L'esprit Modem

Commands List

GenPac 64c

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000	CREATION	Y. STROMBONI	05/07/2007

The main modifications in this document compared to its previous version, are easily identifiable on a monitor by means of the blue text.

CONTENTS

This reference guide assumes knowledge of issuing AT commands.
<*CR*> refers to the carriage return character (typically generated by pressing the ENTER or RETURN key on the
keyboard).
All references to TA (terminal adapter) in this chapter refer to the MT128SMI.

1 - AT Commands

The TA's command buffer can store 80 characters, including spaces and other characters used in telephone numbers. If you mistype a command string, you can edit it by using the backspace or the delete key, but only before
you press <CR>. As you type a command string, it appears on your monitor screen, letting you verify your input as
you type it.

1.1 - AT Commands by Function

1.1.1 - Command Execution

AT	Attention code
A/	Repeat AT Command
Return	Command execution
+++AT<CR>	In-band escape code
<BREAK>AT<CR>	Out-of-band escape code

1.1.2 - General Information Commands

I*n*	Display Product Information
L*n*	List Active Profile Information
!L	Display Network Configuration
>MIB*n*	Management Information Block (MIB) Information

1.1.3 - Network Configuration Commands

****s**	User-User Information Element String
%A97=n	Dialing Method
!C0=n	Network Switch Type
!C6=n	Data SPID
***!C6=n**	Voice SPID
!D0=n	V.120 LLC Information Element
!D3=n	SAPI-0 Data TEI
***!D3=n**	SAPI-0 Voice TEI
!DNn	Disable Data DN/MSN n
!Enn	Enable Data DN/MSN n
>MULT=n	Multi-point Setting
!Nn=s	Data DN/MSN n

1.1.4 - Serial Port Configuration Commands

&Cn	DCD (Data Carrier Detect) Control
&Dn	DTR (Data Terminal Ready) Control
$Dn	Persistent DTR Dialing
&En	Flow Control
&Mn	Asynchronous Mode
@P3=n	Parity
@P4=n	Data Bits
@P6=n	Stop Bits
&Rn	CTS (Clear To Send) Control
&RFn	CTS/RTS Interaction Control
&Sn	DSR (Data Set Ready) Control
$SBn	Serial Port Speed
%Sn	Serial Port Mode
#Xn	Send Multiple Xoff Characters

1.1.5 - General Configuration Commands

@CONFIG	Configuration Menu
En	Command Mode Echo
%En	Escape Sequence Options
&Fn	Load Factory Profile
%Mn	Management Mode
Qn	Quiet Mode
Sr=n	Set S-register
Sr?	Read S-register
Vn	Terse/Verbose Result Codes
&Wn	Store Active Profile
Xn	Connect Messages
Zn	Reset to Stored Profile
&Zn=	Store Telephone Number
!Z=n	Rate Adaptation/Data Protocol

1.1.6 - Digital (Data) Call Commands

A	Answer Digital Call
Dn	Dial Digital Number
DSn	Dial Stored Number
Hn	Hang up Digital Call
!Hn	Digital Call Hold-off Time
&Jn	Channel Bundling (for models supporting two B-channels)
O	Return Online

1.2 - Command Execution Details

1.2.1 - Command: ***AT***

Function:	Attention Code
Unit:	n/a
Values:	n/a
Default:	n/a
Description:	This attention code precedes all command strings except the A/ command and escape codes.

1.2.2 - Command: **A/**

Function:	Repeat AT Command
Unit:	n/a
Values:	n/a
Default:	n/a
Description:	**A/** repeats the AT command that was previously entered.

1.2.3 - Command: **RETURN or ENTER**

Function:	Command Execution
Unit:	n/a
Values:	n/a
Default:	n/a
Description:	Press the **RETURN** or **ENTER** key to execute a command. The **RETURN** or **ENTER** key is frequently abbreviated **<CR>** in command examples.

1.2.4 - Command: **+++AT<CR>**

Function:	In-Band Escape Code
Unit:	ASCII
Values:	Set by S-register ***S2***
Default:	**+ (S2=43)**
Description:	The **+++AT<CR>** command causes the TA to enter command mode, without disconnecting the call, when it is online with a remote device. The default escape code is three + characters, followed by the letters *A*T, up to 80 command characters, and a <CR>. The TA escapes to command mode, executes any commands in the string, and then remains in command mode.

Use the **S2=**n command to change the escape character.

1.2.5 - Command: **<BREAK>AT<CR>**
Function: Out-of-Band Escape Code
Unit: n/a
Values: n/a
Default: n/a
Description: This command places the TA in command mode while remaining online. Enter a break signal, the letters AT, up to 80 command characters, and a <CR>.

1.3 - General Information Commands

1.3.1 - Command: **In**
Function: Display Product Information
Unit: Decimal ASCII code
Values: n=0—Product ID (e.g. 247)
n=1—Firmware version number (e.g. 1.00)
n=2—Product model
n=3—Product features
n=4—Date and time firmware was generated
n=8—Current settings used by Windows for descriptor identification
n=9—Product name
n=11—Digital Port Connection Information
n=20—Extended Product name
n=21—Plug-N-Play string in HEX format
n=22—Plug-N-Play string
n=24—Boot code version
n=99—Crystal frequency
Default: **I0**
Description: The In command displays specific product information depending on the value of n.

1.3.2 - Command: **Ln**
Function: List Active Profile Information
Unit: Decimal ASCII code
Values: n=0—List stored numbers
n=5—List AT command settings
n=6—List S-register summary
n=8—List Low-level ISDN Statistics
n=9—List Connection Statistics
Default: **L0**
Description: The Ln command lists information for various settings or lists various statistics depending on the value of n.

1.3.3 - Command: **!L**
Function: Display Network Configuration
Unit: n/a
Values: n/a
Default: n/a
Description: Use the **!L** command to display the TA's current network configuration: MSN/DN, SPID, TEI, Data protocol, switch type, etc.

1.3.4 - Command: **>MIBn**
Function: Management Information Block (MIB) Information Unit: Decimal ASCII code
Values: n=0 through n=(number of digital ports)-1
Default: **>MIB0**
Description: **>MIBn** displays the Management Information Block (MIB) information for the port specified by n. If n is not specified, n is assumed to be 0. n=0 is the first digital port. Digital port information is identical to the **I11** information. **>MIBn** simply allows a specific port to display the management information of a port other than the one currently receiving the **>MIBn** command.

1.4 - Network Configuration Commands

Use the following commands to select your network switch type (e.g., EuroISDN NET3, VN4, INS64, etc.), specify data directory/multiple subscriber numbers, specify TEI values if required, and to specify other information required to make an ISDN connection.

