. Modem connects to the line at 50000 bps and DCE SPEED reporting is enabled.
175 *	CONNECT 52000	Connected at 52000 bps. Modem connects to the line at 52000 bps and DCE SPEED reporting is enabled.
176 *	CONNECT 54000	Connected at 54000 bps. Modem connects to the line at 54000 bps and DCE SPEED reporting is enabled.
177 *	CONNECT 56000	Connected at 56000 bps. Modem connects to the line at 56000 bps and DCE SPEED reporting is enabled.
178 *	CONNECT 230400	Connected at 230400 bps. Modem connects to the line; the DTE speed is 230400 bps, and DTE SPEED reporting is enabled.
180 *	CONNECT 28000	Connected at 28000 bps. Modem connects to the line at 28000 and DCE SPEED reporting is enabled.
181 *	CONNECT 29333	Connected at 29333 bps. Modem connects to the line at 29333 and DCE SPEED reporting is enabled.
182 *	CONNECT 30667	Connected at 30667 bps. Modem connects to the line at 30667 bps and DCE SPEED reporting is enabled.
183 *	CONNECT 33333	Connected at 48000 bps. Modem connects to the line at 33333 bps and DCE SPEED reporting is enabled.
184 *	CONNECT 34667	Connected at 34667 bps. Modem connects to the line at 34667 bps and DCE SPEED reporting is enabled.
185 *	CONNECT 37333	Connected at 37333 bps. Modem connects to the line at 37333 bps and DCE SPEED reporting is enabled.
186 *	CONNECT 38667	Connected at 38667 bps. Modem connects to the line at 38667 bps and DCE SPEED reporting is enabled.

Short Form	Long Form	Description
187 *	CONNECT 41333	Connected at 41333 bps. Modem connects to the line at 41333 bps and DCE SPEED reporting is enabled.
188 *	CONNECT 42667	Connected at 42667 bps. Modem connects to the line at 42667 bps and DCE SPEED reporting is enabled.
189 *	CONNECT 45333	Connected at 45333 bps. Modem connects to the line at 45333 bps and DCE SPEED reporting is enabled.
190 *	CONNECT 46667	Connected at 46667 bps. Modem connects to the line at 46667 bps and DCE SPEED reporting is enabled.
191 *	CONNECT 49333	Connected at 49333 bps. Modem connects to the line at 49333 bps and DCE SPEED reporting is enabled.
192 *	CONNECT 50667	Connected at 50667 bps. Modem connects to the line at 50667 bps and DCE SPEED reporting is enabled.
193 *	CONNECT 53333	Connected at 53333 bps. Modem connects to the line at 53333 bps and DCE SPEED reporting is enabled.
194 *	CONNECT 54667	Connected at 54667 bps. Modem connects to the line at 54667 bps and DCE SPEED reporting is enabled.
195 *	+MRR: 28000	Connected at 28000 bps. Modem connects to the line at 28000 bps and carrier reporting is enabled. (See S95, Xn)
196 *	+MRR: 29333	Connected at 29333 bps. Modem connects to the line at 29333 bps and carrier reporting is enabled. (See S95, Xn)
197 *	+MRR: 30667	Connected at 30667 bps. Modem connects to the line at 30667 bps and carrier reporting is enabled. (See S95, Xn)
198 *	+MRR: 33333	Connected at 33333 bps. Modem connects to the line at 33333 bps and carrier reporting is enabled. (See S95, Xn)
199 *	+MRR: 34667	Connected at 34667 bps. Modem connects to the line at 34667 bps and carrier reporting is enabled. (See S95, Xn)
200 *	+MRR: 37333	Connected at 37333 bps. Modem connects to the line at 37333 bps and carrier reporting is enabled. (See S95, Xn)
201 *	+MRR: 38667	Connected at 38667 bps. Modem connects to the line at 38667 bps and carrier reporting is enabled. (See S95, Xn)
202 *	+MRR: 41333	Connected at 41333 bps. Modem connects to the line at 41333 bps and carrier reporting is enabled. (See S95, Xn)
203 *	+MRR: 42667	Connected at 42667 bps. Modem connects to the line at 42667 bps and carrier reporting is enabled. (See S95, Xn)
204 *	+MRR: 45333	Connected at 45333 bps. Modem connects to the line at 45333 bps and carrier reporting is enabled. (See S95, Xn)
205 *	+MRR: 46667	Connected at 46667 bps. Modem connects to the line at 46667 bps and carrier reporting is enabled. (See S95, Xn)
206 *	+MRR: 49333	Connected at 49333 bps. Modem connects to the line at 49333 bps and carrier reporting is enabled. (See S95, Xn)
207 *	+MRR: 50667	Connected at 50667 bps. Modem connects to the line at 50667 bps and carrier reporting is enabled. (See S95, Xn)
208 *	+MRR: 53333	Connected at 53333 bps. Modem connects to the line at 53333 bps and carrier reporting is enabled. (See S95, Xn)
209 *	+MRR: 54667	Connected at 54667 bps. The modem has connected to the line at 54667 bps and carrier reporting is enabled. (See S95, Xn)

Note: An asterisk (*) in the Short Form column means that this Result Code is not active in V.22bis modems.

Chapter 11 – Point-to-Point Protocol

Introduction

Point-to-Point Protocol (PPP) is the Internet Standard for transmission of IP packets over serial links. This protocol is commonly used in serial links (asynchronous or synchronous) to transfer packets between two endpoints. These links provide full-duplex simultaneous bi-directional operation and are assumed to deliver packets in order. It is intended that **PPP** provide a common solution for easy connection of a wide variety of hosts, bridges, and routers.

The advantage of **PPP** is that it allows for inter-operability between endpoints (for example, routers) using **PPP** for their serial communication.

Components of PPP

- A method for encapsulating multi-protocol data grams.
- A **Link Control Protocol (LCP)** for establishing, configuring, and testing the data-link connection. The LCP is used to automatically agree upon the encapsulation format options, handle varying limits on sizes of packets, detect a looped-back link and other common configuration errors, and terminate the link.
- A family of **Network Control Protocols (NCPs)** for establishing and configuring different network-layer protocols. In the MultiConnect IP, IPCP will be negotiated

Prerequisites for Establishing a PPP Session

- Before establishing a PPP session, users should be added to the user database. The user name and password supplied by the remote peer will be authenticated using the local database.
- The following sections describe the commands to add / delete user names and passwords to the local database.

Adding Users and Passwords

Upon successful execution of this command, the MultiConnect IP will return an OK or an error message.

Command:

```
# user add <username> [password]
```

Example:

```
# user add user1 user1
OK
(Or)
# user add user1
OK
```

Setting Passwords

Upon successful execution of this command, the MultiConnect IP will return an OK or an error message.

Command:

```
# user password <username> <password>
```

Example:

```
# user password user1 user1
OK
```

Deleting Users

Upon successful execution of this command, the MultiConnect IP will return an OK or an error message.

Command:

```
# user delete <username>
```

Example:

```
# user delete user1
OK
```

Notes

- PPP is enabled on the modem port
- PPP interface is the IP-enabled interface in MultiConnect IP
- All IP-enabled services can be used only after the PPP link is up with an IP Address
- In the event of a PPP link down, SMTP and POP3 requests can trigger the PPP link establishment and termination

PPP Configuration

PPP Interface Related Parameters

- Enable PPP
- Enable/Disable Authentication and Authentication Type
- Configure user name/password for remote peer to authenticate
- Configure IPCP mode
- Configure local and remote IP addresses
- Enabling/Disabling compression
- Configure the compression algorithm

Serial Interface Related Parameters

- Configure the Connect Type
- Configure the modem settings
- Configure the dialing trigger mode

PPP Interface Related Parameters

Enabling/Disabling Authentication

This command enables or disables a PPP Authentication session . If Authentication is enabled, then the authentication protocol, the user name, and password should also be set.

Command:

```
# set ppp [interface] authentication <enable/disable>
```

Example:

```
# set ppp ppp0 authentication enable
OK
```

Authentication Type - Protocol

This command sets the Authentication type.

Command:

```
# set ppp [interface] auth-type <pap/chap/pap-chap>
```

Example:

```
#set ppp ppp0 auth-type pap
OK
```

User Name & Password for Remote Peer Authentication

This command sets the user name with which the remote server will authenticate. If authentication is disabled, this need not be configured.

Command:

```
# set ppp [interface] username
# set ppp [interface] password
```

Example:

```
# set ppp ppp0 username user1
OK
#set ppp ppp0 password user1
OK
```

IPCP Mode

This command sets the IPCP mode.

Command:

```
# set ppp [interface] ipcp-mode <client-only/client-or-lan>
```

Examples:

```
# set ppp ppp0 ipcp-mode client-only
OK
```

When ipcp-mode is set to client-only, the local and remote ip addresses are set to 0.0.0.0 automatically

```
# set ppp ppp0 ipcp-mode client-or-lan
OK
```

When ipcp-mode is set to client-or-lan, the local and remote ip addresses have to be configured

Show Commands

This command allows you to view the PPP configuration settings.

Command:

```
#show ppp ppp0 configuration
```

This command allows you to view the PPP logical link status

Command:

```
# show ppp [interface] link-status
```

Example:

```
#show ppp ppp0 link-status
Up / Down
OK
```

This command allows you to view the PPP link IP address

Command:

```
# show ppp [interface] ip-addr
```

Example:

```
#show ppp ppp0 ip-addr
local: 192.168.2.1
remote: 192.168.2.2
OK
```

Serial Interface Related Parameters

Connect Type

This command sets the connection type. A connection type can be either a direct connection or a connection through a modem. In case of a modem connection, the modem settings also have to be configured as described in the following sections.

Command:

```
# set serial [serial-interface] connect-type <direct/modem>
```

Example:

```
#set serial s0 connect-type direct
OK
(Or)
#set serial s0 connect-type modem
OK
#set serial s1 connect-type direct
"Modem port s1 is an inbuilt modem interface and cannot be set to direct"
ERROR
#set serial s1 connect-type modem
OK
```

Modem Settings - For Modem Connection Only

This command sets the initialization string of the modem.

Command:

```
# set serial [serial-interface] modem init-string <line-no> <init string>
```

Example:

```
#set serial s1 modem init-string 1 ATS0=1
OK
```

This command sets the hangup string of the modem.

Command:

```
# set serial [serial-interface] modem hangup-string <hangup string>
```

Example:

```
#set serial s1 modem hangup-string +++ATH0
OK
```

This command sets the dial-prefix string of the modem.

Command:

```
# set serial [serial-interface] modem dial-prefix <dial-prefix string>
```

Example:

```
#set serial s1 modem dial-prefix ATDT
OK
```

This command is used to set the dial number on the dialing end.

Command:

```
# set serial [serial-interface] modem dial-number <phone no>
```

Example:

```
#set serial s1 modem dial-number 224824
OK
```

This command is used to set the dialing trigger mode

Command:

```
# set serial [serial-interface] modem dialing-trig-mode
<none/dtr/command>
```

Note: By default, the modem on modem port S1 is in the answering state.

This command is valid only for the modem port S1.

Examples:

```
# set serial s0 modem dialing-trig-mode <none/dtr/command>
ERROR : 'Command not supported on device port s0'
# set serial s1 modem dialing-trig-mode <none/dtr/command>
OK
```

none: When the **dialing-trig-mode** is configured none, the modem dials immediately once the target boots up.

dtr: When the **dialing-trig-mode** is configured dtr, the modem dials as soon as the TR goes high on the device port S0; i.e., when the serial device is connected to S0.

command: When the **dialing-trig-mode** is configured as **command**, the serial device can control the physical link establishment and link termination with the aid of the commands **linkup s1** and **hangup s1** respectively.

Chapter 12 – HTTP Server

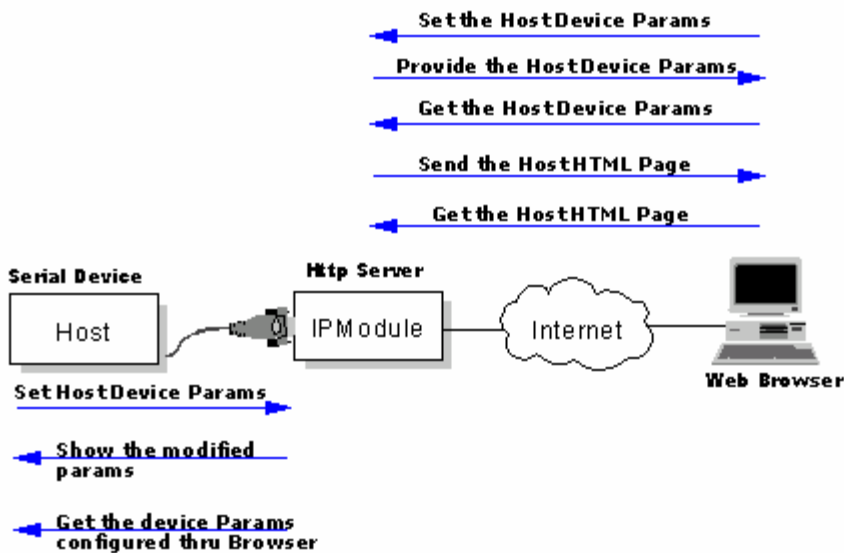
Introduction

The HTTP Server on the MultiConnect IP supports hosting of embedded Web pages on behalf of the host. The host-defined embedded pages support live host parameter monitoring and configuration update through a remote browser.