1.4.1 – Command: ****s**

Function: User-User Information Element String
Unit: s=35-character IA5 string
Values: s=0x01-0x7F (IA5 character range), except some special characters (like <CR>, the carriage return character)
Default: s=[NULL] (no string)
Description: ****s** sets the User-User Information Element that can be sent out with the SETUP message when a call is originated. The protocol discriminator is set for IA5 characters (value 0x04). If no string is set (the string is empty or also called NULL), then no User-User Information Element is sent. Each time the **s command is issued successfully the new string will be automatically stored in non-volatile RAM. To clear this string, simply enter **AT**<CR>**. No commands may follow the User-User string command as this command relies on the carriage return (determined by S-register **S3**) or NULL to terminate the string.
To review the User-User string, enter **ATL<CR>**. The User-User Information Element is sent out for digital and analog calls if the string is not NULL. The maximum string length in this implementation is 35 characters; if longer than 35 characters, then an ERROR message will be issued and the original User-User string will not be changed. If non-IA5 characters are entered, then the command will also issue an ERROR message and the original User-User string will not be changed. By default no string is set (the string is NULL).

1.4.2 - Command: **%A97=n**

Function: Dialing Method
Unit: Decimal ASCII code
Values: n=0 (En bloc sending during call SETUP)
n=1 (Overlap sending during call SETUP)
Default: **%A97=0** (En bloc)
Description: Standardized ISDN signaling protocols, such as DSS1, DSS2, and SS7, support a sending complete indication; i.e., a signal that no more digits will follow. However, appending such a signal to a telephone number is often impractical; therefore, many private networks send the number of a called party by using a procedure called overlap sending, in which no sending complete indication is sent. Computer users, however, can automatically append the sending complete indication to the telephone number by choosing the en bloc method of sending, which results in faster call setup. Use the **%A97=n** command to select between the two methods.

1.4.3 - Command: **!C0=n**

Function: Network Switch Type
Unit: Decimal ASCII code
Values: n=0 (AT&T 5ESS)
n=1 (Northern Telecom DMS-100)
=2 (EuroISDN NET3)
=4 (INS64)
=5 (US NI-1)
=6 (VN4)
Default: C0=2 (NET3)
Description: se the **!C0=n** command to select one of the network switch types supported by the TA. The factory default setting is **!C0=2** (NET3). Refer to the **>A0=**n command for a list of the default type of coding for the respective switch type. **AT!C0?<CR>** or **AT!L<CR>** may be used to review the switch type. The @**CONFIG** configuration menu can also be used to set and review the switch type.

1.4.4 - Command: **!C6=n**

Function: Data SPID
Unit: ASCII

Values: n=0- to 20-character string
Default: null string
Description: Use the **!C6=**n command to specify the data service profile identifier (SPID) that the ISDN service provider assigned at subscription time. The data SPID string can have up to 20 characters. This command is not used if the switch type is set to NET3, VN4, INS64.
AT!C6?<CR> may be used to review the Data SPID or AT!L<CR> may be used to review all SPID numbers. The **@CONFIG** configuration menu can also be used to set and review the Data SPID.
Note: For DMS-100 switches, any ASCII character except the underline (_) character is valid. For US NI-1 and AT&T switches, only the digits 0-9 are valid.

1.4.5 - Command: ***!C6=n**
Function: Voice SPID
Unit: ASCII
Values: n=0- to 20-character string
Default: null string
Description: Use the **!C6=**n command to specify the voice service profile identifier (SPID) that the ISDN service provider assigned at subscription time. The voice SPID string can have up to 20 characters. This command is not used if the switch type is set to NET3, VN4, INS64.
AT!C6?<CR> may be used to review the Voice SPID or AT!L<CR> may be used to review all SPID numbers. The **@CONFIG** configuration menu can also be used to set and review the Voice SPID.
Note: For DMS-100 switches, any ASCII character except the underline (_) character is valid. For US NI-1 and AT&T switches, only the digits 0-9 are valid.

1.4.6 - Command: **!D0=n**
Function: V.120 LLC Information Element Command
Unit: Decimal ASCII code
Values: n=0 (disable),
n=1 (enable)
Default: !**D0=0** (disabled)
Description: Some switches do not support ISDN SETUP messages that contain a LLC (Low Layer Compatibility) Information Element (IE). When these switches receive a LLC IE in the SETUP they immediately reject the call and then the TA reports NO CARRIER. The LLC IE for V.120 may be disabled by using **!D0=0** to avoid problems with switches that do not support a LLC IE.
The V.120 LLC IE only helps the answering TA determine the type of digital call and various options associated with that call and so it is not necessary.

1.4.7 - Command: **!D3=n**
Function: SAPI-0 Data TEI
Unit: Decimal ASCII code
Values: n=0-63 (Sets the TEI to a fixed value from 0 through 63)
n=240 (Sets the data channel for dynamic TEI negotiation)
n=241 (Disables TEI)
Default: **!D3=240** (Auto TEI)
Description: Use the **!D3=**n command to set the terminal endpoint identifier (TEI) for the data channel. A TEI is a number used by the central office switch to uniquely identify each device that is connected to the network. When it uses dynamic TEI assignments (auto TEI), the central office switch assigns a TEI each time the TA connects to the network. However, the ISDN service provider may assign a fixed TEI at subscription time, in which case you must configure the TA with the fixed TEI number. You can also use the **!D3=**n command to disable the data channel, which may be useful when multiple TAs are attached to a network terminator bus.
AT!D3?<CR> may be used to review the Data TEI or **AT!L<CR>** may be used to review all TEI numbers. The **@CONFIG** configuration menu can also be used to set and review the Data TEI.

1.4.8 - Command: ***!D3=n**
Function: SAPI-0 Voice TEI
Unit: Decimal ASCII code
Values: n=0-63 (Sets the TEI to a fixed value from 0 through 63)
n=240 (Sets the voice channel for dynamic TEI negotiation)
n=241 (Disables TEI)
Default: ***!D3=240** (Auto TEI)
Description: Use the ***!D3=**n command to set the TA's terminal endpoint identifier (TEI) for the voice channel. A TEI is a number used by the central office switch to uniquely identify each device that is connected to the network. When it uses dynamic TEI assignments (auto TEI), the central office switch assigns a TEI each time the TA connects to the network. However, the ISDN service provider may assign a fixed TEI at subscription time, in which case you must configure the TA with the fixed TEI number. You can also use the **!D3=**n command to disable the voice channel, which may be useful when multiple TAs are attached to a network terminator bus. **AT!D3?<CR>** may be used to review the Voice TEI or **AT!L<CR>** may be used to review all TEI numbers. The **@CONFIG** configuration menu can be used to set and review the Voice TEI.

1.4.9 - Command: **!DNn**
Function: Disable Data DN/MSN n
Unit: Decimal ASCII code
Values: n=1 (disable Data DN/MSN 1),
n=2 (disable Data DN/MSN 2)
Default: All ports are enabled
Description: **!DNn** disables a Data DN/MSN. This will effectively disable the associated TA port from receiving any data calls. However, the port will still be able to originate data calls. This is useful for applications where a specific port is used for dial-out only. Since the TA has only one serial port, both Data DN/MSN 1 and 2 would have to be disabled in order to not accept a call.
Disabling only one of the Data DN/MSN's will cause the TA to not accept bonded calls (MLPPP or SoftBonding). If no port number is given then the assumed port number is that of the port from which the command was received. If port n had a DN/MSN set, then that DN/MSN is not erased. Enabling the port later by using the **@CONFIG** configuration menu or **!ENn** will reenable that DN/MSN. **AT!L<CR>** may be used to review which ports are disabled (displays PORT DISABLED). The **@CONFIG** configuration menu can also be used to disable or review the disabled ports.

1.4.10 - Command: **!ENn**
Function: Enable Data DN/MSN n
Unit: Decimal ASCII code
Values: n=1 (enable Data DN/MSN 1),
n=2 (enable Data DN/MSN 2)
Default: All ports are enabled
Description !ENn enables a Data DN/MSN that will put it back in service for accepting and originating data calls. If no port number is given, then the assumed port number is that of the port from which the command was received. AT!L<CR> may be used to review which ports are enabled (any port that does not display PORT DISABLED). @CONFIG can also be used to enable or review the disabled ports.

1.4.11 - Command: **>MULT=n**
Function: Multi-point Setting
Unit: Decimal ASCII code
Values: n=0 (Point-to-point),
=1 (Multi-point),
=2 (Multi-point + US NI-1 MLHG)
Default: Switch-type dependent: AT&T 5ESS — n=1 (Multi-point)
MS-100 — n=1 (Multi-point)
uroISDN NET3 — n=0 (Point-to-point)
NS64 — n=0 (Point-to-point)

S NI-1 — n=1 (Multi-point)
N4 — n=0 (Point-to-point)

Description: The >MULT=n command sets whether the switch-type behaves as point-to-point or multi-point. The multi-point setting, however, mostly affects the AT&T 5ESS switch type and should not need modification for the other switch types.

1.4.12 - Command: !Nn=s

Function: Data DN/MSN n
Unit: Decimal ASCII code
Values: n=1 (Data DN/MSN 1)
n=2 (Data DN/MSN 2)
s=25-character string
Default: null string
Description: **!Nn=**s sets the Directory Number (DN)/Multiple Subscriber Number (MSN) for data port n to the character string given by s. The DN/MSN is a telephone number (address) assigned to the TA at subscription time by the ISDN service provider. The DN/MSN is a string of up to 25 characters; valid characters are 0-9, *, and #.
A ":" (colon) is used to separate the address from the subaddress, if a subaddress is required. All data port DN/MSN numbers can be left empty, be the same, be different, or any combination of those choices. The TA uses the Data DN/MSN to discriminate which data calls may be answered. It also supplies the Calling Party Information Element with a calling party number and calling party subaddress if S56 is enabled. If using the TA as a host for MultiLink PPP or SoftBonding calls with the MP+ Dynamic Bandwidth Allocation scheme (S59=1), then Data MSN/DN 2 must be entered.
If no port number n is given, then the assumed port number is that of the port from which the command was received. Use **AT!Nn?<CR>** to review the Data DN/MSN for port n or use **AT!L<CR>** to review all Data DN/MSN port settings. Use **@CONFIG** configuration menu to set and review the Data DN/MSN port settings.

1.5 - Serial Port Configuration Commands

Use the following commands to control the interaction between the TA and the computer/terminal that is connected to it.

1.5.1 - Command: &Cn

Function: DCD (Data Carrier Detect) Control
Unit: Decimal ASCII code
Values: n=0 — DCD is forced high at all times.
n=1 — DCD goes from low to high when the TA establishes a connection (DCD normal).
n=2 — DCD drops briefly following a disconnect, then goes high again. S-register S10 defines how long the DCD signal remains low after a disconnect.
Default: **&C1** (DCD normal)
Description: **&Cn** controls the behavior of the DCD signal (pin 8 on the RS232E/V.24 interface). Normally, DCD goes high when the TA establishes a connection and drops when the connection is lost. However, you can force DCD to remain high at all times or to remain high except for a brief drop following a disconnect.

1.5.2 - Command: &Dn

Function: DTR Control
Unit: Decimal ASCII code
Values: n=0 — The TA ignores the DTR signal.
n=1 — When DTR goes low, the TA exits data mode and re-enters AT command mode.
n=2 — If DTR goes low when the TA is online, then the TA hangs up, returns to command mode, and disables auto-answer. If the TA is offline, it neither answers nor dials while DTR is low.
n=3 — When DTR goes low, the TA resets the data port and disables auto-answer. If DTR goes low when the TA is online, then the TA hangs up, resets the active configuration to the stored configuration, and disables auto-answer.

n=4 — Ignore DTR only when answering a data call. If DTR is low when an incoming data call is present, then the TA will answer the call. If DTR goes high during that call, nothing will happen. However, if DTR goes high and then drops for the minimum time specified by S25, then the call will be disconnected just as it would with &D1. &D4 is the same as &D1, except that &D4 can answer a data call without DTR and DTR can remain low for the duration of the call, but if DTR goes high, then &D4 will behave like &D1.

Default: **&D1** (exit data mode and re-enter AT command mode)

Description: **&Dn** controls how the TA responds to the DTR (Data Terminal Ready) signal on pin 20 of the RS232E/V.24 interface. A high DTR signal tells the TA that the connected computer is ready to communicate. If a call is to be accepted while DTR is low, then the TA must be configured to ignore DTR **(&D0 or &D4**). If this configuration setting is not made, the TA rejects incoming calls until DTR is high when the call is received.

1.5.3 - Command: $Dn

Function: Persistent DTR Dialing

Unit: Decimal ASCII code

Values: n=0—disable,
n=1—enable

Default: **$D0** (disabled)

Description: The **$D**n command enables or disables Persistent DTR Dialing (PDD). PDD causes the terminal adapter to automatically and continuously redial stored telephone number 0 when the port has no active calls and DTR is high. The delay after a call disconnects (returning to the idle state) yet DTR is still high is controlled by S-register **S80**. Also, once DTR changes from low to high, then a delay set by **S80** will occur before dialing begins. See the description of Sregister **S80** for further details regarding its interaction with **$D**n.