In addition to serving HTML Web pages, the HTTP Server also features:

- Dual configuration modes
 - Host Device Configuration
 - Remote configuration of the Host Device using a Web browser
 - Monitoring of the Host Device remotely
 - Supports live parameter updates on the Web browser.
 - MultiConnect IP Configuration
 - MultiConnect IP configuration
- Flexibility to design embedded home pages by the OEMs using normal ASCII text HTML code.
- Supports downloading of a home page using TFTP.
- Access Authentication.
- Support for configuring either Default or Serial Page display.

The MultiConnect IP acts as a proxy between the Host-Serial Device and the Web Browser.



Typical Functions Supported by the HTTP Server

Important Notes:

- This application is applicable only in the MultiConnect IP's non-transparent mode.
- This application can be used only after the **PPP link is UP** with an IP Address on the modem port.

Setup and Configuration

Prerequisite for Enabling the HTTP Server

Before being able to access the MultiConnect IP or the serial host through the Web browser, the HTTP support on the MultiConnect IP needs to be enabled and configured.

The following configuration is mandatory and can be configured using CLI either through serial or through Telnet.

Mandatory Setup for HTTP Server

set ip http enable

Successful execution of this command starts the HTTP daemon thus enabling the HTTP server.

set ip http port <port-number>

By default the HTTP server listens on port 80. However, the default port number can be changed.

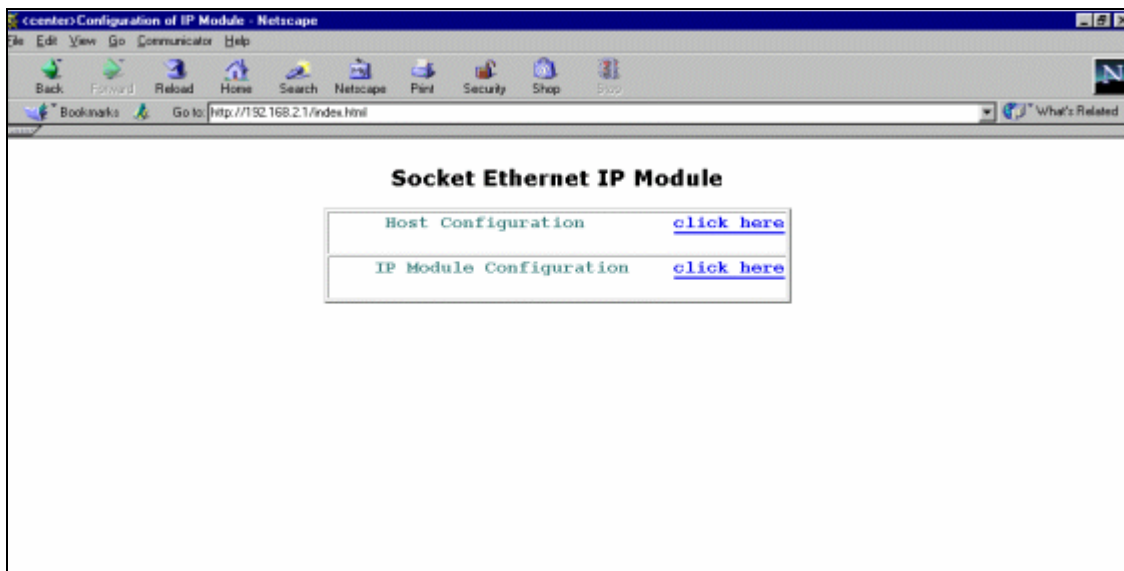
set ip http-page <default/serial>

This command basically decides the Web page that will be displayed when the MultiConnect IP is accessed through the browser.

Note: The default Index.htm is displayed when

- The http-page is set to **default** and
- The MultiConnect IP is accessed through the Web.

The default HTML page contains two links, one for the host configuration and another for the MultiConnect IP configuration. Both these modes are described in subsequent sections.



Index.htm (Default Index Page)

In the event that the http-page is set to **serial**, the **http-s0.HTML** Web page will display upon accessing the MultiConnect IP through the browser. (The Index.htm will not be accessible).

The **http-s0.HTML** Web page can be replaced by the OEM's Home Page specific to the product. More details regarding design conventions, procedure for uploading, and hosting this page are explained later in this chapter.

Configuration Modes

The embedded HTTP Server on the MultiConnect IP supports two configuration modes. This option is available when the http-page is set to **serial** (see **Mandatory Setup** instructions).

- **Host Configuration Mode**
- **MultiConnect IP Configuration Mode** (not supported at this point of time)

In the **Host Configuration Mode**, the OEM's embedded home page is sent to the remote browser. The page serves as a means of monitoring the host parameters live remotely. Further, the host parameters can be updated or configured through the browser.

The **MultiConnect IP Configuration Mode** enables the configuration of the MultiConnect IP remotely through any standard Web browser. All parameters can be configured or their status can be viewed remotely through the interactive GUI provided. Further, vital statistics of the MultiConnect IP can be viewed remotely.

Host Configuration Mode

The **Host Configuration Mode** provides the OEM flexibility to design and implement a product-specific embedded Web page, which is stored, managed, and hosted by the MultiConnect IP module's HTTP server on behalf of the host device.

The OEM can design the Web page to contain the host parameters that will display live values for monitoring and for providing options for setting and configuring the host parameters remotely.

The three essential components of host configuration are the:

- **Parameter List**
- **HTML Page**
- **CGI Scripts**

Note: Certain **File naming and size** conventions are to be strictly adhered to and followed by the Web developer. See details later in this chapter.

The Parameter List

The OEM's customized host HTML page, which is uploaded, may contain parameters (for Configuration or for Monitoring). All these parameters must be available in the **Serial Device Parameter List**, which must be loaded onto the MultiConnect IP.

The format of the Serial device parameter list is shown here:

P<n>:Description:Type:Minimum:Maximum:<Data>

n ranges from **0** to **99**

Description = Name of the parameter

Type = **I**: Integer

S: String

Minimum = If the **Type** is integer, corresponds to Minimum value.

If the **Type** is String, corresponds to Minimum no of characters.

Maximum = If the **Type** is integer, corresponds to Maximum value.

If the **Type** is String, corresponds to Maximum no of characters.

Data = The parameter value to be contained.

Example:**P0:temperature:I:1:65535:100****P1:username:S:8:50:MultiConnect IP**

Here, **P0** and **P1** are two **parameters**, which correspond to the names like **Temperature** & **username** specified in the HTML page.

I/S represents **Integer** and **String** respectively.

1 is the **minimum value** for the parameter P0

65535 is the **maximum value** for the parameter P0.

8 is the **minimum** number of **characters** for the parameter P1.

50 is the **maximum** number of **characters** for the parameter P1.

100: in P0 is an **integer Data**

MultiConnect IP: in P1 is a **string Data**.

The serial device parameter list file (http-host-param) for the demo Web page, which is included with the default setup, (see Figure 3) uses the following parameters and values:

P0:UPSstatus:S:0:5:ON
 P1:Efficiency:I:0:100:90
 P2:NoiseLevel:I:0:100:5
 P3:OverloadCapacity:I:0:100:89
 P4:Tolerance:I:0:100:90
 P5:InputCurrent:I:0:100:78
 P6:InputLineVoltage:I:0:100:90
 P7:OutputVoltage:I:0:100:45
 P8:BatteryVoltage:I:0:100:78
 P9:Load:S:0:100:90
 P10:Alarm:S:0:10:silence

The Embedded HTML Page

The **embedded Web page** stored on the MultiConnect IP consists of normal ASCII text HTML code, which can be generated using any HTML editing tool. The page can include scripts, links to remote Web sites, graphic images, text files, etc.

A maximum 30 KB (uncompressed) of flash space for the OEM's Home Page and an additional 10 KB maximum memory is reserved for the device parameter list.

The OEM Web page must contain the **Parameter Tags**, which are the placeholders in HTML files. These tags are replaced on the fly with real-time values when the page is sent to the browser. The value of the parameter tags also can be changed through the browser in order to configure the host through the MultiConnect IP.

The developer should ensure that the parameter values, which are to be replaced, are qualified with **%P<n>%**.

Example:

```
<HTML>
--
--
--
--
Efficiency <input type="text" name = "P1" value = "%P1%">
--
--
</HTML>
```

In the above sample code segment, when the browser requests a page, the **%P1%** is replaced with Parameter P1's value. This value is extracted from the serial device parameter file.

CGI Scripts

- **Post-Query** is a built-in CGI script that will parse the new values set by the browser and replace them in the **http-host-param** file. See the section entitled Parameters Manipulation from the Browser for more technical information about the **Post-Query** CGI script.
- The MultiConnect IP supports a user-defined CGI script, which performs host-specific processing to the parameters configured by the remote Web browser.

Important: The user-defined CGI-script **MUST** be a shell script.

File Naming and File Size Conventions

The following file naming conventions and file size constraints must be followed by the OEM Web page developer.

File Name(s)	Description
http-s0.HTML	Serial Device Main Page
http-host-param	Default Serial Device Parameter List
http-*.HTML	Any HTML file, should have the filename prefixed with "http-"
cgi-*	Any cgi script should have the filename prefixed with "cgi-"
Constraints	
The HTML file size cannot exceed 30KB Max.	
The Parameter list file cannot exceed 10KB Max.	
The Parameter tags <P1, P2, ...> should be contained in the parameter list.	
The URL for Host Configuration is http-s0.HTML . Therefore, the main page must have the filename http-s0.HTML when the host device's HTML page is uploaded to the MultiConnect IP.	

Uploading the Web Page and Parameter List

The Host Device Files (.HTML, default parameter List....) can be uploaded to the MultiConnect IP using TFTP CLIENT.

It is possible to upload these files in two different ways. In either case, file naming and file size conventions described previously must be followed.

- **Compressed** and **Zipped** formats (tar.gz) or
- **Uncompressed** individual files.

Uploading Compressed and Zipped Files (http.tar.gz)

In order to load files in the compressed (http.tar.gz) format, the following directory structure has to be strictly followed.

```
http/
  HTML/
    http-s0.HTML
    http-host-param
    http-*.HTML
```

```
  cgi-bin/
    cgi-* (Supports only Shell scripts)
```

- Place the HTML files and the default serial device parameter list in the **/http/HTML** directory. All the HTML file-names should be prefixed with **http-**.
- Place the CGI scripts in the **/http/cgi-bin** directory. All the CGI scripts should be prefixed with **cgi-**.
- Create an **http.tar.gz** from the source directory (http/). This file should be in the GZIP format only.
- Upload **http.tar.gz** using any TFTP Client with binary mode set.
- Use the following commands to upload **http.tar.gz** to the MultiConnect IP.

```
[root@admin /root]# tftp 192.168.2.1 (Address of the MultiConnect IP)
tftp>trace
tftp>binary
tftp>verbose
tftp>put http.tar.gz
tftp>quit
```

Upload Uncompressed Files Individually

- Use TFTP client with binary mode set.
- Upload HTML files, the default serial device parameter list, and the CGI bin files individually using the following commands:

```
tftp 192.168.2.92 (IP-Address of the MultiConnect IP)
tftp>verbose
tftp>binary
tftp>trace
tftp>put http-host-param
tftp>put http-s0.HTML.
```
- Upload all the files using the similar command.

Monitoring and Configuring the Host through a Browser

If you have successfully completed the preceding configuration sections and completed the uploading, you are now ready to View, Monitor, and Configure the Host through the Web browser.

In order to view the device home page, enter the IP Address of the MultiConnect IP into the URL Address bar.

Example: <http://192.168.2.1>

The IP address 192.168.2.1 corresponds to the IP address of MultiConnect IP.

Depending upon the configuration selected under **set ip http-page <default/serial>**, the appropriate page is displayed.

- If the http-page is set to **default**, the **index.HTML** page displays or
- If the http-page is set to **serial**, the OEM's customized Web page **http-s0.HTML** displays.

Technical Information

This section describes additional details and implementation suggestions related to the MultiConnect IP.

Parameter Value Display on the Fly

The HTML file can be any valid HTML file. However, it should be ensured that the parameter values, which are to be replaced, are qualified with **%P<n>%**.

Example:

```
<HTML>
-----
-----
Efficiency <input type="text" name = "P1" value = "%P1%">
-----
</HTML>
```

In the above code segment, when the browser requests a page, the **%P1%** is replaced with Parameter P1's value. This value is extracted from the serial device parameter file (**http-host-param**).

Parameter Value Manipulation from the Browser

To update a parameter from the browser, key in the new values and click the **Submit** button.

The **Submit** button in turn invokes the **POST** command as shown below.

```
<form method = "POST" name= "formUPS" ACTION="/cgi-bin/post-query">
```

Post-Query is a built-in CGI script that will parse the new values set by the browser and replace them in the **http-host-param** file.

Should you need to update the newly set parameters in the **http-host-param** file, include the **/cgi-bin/post-query** path in the **ACTION** field of your HTML file. The rest is set by the Post-Query script.

Serial Device Parameter Updating Process

The serial device probes/polls the MultiConnect IP for newly configured parameter values from the browser.

Chapter 13 – SMTP Client

Introduction

SMTP Client is used to establish a TCP session on an SMTP server running on port 25.

SMTP Client supports sending ASCII text or MIME-encoded binary attachment emails with different media types and subtypes from the host/serial device through commands to the MultiConnect IP.

SMTP Client supports the following methods for sending emails:

- To the hosts/email addresses specified in the **command prompt**.
- To the hosts/email addresses **pre-configured**.
- To the hosts/email addresses entered in **interactive mode**.