1.5.4 - Command: &En

Function: Flow Control

Unit: Decimal ASCII code

Values: n=3 — Disable flow control by the TA.
n=4 — Hardware flow control. &E4 causes the TA to use the CTS signal on pin 5 of the RS232E/V.24 interface to regulate flow control. When CTS goes low, data flow from the computer is suspended until CTS goes high again. This method works with pacing, which uses the RTS signal on pin 4. Hardware flow control cannot be enabled unless an error-correction protocol is selected.
n=5 — XON/XOFF flow control. This is an in-band method, in which the XON and XOFF characters (^Q and ^S respectively) are inserted into the data stream, rather than using separate control lines. When an XOFF character is detected, the data stream is suspended until an XON character is detected. The drawback to this method is that some files may contain these characters, causing the file transfer to be suspended indefinitely.
n=6 — When XON/XOFF pacing is active, the TA responds to and discards the XON/XOFF characters from the computer.
n=7 — When XON/XOFF pacing is active, the TA responds to the XON/XOFF characters and passes them through the communications link to the remote device, thereby pacing the remote terminal adapter as well.
n=12 — Disable pacing.
n=13 — Enable pacing.

Default: **&E4, &E6, &E13**

Description: The **&E**n command selects the method by which the TA controls the flow of data to and from the computer, to prevent either device from accepting data faster than it can handle. The TA provides flow control in both directions. When the TA halts data flow, it is termed flow control; when the computer halts data flow, it is termed pacing.

1.5.5 - Command: &Mn

Function: Asynchronous Mode

Unit: Decimal ASCII code

Values: n=0—Asynchronous mode transmission
n=1—Synchronous mode transmission

Default: **&M0** (Asynchronous)
Description: Use **&M**n to set the TA for synchronous or asynchronous transmission. Note that synchronous transmission is only supported by the CLEAR data protocol (**!Z=11**).

1.5.6 - Command: **@P3=n**
Function: Parity
Unit: Decimal ASCII code
Values: n=0—Odd,
n=1—Even,
n=2—Mark,
n=3—Space,
n=4—None
Default: **@P3=4** (None)
Description: Use **@P3=**n to set the type of parity the TA uses immediately after power-up or when using **%S1**, **%S2**, or **%S3**. After power-up when **%S0** is enabled, once the TA receives an AT command it automatically adjusts the parity to match the parity of the received command. See **%S**n for further information regarding interaction with the n command.

1.5.7 - Command: **@P4=n**
Function: Data Bits
Unit: Decimal ASCII code
Values: n=7—7 data bits
n=8—8 data bits
Default: **@P4=8** (8 data bits)
Description: Use **@P4=**n to set the number of data bits the TA uses immediately after power-up or when using **%S1**, **%S2**, or **%S3**. After power-up when **%S0** is enabled, once the TA receives an AT command it automatically adjusts the number of data bits to match the number of data bits of the received command. See **%Sn** for further information regarding interaction with the **@P4=**n command.

1.5.8 - Command: **@P6=n**
Function: Stop Bits
Unit: Decimal ASCII code
Values: n=1—1 stop bit
n=2—2 stop bits
Default: **@P6=1** (1 stop bit)
Description: Use **@P6=**n to set the number of stop bits the TA uses immediately after power-up or when using **%S1**, **%S2**, or **%S3**. After power-up when **%S0** is enabled, once the TA receives an AT command it automatically adjusts the number of stop bits to match the number of stop bits of the received command. See **%Sn** for further information regarding interaction with the **@P6=**n command.

1.5.9 - Command: **&Rn**
Function: CTS Control
Unit: Decimal ASCII code
Values: n=0—CTS acts normally; that is, it follows RTS.
n=1—CTS is forced high, but still provides online flow control.
n=2—CTS is forced high, but it drops on disconnect for the period of time set by S10. CTS still provides flow control when the TA is online.
Default: **&R1** (CTS forced high)
Description: The **&R**n command lets you control the state of the CTS (Clear to Send) signal on the RS232E/V.24 interface. Normally the CTS signal follows the state of the RTS signal when the TA is online.

1.5.10 - Command: **&RFn**
Function: CTS/RTS Interaction Control
Unit: Decimal ASCII code
Values: n=0 (CTS follows RTS when on-line), n=1 (CTS is independent of RTS when on-line)
Default: **&RF1** (CTS is independent of RTS when on-line)

Description: In normal operation, Clear-to-Send (CTS) follows Request-to-Send (RTS) when the modem is on-line. In other words, if RTS goes off, CTS goes off in response. The **&RF0** command enables CTS to follow RTS. In some applications, however, it may be necessary for CTS to operate independently of RTS. **&RF1** allows CTS to operate independently regardless of the state of RTS, and is the factory default. If this is the case, refer to the **&R** command for control of the Clear-to-Send signal. The **&RF**n command has effect only when using **&R0** (CTS acts normally—CTS follows RTS).

1.5.11 - Command: &Sn
Function: DSR Control
Unit: Decimal ASCII code
Values: n=0— DSR is always high.
n=1— DSR acts normally; that is, it follows the state of the CD signal, which goes high when the TA detects a carrier signal, and goes low when the carrier signal is lost.
n=2— DSR is always high, except on disconnect, when it drops for the period of time set by S10 and then goes high again.
Default: **&S1** (DSR normal)
Description: The **&S**n command controls the state of the DSR (Data Set Ready) signal on the RS232E/V.24 interface. A high DSR signal indicates to the computer that the TA is ready to transmit data.

1.5.12 - Command: $SBn
Function: Serial Port Speed
Unit: Decimal ASCII code
Values: n=3 Set serial port speed to 300 baud
n=12 Set serial port speed to 1200 baud
n=24 Set serial port speed to 2400 baud
n=48 Set serial port speed to 4800 baud
n=96 Set serial port speed to 9600 baud
n=192 Set serial port speed to 19200 baud
n=384 Set serial port speed to 38400 baud
n=576 Set serial port speed to 57600 baud
n=1152 Set serial port speed to 115200 baud
n=2304 Set serial port speed to 230400 baud
Default: **$SB1152**
Description: In command mode, the TA detects the computer's/terminal's speed and parity, and matches it when the **%S0** command is active. The **$SB**n command sets the default serial speed to be used when the TA first powers up. If the TA powers up with **$SB230400** set, then the TA powers up in **%S1** mode (locked at 230.4K baud). If **$SB**n is set to any other value at powerup and **%S0** is enabled, then the TA powers up in Autobaud Mode. For example, to configure the TA to operate at 230.4K baud on the serial port at power-up, use the following initialization string: **AT$SB2304&W0<CR>**. Refer to the **%S**n command for further details regarding its interaction with the **$SB**n command.

1.5.13 - Command: %Sn
Function: Serial Port Mode
Unit: Decimal ASCII code
Values: n=0—Autobaud Mode (300-115200 baud),
n=1—Top Speed Mode (230400 baud),
n=2—Fixed Speed Mode (300-115200 baud)
n=3—Fixed Speed, Parity, Data Bits, Stop Bits Mode
Default: **%S0** (Autobaud Mode)
Description: Typically, in command mode the TA selects a serial port speed of 300, 1200, 2400, 4800, 9600, 19200, 38400, 57600, or 115200 baud, depending on how fast the AT commands are coming from the computer or terminal. Using the **%S**n command, you can disable automatic speed selection and lock the serial port speed to 230400 baud (**%S1**) or lock the serial port speed to the last detected speed (**%S2**). The serial port speed remains locked until the TA receives a **%S0** command.

Another method for changing from **%S1** to **%S0** mode is to send a break at 230.4K baud. (This method is for situations where the TA was configured on a terminal capable of 230.4K baud and later moved to a terminal that cannot operate at 230.4K baud. A break sent at any speed slower than 230.4K baud is also interpreted as a break at 230.4K baud, as will some characters sent at slower speeds.) When the **%S2** command is given, the TA locks the serial speed to the speed at which the **%S2** command was given and it also changes the **$SB**n setting accordingly.
If **%S2** is stored by using **&W**n, then when the TA powers up it will use the speed given by **$SB**n and immediately enter the fixed speed mode. A break given at the speed set by **%S2** (or any slower speed) will return the TA to the **%S0** mode just as it does when a break is given in the **%S1** mode.
%S3 is similar to **%S2**, except that **%S3** uses **$SB**n for the serial speed, @**P3=**n for the parity, @**P4=**n for the number of data bits, and @**P6=**n for the number of stop bits. The **%S3** mode is useful for situations where autobauding doesn't completely detect or correctly detect all parameters of the incoming data.

1.5.14 - Command: **#Xn**
Function: Send Multiple Xoff Characters
Unit: Decimal ASCII code
Values: n=0— One Xoff character sent until the buffer reaches the Xon level
n=1— Multiple Xoff characters sent for every character received after buffer reaches full level.
Default: **#X0**
Description: The **#X**n command allows the TA to send either a single or multiple Xoff characters to exert flow control to the computer/terminal. The **#X0** command causes one Xoff to be sent until the TA's buffer reaches the Xon level. The **#X1** command causes an Xoff to be sent for every character received after the TA reaches its full buffer level.

1.6 - General Configuration Commands

1.6.1 - Command: **@CONFIG**
Function: Configuration Menu
Unit: n/a
Values: n/a
Default: n/a
Description: The **@CONFIG** command starts the TA's internal configuration menus, which you can then use to customize the TA's configuration for your particular application. **AT@CONFIG<CR>** must be entered while in a communication program's terminal mode—it cannot be given as an extra command to a non-terminal application. There is help information in the configuration menu and there are also on-screen instructions. The ESCAPE key can be used in place of typing "X" or "EXIT" to exit the configuration menu. When finished configuring the TA, upon exiting a prompt you will be asked whether or not the configuration is to be saved. A "y", "Y", "n", or "N" is required as input. A "y" or "Y" will save the configuration (same as the **&W0** command). An "n" or "N" will not save the configuration nor will it undo any changes made while in the configuration menu. If there was a previous profile saved and changes were made by mistake and are to be undone, then give the TA the **AT*FS1<CR>** command or turn off the TA and turn it back on. The previous stored profile will be restored upon reset or power-up.

1.6.2 - Command: **En**
Function: Command Mode Echo
Unit: Decimal ASCII code
Values: n=0—Echo off,
n=1—Echo on
Default: **E1** (Echo on)
Description: Normally, when you enter commands on the keyboard, the TA echoes the characters back to the computer or terminal, where they are displayed on the monitor. Use the **E**n command to turn this feature on and off.

1.6.3 - Command: **%En**
Function: Escape Sequence Options
Unit: Decimal ASCII code
Values: ESCAPE METHOD
n=0—Do not escape.
n=1—"+++" escape method.
n=2—<BREAK> escape method.
n=3—Both "+++" and <BREAK> escape methods.
ESCAPE RESPONSE
n=4—Disable OK response to "+++".
n=5—Enable OK response to "+++".
Default: **%E1** and **%E4**
Description: By default, the TA responds only to the "**+++**" escape method. However, you can use the **%E**n command to set the TA to respond only to the <**BREAK**> method, to respond to either the "**+++**" or the <**BREAK**> method, or to ignore both methods and not escape. If the escape method is enabled (not **%E0**), then the escape response (OK) is given if enabled by **%E5**. For example, **%E1 %E5** enables the "**+++**" escape method and OK response to "**+++**".

1.6.4 - Command: **&Fn**
Function: Load Factory Profile
Unit: Decimal ASCII code
Values: n=0—Profile 0 (Modem-like operation),
n=2—Profile 2 (V.120 async operation),
n=3—Profile 3 (X.75 async operation),
n=4—Profile 4 (ML-PPP async operation),
n=5—Profile 5 (SoftBonding async operation),
n=6—Profile 6 (HDLC async operation),
n=7—Profile 7 (CLEAR async operation)
Default: **&F0** (Modem-like operation)
Description: For quick setup, the TA includes several Factory Profiles, each of which contains configuration parameters for a specific type of port operation. You can load a Factory Profile into active memory by using the command **&F**n, in which n is the number of the profile you wish to load. If you wish, you can then customize the profile and store it, using the **&W0** command, so that it loads automatically on power-up or reset. The Factory Profiles are stored in permanent memory and are not user-configurable.

1.6.5 - Command: **%Mn**
Function: Management Mode
Unit: Decimal ASCII code
Values: n=0 (disable),
n=1 (enable)
Default: **%M0** (disabled)
Description Management mode is for use with a management agent. When management mode is enabled (**%M1**) the DSR mode (**&S**n) setting is overridden. DSR will be turned off when in command mode and off-line. DSR will be turned on when in data mode or on-line. **!H**n is set to a minimum of 5 seconds (**!H5**) and !Hn is set to a minimum of 5 seconds (**!H5**).

1.6.6 - Command: **Qn**
Function: Quiet Mode
Unit: Decimal ASCII code
Values: n=0—disable,
n=1—enable
Default: **Q0** (disable quiet mode, enable result codes)
Description: The **Q**n command controls whether the TA sends result codes to the computer/terminal. When quiet mode is disabled (**Q0**), then result codes are given. When quiet mode is enabled, the result codes are suppressed. Use the **V**n command to select the format of the result codes when quiet mode is disabled (**Q0**).