Command:

```
send-mail [-b]
          [-t "<Email-Id#1, Email-Id#2..>"]
          [-c "<Email-Id#3, Email-Id#4..>"]
          [-s "<subject>"]
          [-d "<message-body>"]
```

Note: All of these commands are optional. The **send-mail** command prompts for the details required if they are neither given as options nor pre-configured. Various scenarios are covered later in this chapter.

Important Notes:

- This application is applicable only in the MultiConnect IP in non-transparent mode.
- This application can be used only after the **PPP link is UP** with an IP Address on the modem port. (Refer to Chapter 6 Prerequisite Configurations - *Physical Link Established over the Modem Port* for more details)
- In the event of PPP link DOWN, the SMTP request triggers PPP link establishment.

Setup and Configuration Prerequisites

The following details are **mandatory** for configuration and have to be validated before sending an email:

- Host Interaction Mode enabled to restrict Telnet-Dialout and PPP.
Command: **set serial <s0> host-interaction-mode enable**
- Set SMTP server name or IP address of maximum length 64 characters.
Command: **set send-mail smtp-server-name <ipaddress/servername>**
- Set SMTP server port.
Command: **set send-mail smtp-server-port <25>**
- Set Host name of maximum length 64 characters.
Command: **set send-mail host-name <hostname>**
- Set From address identity of maximum length 64 characters.
Command: **set send-mail from-address-identity <hostnameidentity>**
- Set From address of maximum length 64 characters.
Command: **set send-mail from-address <email-id>**

Notes: 1. The **send-mail** command prompts for the ERROR message if any of the above details are not configured or not valid.

2. The following configuration suggestions are **optional**:

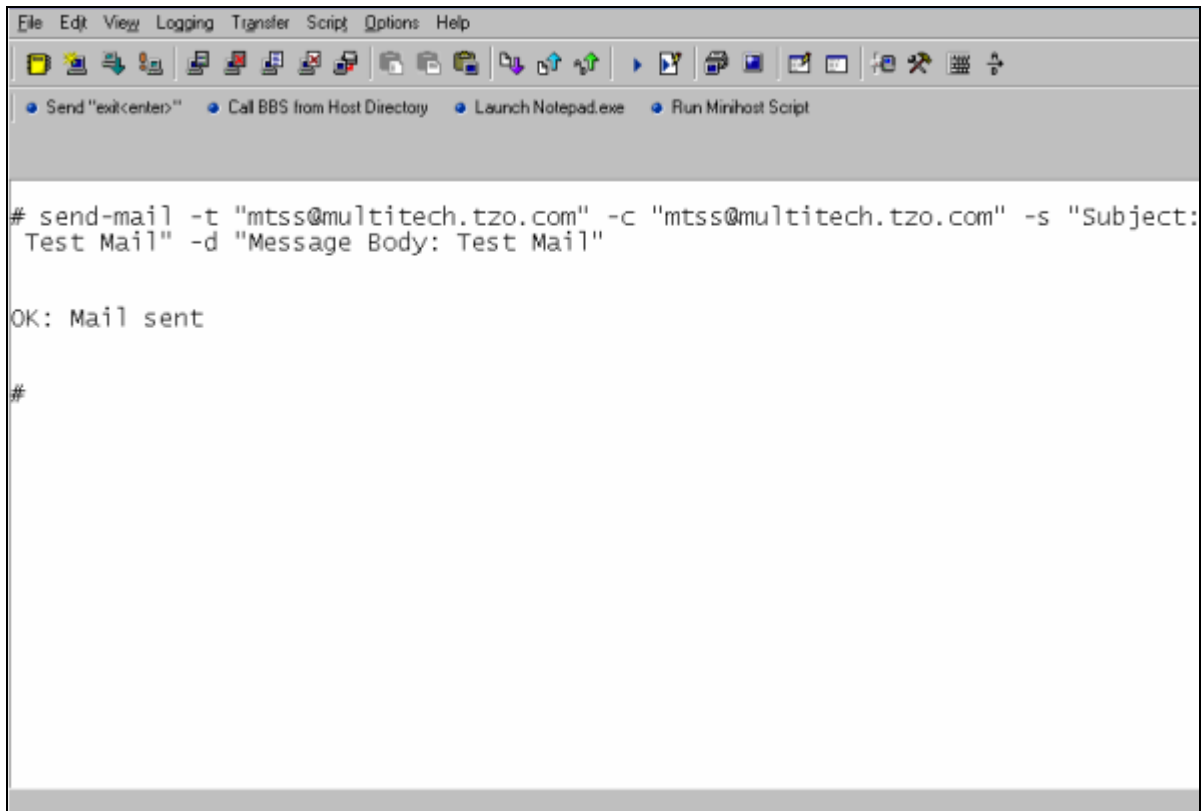
- Set reply-to address of maximum length 64 characters. By default the server takes the **from address** as the reply-to-address.
- If this is configured, this address is taken as the reply to address.
set send-mail reply-to-address <email-ID>

Scenario 1 – Sending a Text Email from the Command Prompt

Issue the following command:

```
send-mail
  -t "<email #1>, <email #2>"
  -c "<email #3>, <email #4>"
  -s "subject data"
  -d "Messagebody"
```

A message is then given as shown in the figure below and the email is sent only to the **to-addresses** (if any) and the **cc-addresses** (if any) entered from the command prompt. The **subject** and **message body** are also taken from the command prompt.



The screenshot shows a terminal window with a menu bar (File, Edit, View, Logging, Transfer, Script, Options, Help) and a toolbar. Below the toolbar, there are four buttons: "Send 'exit:center'", "Call BBS from Host Directory", "Launch Notepad.exe", and "Run Minihost Script". The terminal text shows the command being entered and executed:

```
# send-mail -t "mtss@multitech.tzo.com" -c "mtss@multitech.tzo.com" -s "Subject:
Test Mail" -d "Message Body: Test Mail"

OK: Mail sent

#
```

Notes:

1. The email is **not** sent to addresses pre-configured using set commands.
2. At least one address, either the **to-address** or the **cc-address**, should be given as an alternative for sending email directly from command prompt.
3. If the **subject** option is not specified and is not pre-configured using set commands, SMNP enters into interactive mode and requests a subject to be entered.
4. Type **Ctrl+C** to quit the email at any given time.

Scenario 2 – Sending a Text Email from the Interactive Mode

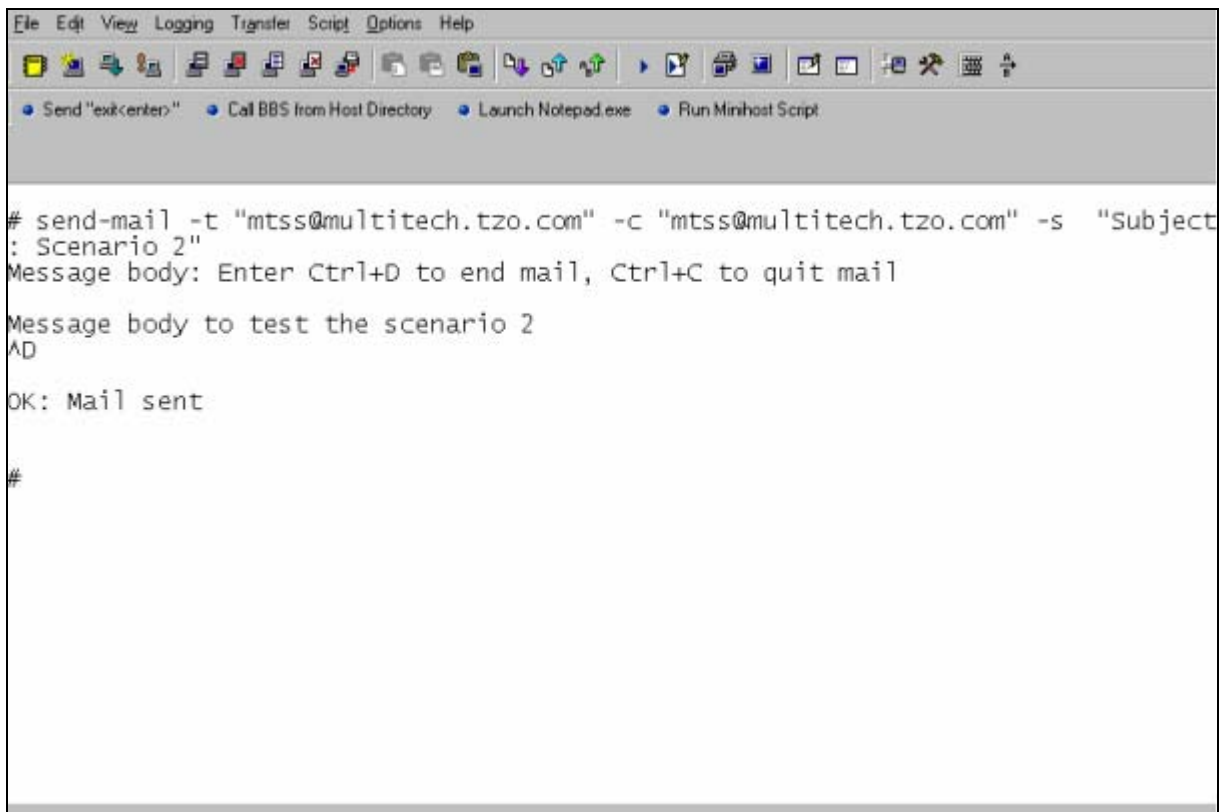
Message body is entered in interactive mode

Issue the following command:

```
send-mail
  -t "<email #1>, <email #2>"
  -c "<email #3>, <email #4>"
  -s "subject data"
```

The SMTP session then enters into interactive mode and requests that the **message body** be entered (see the figure below). After typing the message, type **Ctrl+D** to end the message.

The email is sent only to the **to-addresses** (if any) and the **cc-addresses** (if any) entered from the command prompt. The **subject** is taken from the command prompt.



```
File Edit View Logging Transfer Script Options Help
Send "exitcenter" Call BBS from Host Directory Launch Notepad.exe Run Minihost Script

# send-mail -t "mtss@multitech.tzo.com" -c "mtss@multitech.tzo.com" -s "Subject
: Scenario 2"
Message body: Enter Ctrl+D to end mail, Ctrl+C to quit mail

Message body to test the scenario 2
^D

OK: Mail sent

#
```

Notes:

1. The email is **not** sent to addresses pre-configured using set commands.
2. At least one address, either the **to-address** or the **cc-address**, should be given as an alternative to sending email directly from the command prompt.
3. If the **subject** option is not specified and is not pre-configured using set command, SNMP enters into interactive mode and requests a subject to be entered.
4. Type **Ctrl+C** to quit the email at any given time.

Scenario 3 – Sending a Text Email Using Configuration and Interactive Mode

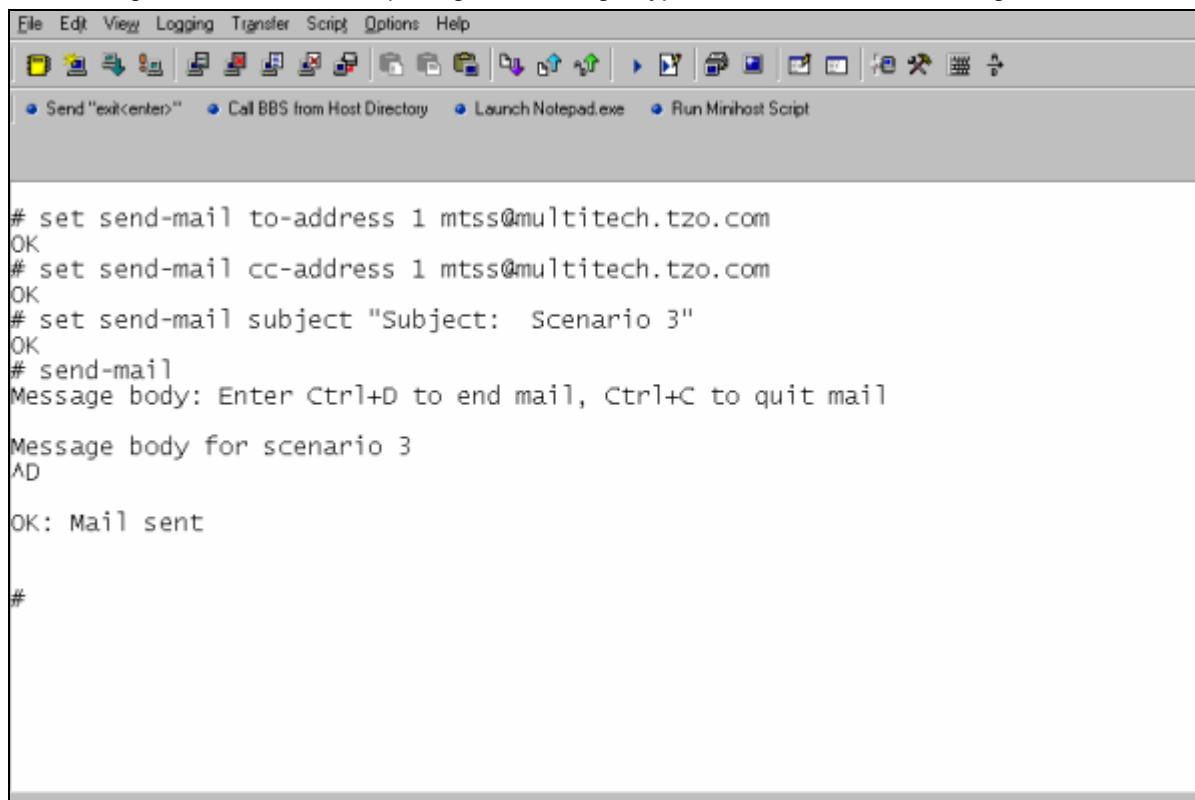
- The to-addresses, cc-addresses, and subject taken from the configuration and
- The message body is entered in interactive mode.