1.6.7 - Command: **Sr=n**
Function: Set S-register
Unit: Varies
Range: r varies; n varies
Default: n/a
Description: Use the **Sr=**n command to set the value of an S-register, where r is the number of the Sregister, and n is the value you want to set. For example, **ATS7=60<CR>** sets S-register 7 to 60. Unsupported S-registers ® report OK without any numbers. Supported S-registers ® that are given a setting (n) that is not valid return an ERROR message. The **L6** command gives a summary of all S-registers and their current settings. See the S-Registers section of this chapter.

1.6.8 - Command: **Sr?**
Function: Read S-register
Unit: Varies
Range: r varies
Default: n/a
Description: Use the **Sr?** command to read the value of an S-register, where r is the number of the Sregister. For example, **ATS7?<CR>** gives the current setting of S-register 7. The **L6** command gives a summary of all S-registers and their current settings.

1.6.9 - Command: **Vn**
Function: Terse/Verbose Result Codes
Unit: Decimal ASCII code
Values: n=0—enable terse result codes,
n=1—enable verbose result codes
Default: **V1** (Verbose)
Description: Use the **V**n command to control whether the TA's result codes are displayed as digits (terse) or as words (verbose). Use the **Q**n command to enable or disable the display of result codes.

1.6.10 - Command: **&Wn**
Function: Store Active Profile
Unit: Decimal ASCII code
Values: n=0— Stores all current AT command and S-Register values in nonvolatile random access memory (NVRAM) and configures the TA so that it reads your custom settings in NVRAM when the modem is turned on or when it is reset with the **Z** command. (The **&F** reset command continues to read the factory default settings in ROM.)
n=1— Erases custom settings in NVRAM the next time the TA is turned off or reset, causing the TA to read the factory default settings in ROM whenever it is turned on or reset.
Default: **&W1** (Use factory default profile)
Description: The **&W**n command stores your active profile, or configuration, in memory so you won't lose your custom settings when you turn off the TA or reset it.

1.6.11 - Command: **Xn**
Function: Connect Messages
Unit: Decimal ASCII code
Values: n=0— Enables messages OK, CONNECT, RING, NO CARRIER, and ERROR (terse result codes 0-4).
n=1— Enables all messages except BUSY (terse result codes 0-5, 10-14, 17-19, 28, and 32). If a call is placed to a busy line, the message NO CARRIER is displayed.
n=2— Enable all messages (terse result codes 0-5, 7,10-14, 17-19, 28, and 32).
n=3— Enables all messages except it does not print the protocol messages.
n=4— Disable printing Calling Line Identification (CLI) at the end of the CONNECT message line. This command does not affect X0, X1, or X2.
n=5— Enable printing Calling Line Identification (CLI) at the end of the CONNECT message line. This command does not affect X0, X1, or X2.
Default: **X2** (Enable all messages) and
X4 (Disable printing CLI with CONNECT message)

Description: Use the **X**n command to select which result code messages the TA sends to the computer/terminal.

1.6.12 - Command: Z
Function: Reset to Stored Profile
Unit: n/a
Values: n/a
Default: n/a
Description: The **Z** command resets the TA to its current power-up profile and clears the command buffer. The result is the same as turning the TA off and on. When you type **ATZ<CR>**, the state of the **&W** command determines where the default values originate. **&W0** defaults come from the customized configuration in NVRAM, and **&W1** defaults come from the factory default configuration in ROM. Because **Z** clears the command buffer, it must be the last command in a command string; normally it is issued by itself: **ATZ<CR>**. Note that whereas the **&F0** reset command always restores the factory default profile, the **Z** reset command restores either the factory default or the stored profile, depending on how the **&W** command is set.

1.6.13 - Command: &Zn=x
Function: Store Telephone Number
Unit: Decimal ASCII code
Values: n=0-9; x=dial string
Default: n/a
Description: The **&Zn=**x command lets you store a telephone number in a memory register for faster dialing. To store a number, type **&Z**, the register number (0-9) where you want to store the number, the = character, and the dialing string that you want stored; then press <CR>. The dialing string can have up to 25 characters. To read a specific stored number, type **AT&Zn?** (e.g., **AT&Z4?**) where n is the number of the register you want to read. To display the list of all numbers stored in memory, type **ATL<CR>**.

1.6.14 - Command: !Z=n
Function: Rate Adaption/Data Protocol
Unit: Decimal ASCII code
Values: n=5—V.120 (async, error detection, error correction)
n=7—HDLC (async, error detection)
n=8—SoftBonding (async, error detection, error correction)
n=9—PPP/ML-PPP (async, error detection)
n=11—CLEAR (async or sync, error detection)
n=12—X.75 (async, error detection, error correction)
Default: **!Z=5** (V.120)
Description The **!Z=**n command selects the rate adaption protocol used to communicate with another terminal adapter. The local and remote terminal adapters must be set to the same protocol for communication to take place, unless the remote terminal adapter supports automatic protocol detection. See **S52** for a description of automatic protocol detection supported by this TA. Some protocols support error correction, such as V.120 and X.75. Other protocols, such as PPP/ML-PPP, rely on the upper layers (the computer) to handle error correction.

1.7 - Digital (Data) Call Commands

Use these commands to make or configure digital (data) calls.

1.7.1 - Command: A
Function: Answer Digital Call
Unit:: n/a
Values: n/a
Default: n/a
Description: The **A** command forces the TA to answer an incoming digital call. To cause the TA to autoanswer, set register **S0** to a value higher than 0.

1.7.2 - Command: **Dn**
Function: Dial Digital Number
Unit: ASCII
Values: n=dial string containing 0-9, “*”, “#”, “&”, “+”, “!”, “-”, “(“, “)”, or “,”
Default: No dial string
Description: The **D** command causes the TA to dial a digital telephone number (e.g., **ATD785-3500<CR>**). The dial string can contain up to 80 characters.

1.7.3 - Command: **DSn**
Function: Dial Stored Number
Unit: Decimal ASCII code
Values: n=0-9
Default: **DS0** (Dial stored number 0)
Description: To dial a stored telephone number, type **DS**n in terminal mode, where n is the location of the number you wish to dial. For example, **ATDS3<CR>** dials a telephone stored in memory register 3 location. Stored numbers can be reviewed by giving the command **ATL<CR>**. Numbers can be stored by the use of the **&Zn=**x command.

1.7.4 - Command: **Hn**
Function: Hang Up Digital Call
Values: n=0—Go on-hook (hang up)
=1—Go off-hook
Default: **H0**
Description: The **H** command forces the TA to go off-hook (to take control of the telephone line) or to go onhook (hang up). Since the TA goes off-hook automatically when it dials, the Hn command is normally used only to hang up. To hang up, you must first escape to command mode (**+++AT<CR>**), then type **ATH<CR>** or **ATH0<CR>**. You can also include the hang up command in the escape sequence: **g**.

1.7.5 - Command: **!Hn**
Function: Digital Call Hold-Off Time
Unit: 1 second
Values: n=0 (disable),
=1-255 (1-255 seconds)
Default: **!H0** (disabled)
Description: When a digital call disconnects a timer will be installed that will hold off incoming digital calls for the given amount of time (n) for that digital port. Digital calls that are received by that port while calls are being held off will not be rejected nor will RING messages be given. Rather the digital call will be held in an alerting state until **!H**n times out at which point the call will begin the normal ringing process. Digital calls originated from that port while the !Hn timer is running will abort the timer and the call will go out immediately. This command can be very useful for certain RAS environments that require at least 1 second to initialize a port after a call has disconnected (such as Citrix and Novell).

1.7.6 - Command: **&Jn**
Function: hannel Bundling (for models supporting two B-channels)
Unit: Decimal ASCII code
Values: n=0 (disable),
n=1 (enable)
Default: **&J0**
Description: The channel bundling option is used by the ML-PPP and SoftBonding protocols to determine whether a second channel should be added to the data connection. Channel bundling may also be referred to as channel bonding and in essence it can yield a 128Kbps data connection as opposed to a single-channel 64Kbps data connection. **&J1** has the same affect as using the &, !, or + characters in the dial string when separating two numbers (e.g. **ATD384020&384030<CR>**). Channel bundling is affected by the use of Dynamic Bandwidth Allocation (DBA) which is controlled by S-registers S59, S60, S61, S62, and S63.

1.7.7 - Command: **O**
Function: Return Online
Unit: n/a
Values: n/a
Default: n/a
Description: The **O** command returns the TA to online mode from the online command mode. When the TA makes a data connection, it enters online data mode. The TA typically remains in this mode until it receives an escape sequence or until the call is ended. When it detects an escape sequence, the TA enters online command mode, in which it can accept AT commands while retaining the online connection. To return the TA to online mode from the online command mode, enter the command **ATO<CR>**.

2 - S-Registers

S-registers are sections of memory in which values are stored that affect how the TA operates.
S-registers are so-called because each has a name that begins with the character S.
Use the **Sr=**n command to assign a value to an S-register or use the **Sr?** command to read the current value of an Sregister.
S-registers are stored in non-volatile RAM (NVRAM) by using the **&W**0 command. **ATZ<CR>** restores S-registers to values stored in NVRAM if any were stored using the **&W0** command; otherwise, they revert to factory default settings in ROM.

2.1 - S-Register Summary List

2.1.1 - S-Register Function

S0	Rings Until Answer
S1	Ring Count
S2	Escape Character
S3	Carriage Return Character
S4	Line Feed Character
S5	Backspace Character
S7	Wait for Connection (Abort Timer)
S8	Pause Time for Comma
S10	DCD Drop Time
S25	DTR Drop Time
S26	Delay DTR Monitoring After Connect
S27	RS-232 CLEAR Synchronization Sequence
S29	On-line Inactivity Timer Period
S30	On-line Inactivity Timer
S31	Maximum Re-dial Timeout Value (for models supporting two B-channels)
S32	Escape Sequence Timeout
S34	Maximum Escape Sequence Length
S50	Caller Line ID (CLI)
S52	Auto-Protocol Detection
S53	Maximum X.75 Buffer Size
S54	Force 56Kbps B-Channel Data Rate
S56	Calling Party Number Information Element Settings
S57	Called Party Number Information Element Settings
S58	Client-side PPP/ML-PPP Authentication Protocol Negotiation
S59	Dynamic Bandwidth Allocation (DBA) Scheme (for models supporting two B-channels)
S60	Bandwidth-On-Demand (BOD) High Threshold Sampling Period (for models supporting two Bchannels)
S61	Bandwidth-On-Demand (BOD) High Throughput Threshold (for models supporting two B-channels)
S62	Bandwidth-On-Demand (BOD) Low Threshold Sampling Period (for models supporting two Bchannels)
S63	Bandwidth-On-Demand (BOD) Low Throughput Threshold (for models supporting two B-channels)
S73	MultiLink Endpoint Discriminator Type (for models supporting two B-channels)
S74	Maximum CLEAR Buffer Size
S80	Persistent DTR Dialing Delay

S81 Link Setup Timeout
S84 Data to Terminal Delay
S85 Data to B-channel Delay
S154 B-Channel Answer Rate

2.2 - S-Register Detail

2.2.1 - S-Register: **S0**
Usage: S0=n; S0?
Function: Number of Rings Until Answer
Unit: 1 ring
Range: n=**0-255** (0-255 rings)
Default: **1** (1 ring)
Description: **S0** sets the number of rings the TA waits for before it answers and begins its connect sequence.
S0=0 turns off the ability to automatically answer a call. **S0=1** causes the TA to automatically answer after 1 ring. Note that if the **S0** value is set too high, the calling device may time out before the TA answers the call. For auto-answer, **S0** must have a non-zero value, DTR must be high (**&D**n command), and the TA must be offline.

2.2.2 - S-Register: **S1**
Usage: S1?
Function: Ring Count
Unit: 1 ring
Range: n=**0-255** (0-255 rings)
Default: **0** (0 rings)
Description: S1 counts the number of rings that have occurred, up to a maximum of 255. It is a read-only register and is seldom, if ever, used in typical operation. If you set S1 to a value other than its default value of zero, or if the value is increasing with rings, this new value remains stored in S1 for eight seconds after the last ring is counted, after which time the value reverts to zero.

2.2.3 - S-Register: **S2**
Usage: S2=n; S2?
Function: Escape Character
Unit: Decimal ASCII code
Range: n=**0-127**
Default: **43** (+)
Description: **S2** specifies the character used by the TA to escape from data mode and return to command
mode.

2.2.4 - S-Register: **S3**
Usage: S3=n; S3?
Function: Carriage Return Character
Unit: Decimal ASCII code
Range: n=**0-127**
Default: **13** (^M)
Description: **S3** specifies the character used by the TA to indicate the end of a command line.

2.2.5 - S-Register: **S4**
Usage: S4=n; S4?
Function: Line Feed Character
Unit: Decimal ASCII code
Range: n=**0-127**
Default: **10** (^J)
Description: **S4** specifies the character used by the TA to indicate the end of a status message.