To support this scenario, you must configure the following details in addition to the mandatory configuration

- Set subject data of maximum length 255 characters.
Command: **set send-mail subject subject data**
- Set to-addresses of maximum length 64 characters.
Command: **set send-mail to-address 1 <email-id #1>**
set send-mail to-address 2 <email-id#2>
- Set cc-addresses of maximum length 64 characters.
Command: **set send-mail cc-address 1 <email-ID#3>**
set send-mail cc-address 2 <email-ID#4>

Issue the following command at the serial command prompt: **#send-mail**

The SMTP session then enters into interactive mode and requests that the **message body** be entered as shown in the figure below. After completing the message, type **Ctrl+D** to end the message.



```

File Edit View Logging Transfer Script Options Help
Send "exit<enter>" Call BBS from Host Directory Launch Notepad.exe Run Minihost Script

# set send-mail to-address 1 mtss@multitech.tzo.com
OK
# set send-mail cc-address 1 mtss@multitech.tzo.com
OK
# set send-mail subject "Subject: Scenario 3"
OK
# send-mail
Message body: Enter Ctrl+D to end mail, Ctrl+C to quit mail

Message body for scenario 3
^D
OK: Mail sent

#
  
```

The email is sent only to pre-configured recipients. The subject is also taken from the configuration.

Notes:

1. The email is sent to addresses pre-configured using set commands.
2. At least one address, either the **to-address** or the **cc-address**, should be configured using set commands; otherwise, the SMTP session enters into interactive mode prompting you to enter the required details.
3. If the **subject** option is not specified or is not pre-configured using set commands, SNMP enters into interactive mode and requests a subject to be entered.
4. Type **Ctrl+C** to quit the email at any given time.

Scenario 4 – Sending a Text Email Using No Configuration

*The **to-address**, **cc-address**, and **subject** are NOT configured in this example.*

Issue the following command:

send-mail

The SMTP session then enters into interactive mode requesting the **to-address**, **cc-address**, **subject** and the **message body** to be entered. After entering a message, type **Ctrl+D** to end the message.

The email is sent only to the entered **to-addresses** (if any) and **cc-addresses** (if any). The **subject** and **message body** are taken as given in the interactive mode.

```

File Edit View Logging Transfer Script Options Help
Send "exit:center)" Call BBS from Host Directory Launch Notepad.exe Run Minihost Script

# send-mail
To: mtss@multitech.tzo.com
To:
To address not given

Cc: mtss@multitech.tzo.com
Cc:
Cc address not given

subject: Test the scenario 4
Message body: Enter Ctrl+D to end mail, Ctrl+C to quit mail
Message body to test the scenario 4
^D

OK: Mail sent

# _

```

Notes:

1. The email is sent only to addresses entered in interactive mode.
2. If the **subject** is already configured using set command, it will be taken as the subject for the email.
3. Type **Ctrl+C** to quit the email at any given time.

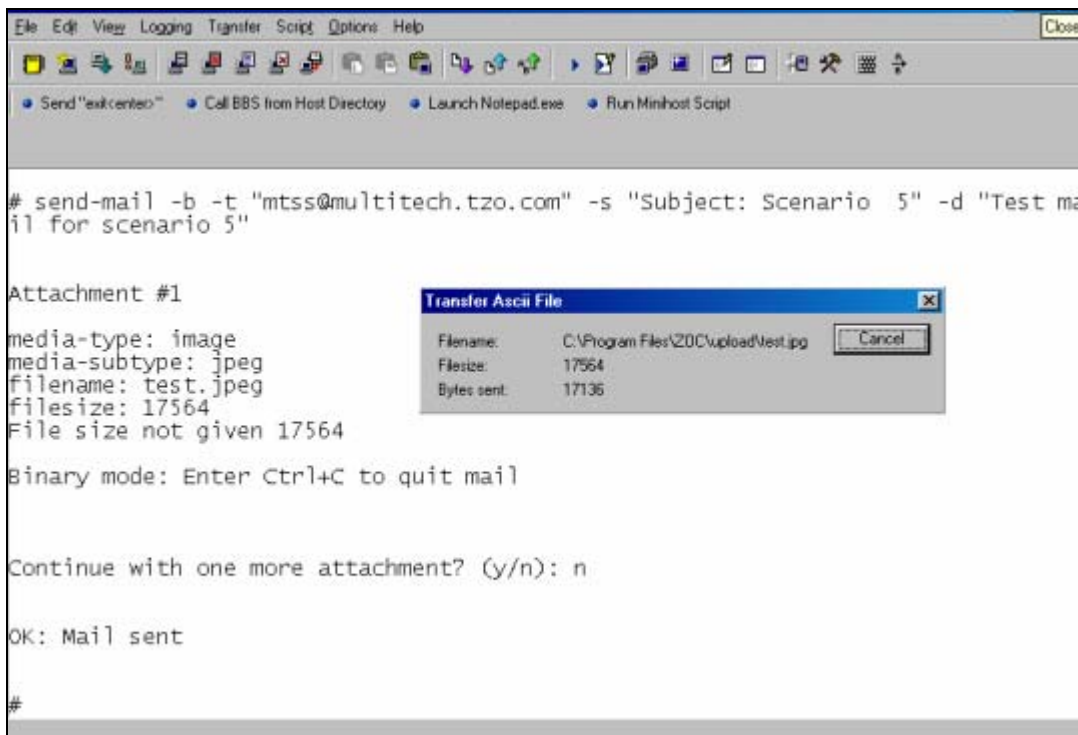
Scenario 5 – Sending a Mime Encoded Binary Attachment Using Command Prompt

The email addresses, subject, and message body are taken from the command prompt.

Issue the following command:

```
send-mail
-b
-t "<email-id #1>, <email-id #2>"
-c "<email-id #3>, <email-id #4>"
-s "subject data"
-d "Message body"
```

The SMTP session then enters into interactive mode requesting media-type, media-subtype, filename, filesize, and the attachment body as shown in this figure.



When the attachment body reaches the filesize, another message is displayed asking whether to continue with one more attachment as shown in figure. Type **n** for **No**. The email with its attachment is sent only to the **to-addresses** (if any) and **cc-addresses** (if any) entered from the command prompt. The **subject** and **message body** are also taken from the command prompt.

Notes:

1. The email is not sent to addresses pre-configured using set commands.
2. At least one address, either the **to-address** or the **cc-address**, should be given as an alternative to sending email directly from command prompt.
3. If the **subject** option is not specified and is not configured using set commands, SMTP enters into interactive mode requesting the **subject** to be entered.
4. Type **Ctrl+C** to quit the email at any given time.
5. If the host wants to quit the email while sending the binary attachment body, type **Ctrl+C** and wait for 3 seconds without entering any character to quit the email.

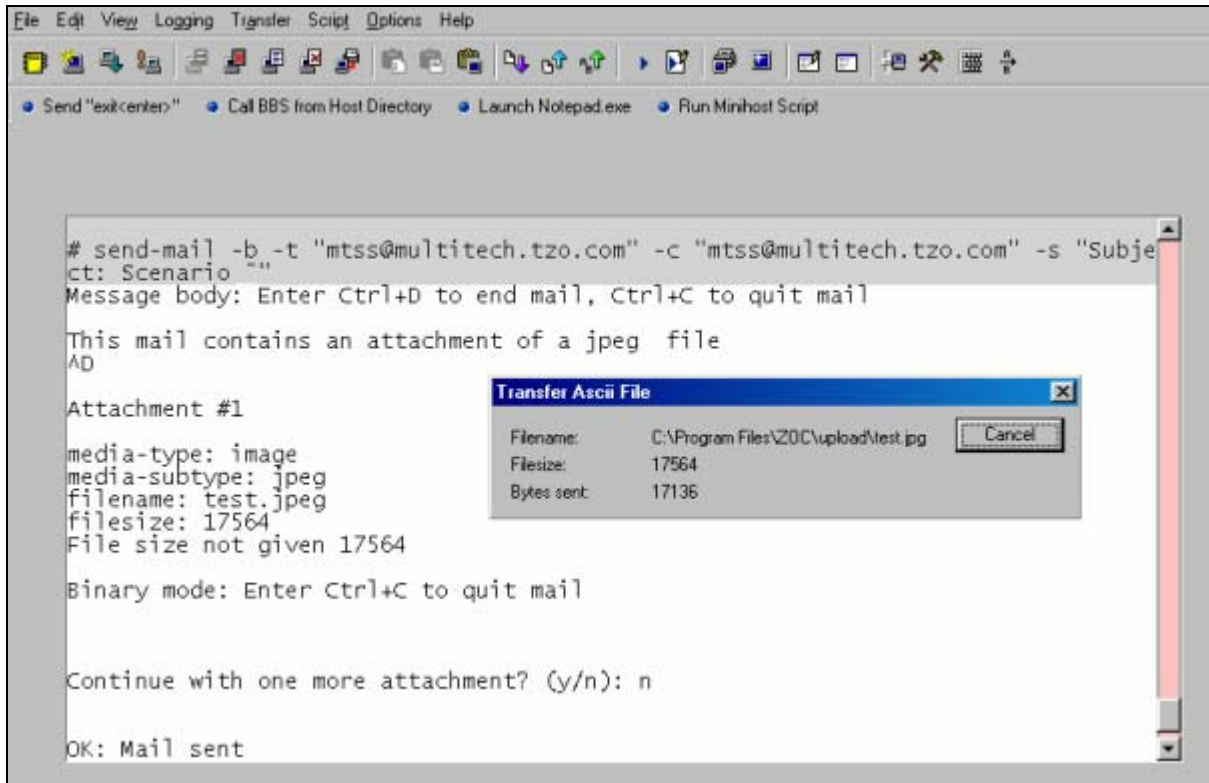
Scenario 6 – Sending a Mime Encoded Binary Attachment Using the Command Prompt

- The *to-address*, *cc-address*, and *subject* are entered through the command prompt
- The message body is entered in the Interactive Mode

Issue the following command:

```
send-mail
-b
-t "<email-id#1>, <email-id#2>"
-c "<email-id#3>, <email-id#4>"
-s "subject data"
```

The SMTP session then enters into interactive mode requesting the **message body** as shown in the figure to be entered. After entering the message, type **Ctrl+D** to end the message.



The SMTP session then enters into interactive mode requesting media-type, media-subtype, filename, filesize, and the attachment body as shown in the figure.

When the attachment body reaches the filesize, another message displays asking whether to continue with one more attachment as shown in the figure. Type **n** for **No**. The email with its attachment is sent only to the **to-addresses** (if any) and **cc-addresses** (if any) entered from the command prompt. The **subject** is taken from the command prompt.

Notes:

1. The email is **not** sent to addresses pre-configured using set commands.
2. At least one address, either **to-address** or **cc-address**, should be given as an option to the command prompt.
3. If the **subject** option is not specified and is not configured using set commands, SMTP enters into interactive mode and requests the subject to be entered.
4. Type **Ctrl+C** to quit the email at any given time.
5. If the host wants to quit the email while sending the binary attachment body, type **Ctrl+C** and wait for 3 seconds without entering any character to quit the email.

Scenario 7 – Sending a Mime Encoded Binary Attachment Using Configuration and Interactive Mode

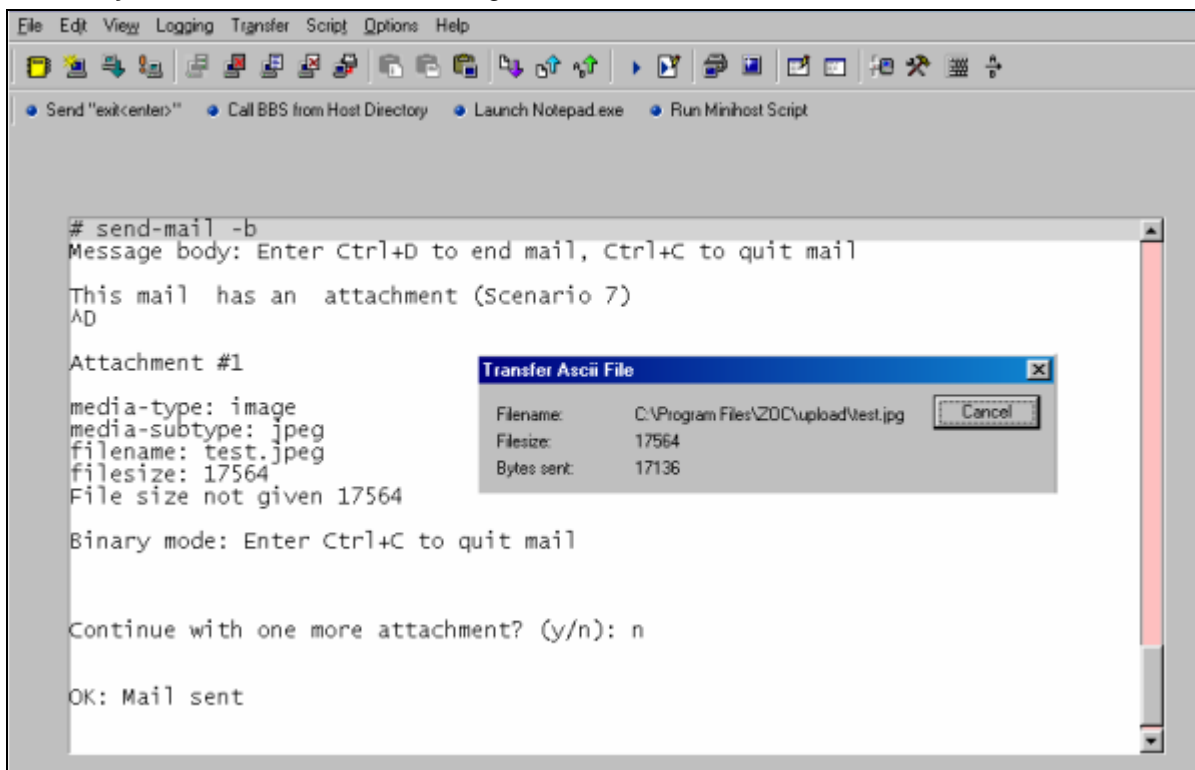
- The to-address, cc-address, and subject are pre-configured.
- The message body is entered in the Interactive Mode.

Configure the following details apart from the mandatory configuration:

- Set subject data of maximum length 255 characters.
Command: **set send-mail subject "subject data"**
- Set to-addresses of maximum length 64 characters.
Command: **set send-mail to-address 1 email-id#1**
set send-mail to-address 2 email-id#2
- Set cc-addresses of maximum length 64 characters.
Command: **set send-mail cc-address 1 email-id#3**
set send-mail cc-address 2 email-id#4

Issue the following command: **# send-mail -b**

The SMTP session then enters into interactive mode requesting the message body to be entered as shown in this figure. After entering the message, type **Ctrl+D** to end the message. When the attachment body reaches the file size, you will be asked whether to continue with one more attachment. Type **n** for **No**. The email with its attachment is sent only to the pre-configured **to-addresses** and **cc-addresses**, if any. The **subject** is also taken from the configuration.



Notes:

1. The email is sent to addresses pre-configured using set commands.
2. At least one address, either the **to-address** or the **cc-address**, should be configured using set commands; otherwise, the SMTP session will enter into interactive mode prompting for the required details to be entered.
3. If the **subject** is not configured using commands, SMTP will request the subject to be entered.
4. Type **Ctrl+C** to quit the email at any given time.
5. If the host wants to quit the email while sending the binary attachment body, type **Ctrl+C** and wait for 3 seconds without entering any character.

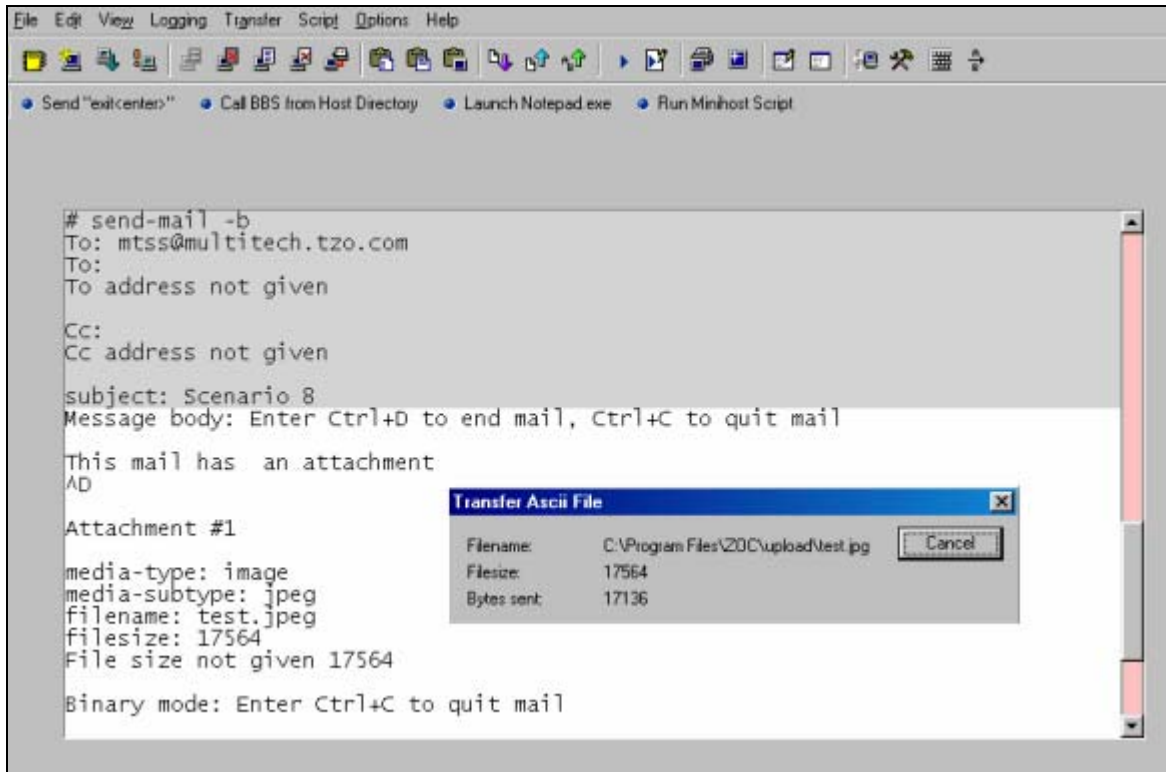
Scenario 8 – Sending a Mime Encoded Binary Email with Attachment Using Interactive Mode

Issue the following command: **send-mail -b**

The SMTP session then enters into interactive mode requesting the **to-address**, the **cc-address**, **subject**, and **message body** to be entered. After completion of the message, type **Ctrl+D** to end the message.

The SMTP session in interactive mode requests media-type, media-subtype, filename, filesize, and the attachment body as shown in the figure.

When the attachment body reaches the filesize, another message is displayed asking whether to continue with one more attachment. Type **n** for **No**. The email with its attachment is sent only to the entered **to-addresses** (if any) and **cc-addresses** (if any). The **subject** and **message body** are used as entered in the interactive mode.



Notes:

1. The email is sent only to addresses entered in interactive mode.
2. If the **subject** is pre-configured using set commands, it will be used as the subject for the email.
3. Type **Ctrl+C** to quit the email at any given time.
4. If the host wants to quit the email while sending the binary attachment body, type **Ctrl+C** and wait for 3 seconds without entering any character to quit the email.

Chapter 14 – POP3 Client

Introduction

The MultiConnect IP can be configured as a POP3 client to retrieve emails from a POP3 server. The POP3 client, available in MultiConnect IP, can do the following:

- List the number of messages and message sizes
- Retrieve the header information of messages
- Retrieve the complete email
- Retrieve the top 'n' lines of a message
- Delete an email on the server
- Retrieve the unique email ID listing

Important Notes:

- This application is applicable only in the non-transparent mode.
- This application can be used only after the **PPP link is UP** with an IP Address on the modem port. (Refer to Chapter 6 Prerequisite Configurations - *Physical Link Established Over the Modem Port* for more details)
- In the event of PPP link DOWN, the POP3 request triggers PPP link establishment.

Setup and Configuration Prerequisites

To fulfill the prerequisites for receiving/retrieving emails from the email server, configure the following parameters:

- pop3 server name/ip address
Command: **set rcv-mail server-name <server-name>**
- pop3 port number
Command: **set rcv-mail server-port <port-number>**
- pop3 account/user name
Command: **set rcv-mail mailbox-name <account/user name>**
- pop3 account/user password
Command: **set rcv-mail mailbox-password <account/user password>**

These commands need to be executed only to set the initial configuration. However, they must be executed whenever a parameter is changed.

Example

Assuming that the POP3 server is **192.168.2.10**, POP3 port is **110**, account/user name is **mtss**, and the account/user password is **mtsspass**, execute the following commands to configure the MultiConnect IP to retrieve emails.

```
set rcv-mail server-name 192.168.2.10
OK
set rcv-mail server-port 110
OK
set rcv-mail mailbox-name mtss
OK
set rcv-mail mailbox-password mtsspass
OK
```

Example of the *show rcv-mail* configuration

Use the **show rcv-mail** configuration to check the configuration.

```
+-----+
|                pop3 configuration                |
+-----+
| server-name      : 192.168.2.10 |
| server-port      : 110          |
| mailbox-name     : mtss         |
| mailbox-password : mtsspass    |
+-----+
```

If any of the above fields are missing, then the email cannot be retrieved.

Optional Configuration for Deleting Emails from the Server

An optional parameter that can be configured is:

```
# rcv-mail leave-mail-on-server disable
OK
```

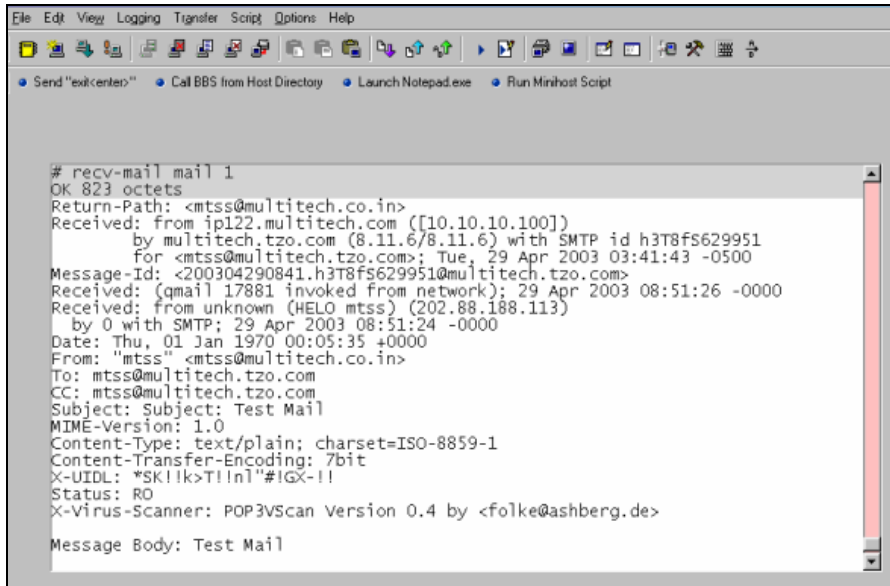
The command **rcv-mail leave mail on server <enable/disable>** is used to indicate that email retrieved from the POP3 server should be deleted.

If **leave mail on server** is **disabled**, then an email retrieved from the POP3 server using the commands **rcv-mail mail** or **rcv-mail mail <n>**, where **n** is the message number, is deleted from the POP3 server. The default value is **enable**.

Scenario 1 – Retrieving Emails

The command **recv-mail mail** can be used to retrieve all the emails from a POP3 server. This command will retrieve all the email with headers, message body, and attachments.

The command **recv-mail mail <n>**, where **n** is the message number, can be used to retrieve the **nth** message.



```

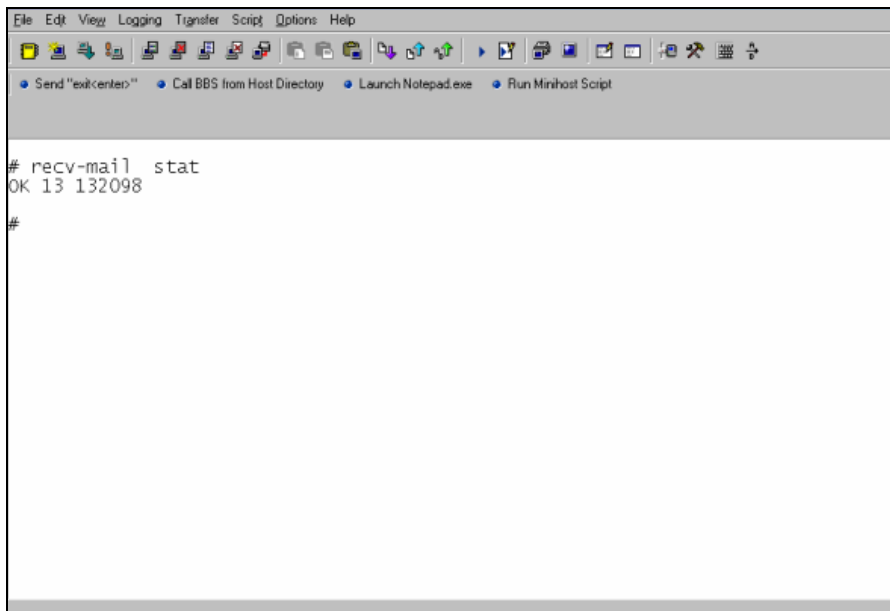
File Edit View Logging Transfer Script Options Help
Send "exit:center" Call BBS from Host Directory Launch Notepad.exe Run Minihost Script

# recv-mail mail 1
OK 823 octets
Return-Path: <mtss@multitech.co.in>
Received: from ip122.multitech.com ([10.10.10.100])
    by multitech.tzo.com (8.11.6/8.11.6) with SMTP id h3T8fs629951
    for <mtss@multitech.tzo.com>; Tue, 29 Apr 2003 03:41:43 -0500
Message-Id: <200304290841.h3T8fs629951@multitech.tzo.com>
Received: (qmail 17881 invoked from network); 29 Apr 2003 08:51:26 -0000
Received: from unknown (HELO mtss) (202.88.188.113)
    by 0 with SMTP; 29 Apr 2003 08:51:24 -0000
Date: Thu, 01 Jan 1970 00:05:35 +0000
From: "mtss" <mtss@multitech.co.in>
To: mtss@multitech.tzo.com
CC: mtss@multitech.tzo.com
Subject: Subject: Test Mail
MIME-Version: 1.0
Content-Type: text/plain; charset=ISO-8859-1
Content-Transfer-Encoding: 7bit
X-UIDL: *SKllk>T!lnl"#lGX-!!
Status: RO
X-Virus-Scanner: POP3VScan Version 0.4 by <folke@ashberg.de>

Message Body: Test Mail
  
```

Scenario 2 – Retrieving the Number of Emails and the Total Email Size

Use the command **recv-mail stat** to retrieve the number of emails and the total email size in octets. The output is single line.



```

File Edit View Logging Transfer Script Options Help
Send "exit:center" Call BBS from Host Directory Launch Notepad.exe Run Minihost Script

# recv-mail stat
OK 13 132098
#
  
```

Scenario 3 – Retrieving the Email List

Use the command **recv-mail list** to retrieve the email list containing the message number and the size of the individual messages (in octets). The output is multi-lined.

Use the command **recv-mail list <n>** to retrieve the message size of the **n**th message. The output is multi-lined.

```
# recv-mail list
OK 13 visible messages (132098 octets)
1 781
2 781
3 794
4 794
5 786
6 786
7 795
8 795
9 25188
10 25188
11 25134
12 25131
13 25145
# -
```

Scenario 4 – Retrieving Emails Headers

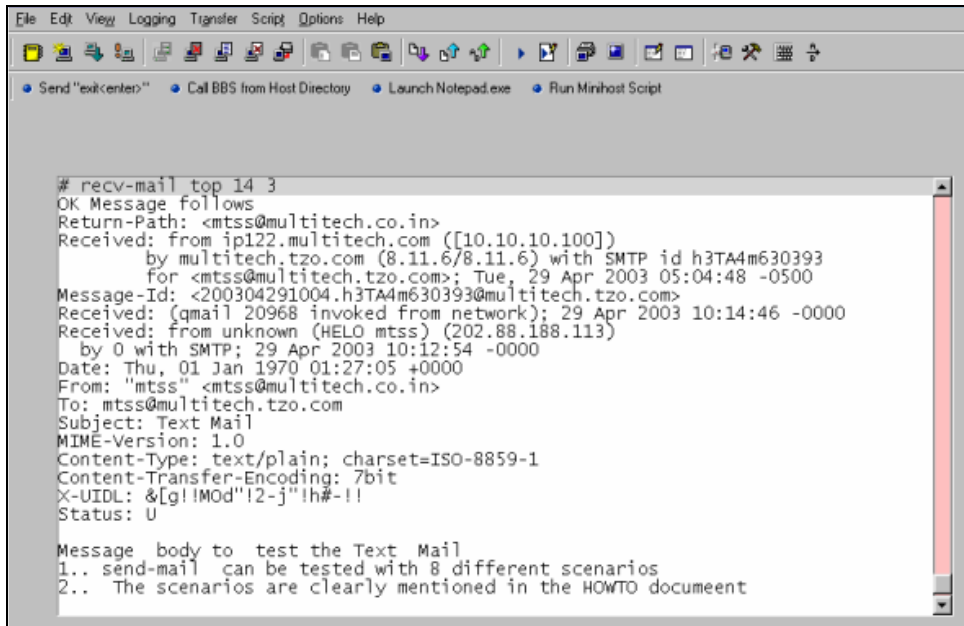
Use the command **recv-mail header** to retrieve the message header of all emails. The output is multi-lined.

Use the command **recv-mail header <n>** to retrieve the message header of the **n**th email. The output is multi-lined.

```
# recv-mail header 1
OK Message follows
Return-Path: <mtss@multitech.co.in>
Received: from ip122.multitech.com ([10.10.10.100])
    by multitech.tzo.com (8.11.6/8.11.6) with SMTP id h3T8fS629951
    for <mtss@multitech.tzo.com>; Tue, 29 Apr 2003 03:41:43 -0500
Message-Id: <200304290841.h3T8fS629951@multitech.tzo.com>
Received: (gmail 17881 invoked from network); 29 Apr 2003 08:51:26 -0000
Received: from unknown (HELO mtss) (202.88.188.113)
    by 0 with SMTP; 29 Apr 2003 08:51:24 -0000
Date: Thu, 01 Jan 1970 00:05:35 +0000
From: "mtss" <mtss@multitech.co.in>
To: mtss@multitech.tzo.com
CC: mtss@multitech.tzo.com
Subject: Subject: Test Mail
MIME-Version: 1.0
Content-Type: text/plain; charset=ISO-8859-1
Content-Transfer-Encoding: 7bit
X-UIDL: *SK!Ik>T!In! "#!GX-!!
Status: RO
#
```

Scenario 5 – Retrieving First t Lines

To retrieve the first few lines of an email, use the command **recv-mail top <n> <t>**, where **n** is the message number and **t** is the number of lines to be retrieved. This command shows the message headers and the first **t** number of lines. The output is multi-lined.



```
File Edit View Logging Transfer Script Options Help
Send "exit:center" Call BBS from Host Directory Launch Notepad.exe Run Minihost Script

# recv-mail top 14 3
OK Message follows
Return-Path: <mtss@multitech.co.in>
Received: from ip122.multitech.com ([10.10.10.100])
    by multitech.tzo.com (8.11.6/8.11.6) with SMTP id h3TA4m630393
    for <mtss@multitech.tzo.com>; Tue, 29 Apr 2003 05:04:48 -0500
Message-Id: <200304291004.h3TA4m630393@multitech.tzo.com>
Received: (qmail 20968 invoked from network); 29 Apr 2003 10:14:46 -0000
Received: from unknown (HELO mtss) (202.88.188.113)
    by 0 with SMTP; 29 Apr 2003 10:12:54 -0000
Date: Thu, 01 Jan 1970 01:27:05 +0000
From: "mtss" <mtss@multitech.co.in>
To: mtss@multitech.tzo.com
Subject: Text Mail
MIME-Version: 1.0
Content-Type: text/plain; charset=ISO-8859-1
Content-Transfer-Encoding: 7bit
X-UIDL: &[g!MOD"!2-j"!h#-!!
Status: U

Message body to test the Text Mail
1.. send-mail can be tested with 8 different scenarios
2.. The scenarios are clearly mentioned in the HOWTO documeent
```

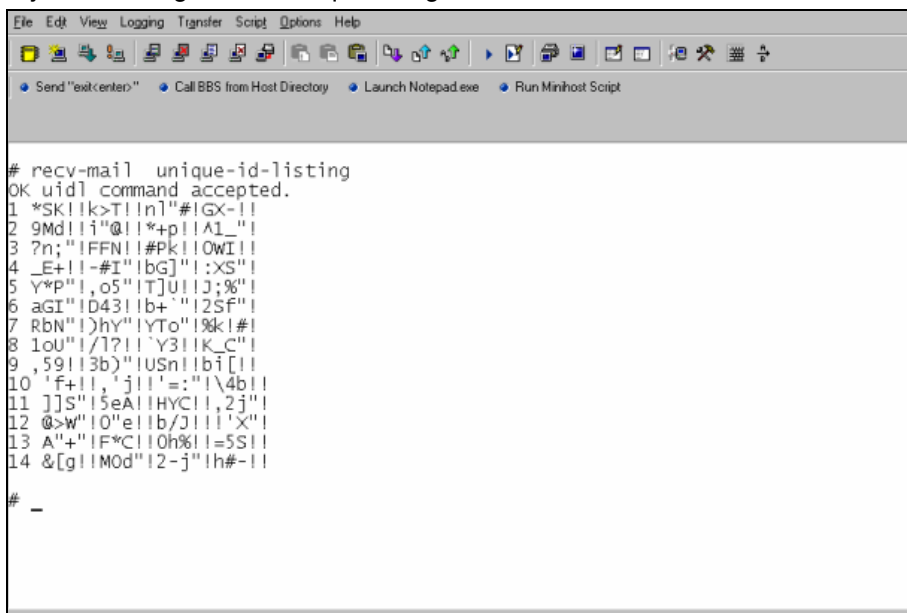
Scenario 6 – Deleting an Email on the Server

Use the command **recv-mail delete <n>**, where **n** is the message number of the email that should be deleted from the server.

```
# recv-mail delete 1
OK
```

Scenario 7 – Retrieving the Unique Email ID

Use this command to retrieve the unique email ID of a message. The unique message ID is used to identify the message with a unique string.



```
File Edit View Logging Transfer Script Options Help
Send "exit:center" Call BBS from Host Directory Launch Notepad.exe Run Minihost Script

# recv-mail unique-id-listing
OK uidl command accepted.
1 *SK!!k>T!!n!#!GX-!!
2 9Md!!i"@!!*+p!!A1_!!
3 ?n;!FFN!!#Pk!!OWI!!
4 _E+!!-#I"!bG"!!:XS!!
5 Y*P"! ,o5"!T!U!!J;%!!
6 aGI"!D43!!b+""!2SF!!
7 RbN"!>hy"!YTo"!%k!#!
8 loU"!/?!!Y3!!K_C"!
9 ,59!!3b)!!USn!!bi[!!
10 'f+!! ,j!!="!!\4b!!
11 ]]S"!5eA!!HYC!! ,2j!!
12 @>w"!O"!e!!b/J!!!X!!
13 A"+"!F*C!!0h%!!=S!!
14 &[g!MOD"!2-j"!h#-!!

# _
```

Error Messages

- **ERROR Invalid parameters. Check POP3 parameters**

This error message is displayed if the POP3 parameters are not configured correctly. See prerequisites for POP3.

- **ERROR: Set up failed**

This error occurs if the server is not accessible or the POP3 client is not able to connect to the POP3 server on the configured port.

- **ERROR: Unable to login**

This error occurs if the POP3 client could not authenticate to the POP3 server. This could happen when the username or password is not valid.

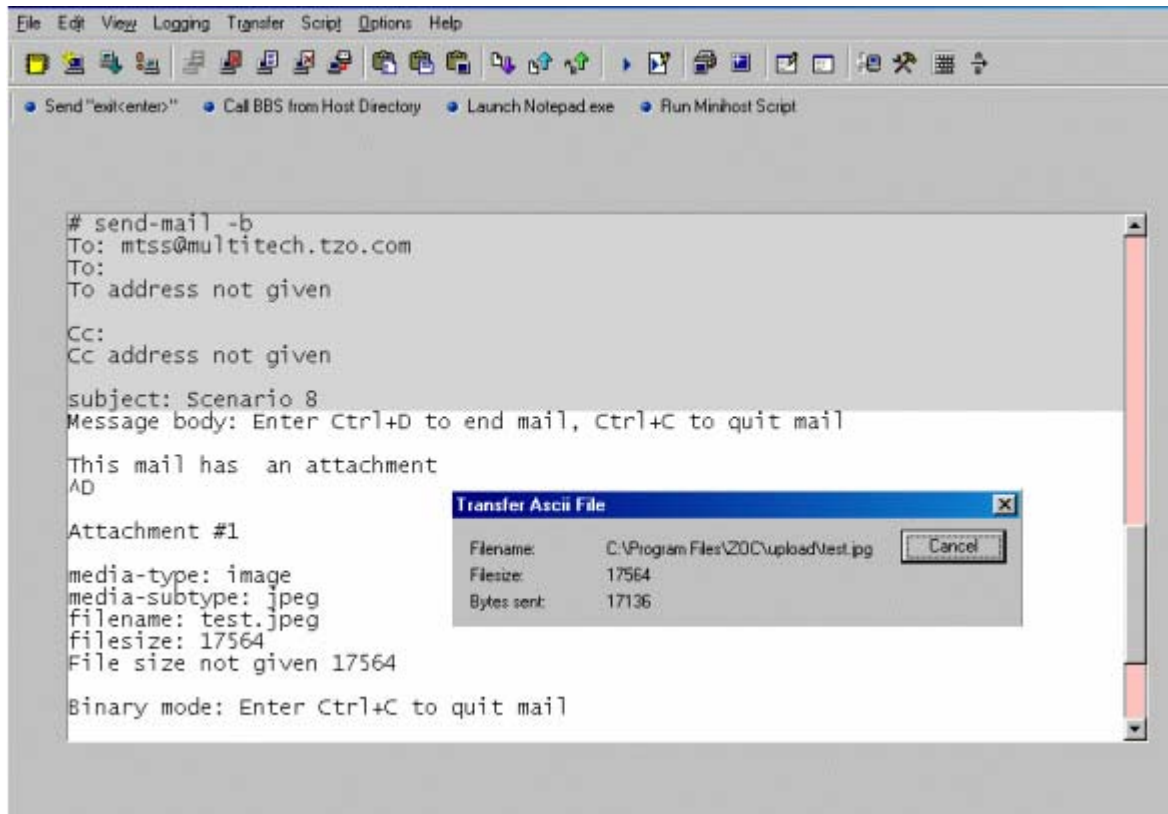
- **Other errors**

Other errors might occur due to **timeout, none availability of resources**, etc.

Scenario 8 – Sending a Mime Encoded Binary Email Using Interactive Mode

Issue the following command: **send-mail -b**

The SMTP session then enters into interactive mode requesting the **to-address**, the **cc-address**, **subject**, and **message body** to be entered. After completion of the message, type **Ctrl+D** to end the message.



The SMTP session enters into interactive mode requesting media-type, media-subtype, filename, filesize, and the attachment body as shown in the figure.

When the attachment body reaches the filesize, another message is displayed asking whether to continue with one more attachment. Type **n** for **No**. The email with its attachment is sent only to the entered **to-addresses** (if any) and **cc-addresses** (if any). The **subject** and **message body** are used as entered in the interactive mode.

Notes:

1. The email is sent only to addresses entered in interactive mode.
2. If the **subject** is pre-configured using set commands, it will be used as the subject for the email.
3. Type **Ctrl+C** to quit the email at any given time.
4. If the host wants to quit the email while sending the binary attachment body, type **Ctrl+C** and wait for 3 seconds without entering any character to quit the email.

Chapter 15 – FTP Client

Introduction

The FTP Client is used to establish a TCP session to the FTP server running on port 21. This chapter covers the FTP Client Features and provides you with ten FTP Client Scenarios.

FTP Client Features

- Supports automatic authentication to the FTP server depending on the configuration.
- Supports listing the contents of the specified directory of the FTP server
- Supports active and passive modes of data transfer.
- Supports sending files from the host/serial device to the FTP server.
- Supports receiving files from the FTP server to the host/serial device.

Command to List Directory Contents or to Send/Receive Files

The host/serial device can use the following command to list the contents of the directory or to send/receive text/binary files to/from a remote server depending upon the requirement.

ftp < [-l] [-t] [-r] > [-p] <ip-address/host-name>

The FTP command will prompt for the details required if these details were not configured previously.

Important:

1. The user must have access permission to perform the above functionality.
2. FTP client cannot be accessed through a Telnet session.
3. By default, the data connection is in active mode. This can be optionally changed to passive mode by using **-p** option in the command.
4. By default, the Format control is set to NON_PRINT, the structure type is set to FILE, and the Transmission mode is set to STREAM mode in the client.
5. The file transfer can be done only if the server supports BINARY/IMAGE data type.
6. The file can be received only if the server supports SIZE command.

Prerequisites

The host/serial device must ensure the validity of the following details before using FTP client:

1. If the host device wants to use domain names instead of an IP address for a remote server, then the following parameters must be set:
 - Default Gateway should be configured to a valid IP address.
`# set ip def-gway <ip-address>`
 - DNS should be enabled.
`# set ip dns <enable>`
 - DNS address should be configured to a valid ip-address.
`# set ip pri-dns <ip-address>`
2. If you want the host device to use automatic authentication to a particular FTP server, then set the following parameters:
 - **Mandatory:** The device name should be configured to a valid the IP address/host-name. The login name should be set to a valid user name.
`#set ftp machine <ip-address/host-name/default> login <user-name>`
 - **Optional:** The password can be optionally configured as the password corresponding to the user name.
`# set ftp machine <ip-address/host-name/default> login <user-name> password <passwd>`
 - **Optional:** The account password can be optionally configured as the password corresponding to the user name. This is an extra authentication that can be used when an FTP server asks for an account password.
`# set ftp machine <ip-address/host-name/default> login <user-name> password <passwd> account <passwd>`

ERROR Messages

An ERROR message displays if any of the above details are not configured or are not valid.

How to Delete a Previous Configuration

The previous configuration can be deleted by specifying the following command:

"set ftp machine" without any arguments.

Notes:

- If a value is configured as the default, the FTP client tries to authenticate for every FTP server.
- If the above mandatory fields are not configured or if the configured device and the server specified in the command line are different, MultiConnect IP prompts the user to enter login name and password.

Scenario 1 - Listing Directory Contents

This scenario describes how to list the contents of the specified directory of the FTP server without Automatic Authentication (default) and the data connection in ACTIVE mode.

Description	The MultiConnect IP establishes the control connection to the specified FTP server and prompts the host device to enter the login name, password: <pre>Name (ip-address:admin): mtss <CR> Password: **** <CR></pre> If successfully logged in, MultiConnect IP sends a message and prompts the host device to enter the <i>remote directory</i>, the contents of which will then be displayed. <pre>Connected Remote directory: <CR> or <Directory-Path></pre> If the Host simply enters <CR> without specifying the directory, then the contents of the present working directory are listed. If the complete path of the directory is given, then the contents of that directory are listed. By default the data connection is in active mode. The client sets the data transfer mode as 'ASCII' to receive the list of contents of the directory.
Configuration	None
Command	<code>ftp -l ip-address</code>
Result Response	OK: FTP session closed

Scenario 2 - Listing Directory Contents

This scenario describes how to list the contents of the specified directory of the FTP server without Automatic Authentication (default) and the data connection in PASSIVE mode.

Description	The MultiConnect IP establishes the control connection to the specified FTP server and prompts the host device to enter the login name, password: <pre>Name (ip-address:admin): mtss <CR> Password: **** <CR></pre> If successfully logged in, MultiConnect IP sends a message and prompts the host device to enter the <i>remote directory</i>, the contents of which will then be displayed. <pre>Connected Remote directory: <CR> or <Directory-Path></pre> If the Host simply enters <CR> without specifying the directory, then the contents of the present working directory are listed. If the complete path of the directory is given, then the contents of that directory are listed. The data connection is in passive mode due to the '-p' option. The client sets the data transfer mode as 'ASCII' to receive the list of contents of the directory.
Configuration	None
Command	<code>ftp -l -p ip-address</code>
Result Response	OK: FTP session closed

Scenario 3 - Listing Directory Contents

This scenario describes how to list the contents of the specified directory of the FTP server

- a) With Automatic Authentication enabled by specifying all authentication details: IP address of the device, valid login name, valid password, and valid account password.
- b) Data connection in ACTIVE mode.

Description	The MultiConnect IP establishes a control connection, automatically checks for the configured values, and logs into the FTP server. If successfully logged in, it sends a message and prompts the host device to enter the <i>remote directory</i>, the contents of which are then displayed as follows: <pre>Connected Remote directory: <CR> or <Directory-Path></pre> If the Host simply enters <CR> without specifying the directory, then the contents of the present working directory are listed. If the complete path of the directory is given, then the contents of that directory are listed. By default the data connection is in active mode. The client sets the data transfer mode as 'ASCII' to receive the list of contents of the directory. Note: If the '-p' option is specified in the command, the data connection will be in passive mode
Configuration	<pre>set FTP device <ip-address/host-name> login <user-name> password <passwd> account <passwd></pre>
Command	<pre>ftp -l [-p] ip-address</pre>
Result Response	OK: FTP session closed

Scenario 4 - Listing Directory Contents

This scenario describes how to list the contents of the specified directory of the FTP server

- a) With Automatic Authentication enabled by specifying a few authentication details: IP address of the device and a valid login name.
- b) Data connection in ACTIVE mode.

Description	The MultiConnect IP establishes a control connection, automatically checks for the configured values, and logs into the FTP server. If the user is a valid user, the host device is prompted to enter Password as shown here: <pre>Password: *** <CR></pre> If successfully logged in, the MultiConnect IP sends a message and prompts the host device to enter the <i>remote directory</i>, the contents of which are then displayed as follows: <pre>Connected Remote directory: <CR> or <Directory-Path></pre> If the Host simply enters <CR> without specifying the directory, then the contents of the present working directory are listed. If the complete path of the directory is given, then the contents of that directory are listed. By default the data connection is in active mode. The client sets the data transfer mode as 'ASCII' to receive the list of contents of the directory. Note: If the '-p' option is specified in the command, the data connection will be in passive mode
Configuration	<pre>set ftp machine <ip-address/host-name> login <user-name></pre>
Command	<pre>ftp -l [-p] ip-address</pre>
Result Response	OK: FTP session closed

Scenario 5 - Sending a File to the FTP Server

This scenario describes how to send a file to the FTP server:

- a) Without Automatic Authentication (default).
- b) Data connection in ACTIVE mode.

Description	The MultiConnect IP establishes a control connection to the specified FTP server and prompts the host device to enter the login name and password as shown here: <pre>Name (ip-address:admin): mtss <CR> Password: **** <CR></pre> If successfully logged in, the MultiConnect IP sends a message and prompts the host device to enter Filename and Filesize and sends a message as shown here: <pre>Connected Filename: filename <CR> Filesize: filesize <CR> Enter data. To terminate press Ctrl + C with 3 seconds delay. ----- File Transfer ----</pre> When the specified filesize is reached, the FTP session responds with the OK message. By default the data connection is in active mode. The client sets the data transfer mode as 'BINARY/IMAGE' during the file transfer. Note: If the '-p' option is specified in the command, the data connection will be in passive mode
Configuration	None
Command	<code>ftp -t [-p] ip-address</code>
Result Response	OK: FTP session closed

Scenario 6 - Sending a File to the FTP Server

This scenario describes how to send a file to the FTP server:

- a) With Automatic Authentication enabled by specifying all authentication details: IP address of the device, valid login name, valid password, and valid account password.
- b) Data connection in ACTIVE mode.

Description	The MultiConnect IP establishes a control connection, automatically checks for the configured values, and logs into the FTP server. If successfully logged in, it sends a message and prompts the host device to enter Filename, Filesize, and then it sends a message as shown here: <pre>Connected Filename: filename <CR> Filesize: filesize <CR> Enter data. To terminate press Ctrl + C with 3 seconds delay ----- File Transfer ----</pre> When the specified filesize is reached, the FTP session responds with the OK message. By default the data connection is in active mode. The client sets the data transfer mode as 'BINARY/IMAGE' during the file transfer. Note: If the '-p' option is specified in the command, the data connection will be in passive mode
Configuration	set ftp machine <ip-address/host-name> login <user-name> password <passwd> account <passwd>
Command	<code>ftp -t [-p] ip-address</code>
Result Response	OK: FTP session closed

Scenario 7 - Sending a File to the FTP Server

This scenario describes how to send a file to the FTP server:

- With Automatic Authentication enabled by specifying a few authentication details: IP address of the device and valid login name.
- Data connection in ACTIVE mode.

Description	The MultiConnect IP establishes the control connection to the specified FTP server, automatically checks for the configured values, and logs into the FTP server. If the user is valid, the MultiConnect IP prompts the host device to enter the Password as below: Password: **** <CR> If successfully logged in, the MultiConnect IP sends a message and prompts the host device to enter Filename and Filesize and sends a message as shown here: Connected Filename: filename <CR> Filesize: filesize <CR> Enter data. To terminate press Ctrl + C with 3 seconds delay. ----- File Transfer ----- When the specified filesize is reached, the FTP session responds with the OK message. By default the data connection is in active mode. The client sets the data transfer mode as 'BINARY/IMAGE' during the file transfer. Note: If the '-p' option is specified in the command, the data connection will be in passive mode
Configuration	set ftp machine <ip-address/host-name> login <user-name>
Command	ftp -t [-p] ip-address
Result Response	OK: FTP session closed

Scenario 8 - Receiving a File from the FTP Server

This scenario describes the receiving of a file from the FTP server:

- Without Automatic Authentication (default).
- Data connection in ACTIVE mode.

Description	The MultiConnect IP establishes a control connection to the specified FTP server and prompts the host device to enter the login name and password as shown here: Name (ip-address:admin): mtss <CR> Password: **** <CR> If successfully logged in, the MultiConnect IP sends a message and prompts the host device to enter Filename and sends a message as shown here: Connected Filename: filename <CR> size = <filesize from server> Press <CR> to receive file <CR> ----- File Transfer ----- When the complete file is received, the FTP session responds with OK. By default the data connection is in active mode. The client sets the data transfer mode as 'BINARY/IMAGE' during the file transfer. Note: If the '-p' option is specified in the command, the data connection will be in passive mode
Configuration	None
Command	ftp -r [-p] ip-address
Result Response	OK: FTP session closed

Scenario 9 - Receiving a File from the FTP Server

This scenario describes the receiving of a file from the FTP server:

- a) With Automatic Authentication enabled by specifying all authentication details: IP address of the device, valid login name, valid password, and valid account password.
- b) Data connection in ACTIVE mode.

Description	The MultiConnect IP establishes a control connection, automatically checks for the configured values, and logs into the FTP server. If successfully logged in, the MultiConnect IP sends a message and prompts the host device to enter the Filename, and then it sends a message as shown here: <pre> Connected Filename: filename <CR> size = <filesize from server> Press <CR> to receive file <CR> ----- File Transfer ----- </pre> When the complete file is received, the FTP session responds with OK. By default the data connection is in active mode. The client sets the data transfer mode as 'BINARY/IMAGE' during the file transfer. Note: If the '-p' option is specified in the command, the data connection will be in passive mode
Configuration	<pre>set ftp machine <ip-address/host-name> login <user-name> password <passwd> account <passwd></pre>
Command	<pre>ftp -r [-p] ip-address</pre>
Result Response	<pre>OK: FTP session closed</pre>

Scenario 10 - Receiving a File from the FTP Server

This scenario describes the receiving of a file from the FTP server:

- a) With Automatic Authentication enabled by specifying a few authentication details: IP address of the device and a valid login name
- b) Data connection in ACTIVE mode.

Description	The MultiConnect IP establishes a control connection to the specified FTP server, automatically checks for the configured values, and logs into the FTP server. If the user is a valid user, the MultiConnect IP prompts the host device to enter the Password shown here: Password: **** <CR> If successfully logged in, the MultiConnect IP sends a message and prompts the host device to enter a Filename, and then it sends a message as below: Connected Filename: filename <CR> size = <filesize from server> Press <CR> to receive file <CR> ----- File Transfer ---- When the complete file is received, the FTP session responds with OK. By default the data connection is in active mode. The client sets the data transfer mode as 'BINARY/IMAGE' during the file transfer. Note: If the '-p' option is specified in the command, the data connection will be in passive mode
Configuration	set ftp machine <ip-address/host-name> login <user-name>
Command	ftp -r [-p] ip-address
Result Response	OK: FTP session closed

How to Close or Abort the FTP Session

The host can abort the FTP session by issuing “Ctrl+C” at any given time.

How to Abort a File Transfer Session

The host can abort the file transfer by issuing “Ctrl+C” with a delay of 3 seconds. The file into which data was written will be deleted by the client, and the data connection will be closed.

Note About Read and Store

The serial device has to read and store the data received. It has to implement timeout mechanisms to come out in cases where the network is prone to errors.

Chapter 16 – SNTP Client

Introduction

SNTP Client is used to synchronize timekeeping among a set of distributed time servers and clients. It is built on the IP and UDP, which provide a connectionless transport mechanism.

Features

- Supports SNTP client built on UDP (port 123) to update the local time after booting and at periodic intervals.
- Supports to set Standard Name of Time Zone.
- Supports to set offset from UTC.
- Supports Daylight savings feature.
- Supports the configuration of Offset During Daylight Savings, Start of Daylight Savings Time, and End of Daylight Savings Time.

Command to Enable/Disable SNTP Client

The host/serial device can use the command below to enable/disable the SNTP client.

```
# set sntp-client <enable/disable>
```

Prerequisites

Mandatory Prerequisites: The following details are **mandatory** configuration and have to be validated before starting SNTP client:

- Set NTP server name or IP address.
set sntp-client ntp-server-name <ipaddress>
- Set the time-zone (Default is UTC).
set sntp-client time-zone <UTC>
- Set the time zone offset to be added
set sntp-client time-zone-offset <+00:00>
- Set the polling time.
set sntp-client polling-time <300>

ERROR Message

The *send-mail* command prompts for the ERROR message if any of the above details are not configured or not valid.

Optional Prerequisites: The following configurations are **optional** and can be used when you want the host device to enable daylight savings mode.

- Enable the Daylight Savings Mode
set sntp-client daylight-saving <enable>
- Set the Daylight Savings Offset value
set sntp-client daylight-saving offset <+60>
- Set the Start Ordinal/week for Daylight Savings.
set sntp-client daylight-saving start-ordinal <First>
- Set the Start Weekday for Daylight Savings.
set sntp-client daylight-saving start-weekday <sunday>
- Set the Start Month for Daylight Savings.
set sntp-client daylight-saving start-month <april>
- Set the Start Time for Daylight Savings.
set sntp-client daylight-saving start-time <10:00>
- Set the End Ordinal/ week for Daylight Savings.
set sntp-client daylight-saving end-ordinal <Last>
- Set the End Weekday for Daylight Savings
set sntp-client daylight-saving end-weekday <sunday>
- Set the End Month for Daylight Savings.
set sntp-client daylight-saving end-month <october>
- Set the End Time for Daylight Savings.
set sntp-client daylight-saving end-time <10:00>

Scenario 1 - Updating Time from the NTP Server

This scenario describes the updating of time from the NTP server with Daylight Savings Mode **disabled**.

Description	The MultiConnect IP time and date are updated with the time specified by the server and with the time-zone offset added to the time. SNTP client should send periodic requests to the server for the time update function depending on the polling time.
Configuration	1. Mandatory configuration.
Command	<code>set sntp-client enable</code>
Result Responses	Use "show date" or "show time" commands to check. Time and Date should be synchronized with the server. OK

Scenario 2 - Updating Time from the NTP Server

This scenario describes the updating of time from the NTP server with Daylight Savings Mode **enabled**.

Description	The MultiConnect IP time and date are updated with the time specified by the server and with the daylight offset added to the time if the time falls between start and end configuration. SNTP client should send periodic requests to the server for the time update function depending on the polling time.
Configuration	1. Mandatory configuration. 2. Optional configuration.
Command	<code>set sntp-client enable</code>
Result Responses	Use "show date" or "show time" commands to check. Time and Date should be synchronized with the server. OK

Note:

When the server cannot be reach or is not running, the SNTP client tries to reach the server every 10 seconds for 6 times and waits for the polling time, and then it tries again to reach the server as before.

Appendix A – Flash Upgrade

Introduction

The MultiConnect Adapter contains a 2 MB flash wherein the boot image, the firmware and configuration files are stored in a compressed format. The flash can easily be upgraded both locally as well as remotely.

- **Local Upgrade**
The flash of the MultiConnect can be upgraded locally through serial port using the upload feature of serial applications.
- **Remote Upgrade**
The flash can be upgraded remotely through the Ethernet using TFTP.

The MultiConnect Adapter flash contains two main files, which are required for an upgrade.

- **Binary File**
 - The binary file contains the firmware of the Adapter
The name of this binary file would be in the following format
MTXCSEM-TFTP-v<version>w-<date in ddMmmmyyyy format>
- **Gun-zipped .tar File**
 - This contains the HTML pages of the serial device and other files related to it, such as **http-host-param (http page configuration file)**
 - The name of this tar file would always be **http.tar.gz**

Prerequisites

Prerequisite 1 – Required Tool (TFTP Client)

A Trivial File Transfer Protocol (TFTP) client must be installed on your PC in order to execute the flash upload procedure.

TFTP for Windows

Though Windows 98 and ME do not come with a TFTP client, the file can be copied from a PC operating Windows NT or 2000 (not XP):

- On a PC operating Windows NT or Windows 2000, locate the TFTP file at C:\WINNT\SYSTEM32\tftp.exe.
- Copy the this file to C:\WINDOWS on your Windows 98 or ME PC.

Downloading TFTP from the Internet

If your operating system does not include a TFTP client program, a TFTP client program is available for Windows users from the Internet. Walusoft's TFTP Suite Pro is recommended. The URL is:

<http://www.walusoft.co.uk/download.htm>

Prerequisite 2 – Serial Port Configuration

The default serial port parameters should be:

Data length – 8 bits

Parity – None

Stop bits – 1

Baud-rate of the serial port to which the MultiConnect Adapter is connected should be set to 115200 bps for proper operation.

Prerequisite 3 – Enabling TFTP Server

Enable TFTP server on MultiConnect Adapter by issuing the following command:

```
# set ip tftp enable  
OK
```

Serial Flash Upgrade Scenario

Following steps explain the procedure to upgrade a flash using the serial COM port (serial flash upgrade).

Connect the MultiConnect Adapter to a PC COM Port.

- Open an application through which we can access the serial device(e.g., Meterm, zoc, hyperterm).
- Reboot the MultiConnect Adapter.
- Wait for the boot message and prompt “press d to download” to appear.
- Press **d** when prompted.
- Select the **XMODEM** Protocol from the Terminal application.
- Choose a file (MTXCSEM-TFTP-...) file to be uploaded.
- Perform a file upload.



The MultiConnect Adapter reboots and will be up after a few seconds (10-15 secs).

The MultiConnect Adapter reboots after it has been successfully upgraded.

Appendix B – Regulatory Information

Regulatory Information

FCC Part 15 Regulation

This equipment has been tested and found to comply with the limits for a **Class A** digital device, pursuant to Part 15 of the FCC rules. These limits are designed to provide reasonable protection against harmful interference in a residential installation. This equipment generates, uses, and can radiate radio frequency energy, and if not installed and used in accordance with the instructions, may cause harmful interference to radio communications. However, there is no guarantee that interference will not occur in a particular installation. If this equipment does cause harmful interference to radio or television reception, which can be determined by turning the equipment off and on, the user is encouraged to try to correct the interference by one or more of the following measures:

Reorient or relocate the receiving antenna.

Increase the separation between the equipment and receiver.

Plug the equipment into an outlet on a circuit different from that to which the receiver is connected.

Consult the dealer or an experienced radio/TV technician for help.

This device complies with Part 15 of the FCC rules. Operation of this device is subject to the following conditions: (1) This device may not cause harmful interference, and (2) this device must accept any interference that may cause undesired operation.

WARNING – Changes or modifications to this unit not expressly approved by the party responsible for compliance could void the user's authority to operate the equipment.

Industry Canada

This Class B digital apparatus meets all requirements of the Canadian Interference-Causing Equipment Regulations.

Cet appareil numérique de la classe B respecte toutes les exigences du Règlement Canadien sur le matériel brouilleur.



EMC, Safety, and Directive Compliance

The CE mark is affixed to this product to confirm compliance with the following European Community Directives:

Council Directive 89/336/EEC of 3 May 1989 on the approximation of the laws of Member States relating to electromagnetic compatibility;

and

Council Directive 73/23/EEC of 19 February 1973 on the harmonization of the laws of Member States relating to electrical equipment designed for use within certain voltage limits.

Appendix C – Warranty and Service

Multi-Tech Warranty Statement

Multi-Tech Systems, Inc., (hereafter “MTS”) warrants that its products will be free from defects in material or workmanship for a period of two, five, or ten years (depending on model) from date of purchase, or if proof of purchase is not provided, two, five, or ten years (depending on model) from date of shipment.

MTS MAKES NO OTHER WARRANTY, EXPRESS OR IMPLIED, AND ALL IMPLIED WARRANTIES OF MERCHANTABILITY AND FITNESS FOR A PARTICULAR PURPOSE ARE HEREBY DISCLAIMED.

This warranty does not apply to any products which have been damaged by lightning storms, water, or power surges or which have been neglected, altered, abused, used for a purpose other than the one for which they were manufactured, repaired by Customer or any party without MTS's written authorization, or used in any manner inconsistent with MTS's instructions.

MTS's entire obligation under this warranty shall be limited (at MTS's option) to repair or replacement of any products which prove to be defective within the warranty period or, at MTS's option, issuance of a refund of the purchase price. Defective products must be returned by Customer to MTS's factory — transportation prepaid.

MTS WILL NOT BE LIABLE FOR CONSEQUENTIAL DAMAGES, AND UNDER NO CIRCUMSTANCES WILL ITS LIABILITY EXCEED THE PRICE FOR DEFECTIVE PRODUCTS.

Repair Procedures for U.S. and Canadian Customers

In the event that service is required, products may be shipped, freight prepaid, to our Mounds View, Minnesota factory:

Multi-Tech Systems, Inc.
2205 Woodale Drive
Mounds View, MN 55112
Attn: Repairs, Serial # _____

A Returned Materials Authorization (RMA) is not required. Return shipping charges (surface) will be paid by MTS to destinations in U.S. and Canada.

Please include, inside the shipping box, a description of the problem, a return shipping address (must have street address, not P.O. Box), your telephone number, and if the product is out of warranty, a check or purchase order for repair charges.

For out of warranty repair charges, go to www.multitech.com/DOCUMENTS/Company/warranty/

Extended two-year overnight replacement service agreements are available for selected products. Please call MTS customer service at (888) 288-5470 or visit our web site at www.multitech.com/PARTNERS/Programs/orc/ for details on rates and coverage's.

Please direct your questions regarding technical matters, product configuration, verification that the product is defective, etc., to our Technical Support department at (800) 972-2439 or email support@multitech.com. Please direct your questions regarding repair expediting, receiving, shipping, billing, etc., to our Repair Accounting department at (800) 328-9717 or (763) 717-5631, or email mtsrepair@multitech.com.

Repairs for damages caused by lightning storms, water, power surges, incorrect installation, physical abuse, or user-caused damages are billed on a time-plus-materials basis.

Repair Procedures for International Customers (Outside U.S.A. and Canada)

Your original point of purchase Reseller may offer the quickest and most economical repair option for your Multi-Tech product. You may also contact any Multi-Tech sales office for information about the nearest distributor or other repair service for your Multi-Tech product. The Multi-Tech sales office directory is available at www.multitech.com/PARTNERS/Channels/offices/

In the event that factory service is required, products may be shipped, freight prepaid to our Mounds View, Minnesota factory. Recommended international shipment methods are via Federal Express, UPS or DHL courier services, or by airmail parcel post; shipments made by any other method will be refused. A Returned Materials Authorization (RMA) is required for products shipped from outside the U.S.A. and Canada. Please contact us for return authorization and shipping instructions on any International shipments to the U.S.A. Please include, inside the shipping box, a description of the problem, a return shipping address (must have street address, not P.O. Box), your telephone number, and if the product is out of warranty, a check drawn on a U.S. bank or your company's purchase order for repair charges. Repaired units shall be shipped freight collect, unless other arrangements are made in advance.

Please direct your questions regarding technical matters, product configuration, verification that the product is defective, etc., to our Technical Support department nearest you or email support@multitech.com. When calling the U.S., please direct your questions regarding repair expediting, receiving, shipping, billing, etc., to our Repair Accounting department at +(763) 717-5631 in the U.S.A., or email mtsrepair@multitech.com.

Repairs for damages caused by lightning storms, water, power surges, incorrect installation, physical abuse, or user-caused damages are billed on a time-plus-materials basis.

Repair Procedures for International Distributors

International distributors should contact their MTS International sales representative for information about the repairs for their Multi-Tech product.

Please direct your questions regarding technical matters, product configuration, verification that the product is defective, etc., to our International Technical Support department at +(763)717-5863. When calling the U.S., please direct your questions regarding repair expediting, receiving, shipping, billing, etc., to our Repair Accounting department at +(763) 717-5631 in the U.S.A. or email mtsrepair@multitech.com.

Repairs for damages caused by lightning storms, water, power surges, incorrect installation, physical abuse, or user-caused damages are billed on a time-plus-materials basis.

Replacement Parts

SupplyNet, Inc., can supply you with replacement power supplies, cables and connectors for selected Multi-Tech products. You can place an order with SupplyNet via mail, phone, fax or the Internet at the following addresses:

Mail:	SupplyNet, Inc. 614 Corporate Way Valley Cottage, NY 10989
Phone:	800 826-0279
Fax:	914 267-2420
Email:	info@thesupplynet.com
Internet:	http://www.thesupplynet.com

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