2.2.6 - S-Register: **S5**
Usage: S5=n; S5?

Function: Backspace Character
Unit: Decimal ASCII code
Range: n=**0-32, 127**
Default: **8** (^H)
Description: **S5** specifies the character used by the TA to delete the previous character in the command line.

2.2.7 - S-Register: S7
Usage: S7=n; S7?
Function: Wait for Connection (Abort Timer)
Unit: 1 second
Range: n=**0-255** (0-255 seconds for all switch types except INS64)
n=0-50 (0-50 seconds for INS64 switch type)
Default: **45** (45 seconds)
Description: g sets the Abort Timer delay time, which is the length of time the TA waits for a connection after dialing. If no connection is established during the specified time, the TA ends the call. The INS64 switch type limits the maximum delay time to 50 seconds or less. All other switch types allow up to 255 seconds of delay.

2.2.8 - S-Register: S8
Usage: S8=n; S8?
Function: Pause Time for Comma
Unit: 1 second
Range: n=**0-255** (0-255 seconds)
Default: 2 (2 seconds)
Description: **S8** sets the length of the pause caused by a comma inserted in a dialing command. The default setting is 2 seconds, where each unit is one second. S8 may be set for up to 255 seconds.

2.2.9 - S-Register: S10
Usage: S10=n; S10?
Function: DCD Drop Time
Unit: 50 ms
Range: n=**0-254** (0-12.75 seconds),
n=255 (do not disconnect)
Default: **20** (1 second)
Description: **S10** sets the time after a carrier signal is lost before the TA disconnects. (The **&C2** command must be in effect.) The default setting is one second. Maximum delay is 12.75 seconds (**S10=254**). Set **S10** to 255 to cause the TA not to disconnect with loss of carrier.

2.2.10 - S-Register: S25
Usage: S25=n; S25?
Function: DTR Drop Time
Unit: 100 ms
Range: n=**0** (50ms),
n=**1-255** (100ms-25.5s)
Default: **5** (500ms)
Description: **S25** sets the time that DTR must remain low before the TA disconnects. The **S25** unit value for 0 is 50 ms. For values from 1 through 255, the unit value is 100 ms.

2.2.11 - S-Register: S26
Function: Delay DTR Monitoring After Connect
Unit: 500 ms (1/2 second)
Range: n=**0-255** (0-127.5 seconds)
Default: **10** (5 seconds)
Description: After a synchronous, CLEAR data call has been originated or answered, the monitoring of the DTR signal is delayed for the number of 500ms intervals indicated by **S26**. By default, after the connection is established there is a 5 second delay until DTR is monitored. If DTR drops during the time of the delay after the connection is established, then the TA will not disconnect the data call.

After the delay period is over, normal DTR monitoring resumes (assuming DTR is being monitored - **&D1, &D2, or &D3**).

2.2.12 - S-Register: S27

Usage: S27=n; S27?
Function: RS-232 CLEAR Synchronization Sequence
Unit: Decimal ASCII code
Range: n=**0**—0x0000,
n=**1**—0x1616,
n=**2**—0x7E7E,
n=**3**—0xFFFF,
n=**4**—Auto-Synchronize
Default: **4** (Auto-Synchronize)
Description: **S27** lets the TA synchronize the RS-232 channel on a specific sequence in a CLEAR synchronous data connection. Auto-synchronizing normally happens immediately after connecting. **S27** is mostly for the case where auto-synchronization happens to fail (which it should not).

2.2.13 - S-Register: S29

Usage: S29=n; S29?
Function: On-line Inactivity Timer Period
Unit: 0.25 seconds
Range: n=**0**—does not disconnect
n=**1-255** (0.25-63.75 seconds)
Default: 240 (60 seconds)
Description: **S29** sets the on-line inactivity timer period and affects the on-line inactivity timer ***S30*** by adjusting its unit of time. For example, this allows the inactivity of data calls to be timed down to 0.25 seconds and if no data is received within 0.25 seconds the data call will disconnect. This is useful for quick connect/disconnects or for continuous connect/disconnect cycles when combined with the use of Persistent DTR Dialing (PDD). By default the period is 60 seconds (1 minute).

2.2.14 - S-Register: S30

Usage: S30=n; S30?
Function: On-line Inactivity Timer
Unit: (n * **S29**) seconds (**S29=240** by default)
Range: n=**0** (does not disconnect),
=**1-255** (1-255 minutes by default (**S29=240**))
Default: **0** (does not disconnect)
Description: **S30** causes the TA to disconnect a data connection if no data is transmitted or received for the specified time. It will NOT cause an analog call (voice/modem/fax) to disconnect. The timer will restart any time a data character is passed through the serial port (either sent or received). The inactivity timer is disabled by setting **S30=0** or **S29=0**. By default **S30=0**, so data calls are not disconnected if sitting idle.

2.2.15 - S-Register: S31

Usage: S31=n; S31?
Function: Maximum Re-dial Timeout Value (for models supporting two B-channels)
Unit: 1 minute
Range: n=**0** (does not try to re-dial),
=**1-255** (1-255 minutes)
Default: **30** (30 minutes)
Description: **S31** sets the maximum re-dial timeout value for attempting to add a second channel to a ML-PPP or SoftBonding data call. Once this maximum timeout is reached, there will be no further attempts to re-dial. Re-dialing will occur if a call attempt fails due to the host being busy or not answering. The first re-dial timeout period is 1 minute. If re-dialing fails after 1 minute is up, then the next redial timeout is 3 minutes. If re-dialing fails after 3 minutes is up, then the next re-dial timeout is 5 minutes. If re-dialing fails after 5 minutes, then the subsequent re-dial timeouts occur every 5 minutes up to the maximum re-dial timeout value (**S31**).

2.2.16 - S-Register: **S32**
Usage: S32=n; S32?
Function: Escape Sequence Timeout
Unit: 100 ms
Range: n=**0-255** (0-25.5 seconds)
Default: **20** (2 seconds)
Description: **S32** sets the time allowed in an escape sequence from the receipt of the A in AT to the receipt of the carriage return. If the **S32** time interval expires before you press ENTER, the escape sequence ends. The default time is 2 seconds.

2.2.17 - S-Register: **S34**
Usage: S34=n; S34?
Function: Maximum Escape Sequence Length
Unit: 1 character
Range: **0-10** (0-10 characters)
Default: **2** (2 characters after escape sequence)
Description: **S34** sets the maximum character length of the escape sequence, not including **+++AT**. For example a character length of **S34=2** allows 2 characters after **+++AT** (e.g., **+++ATH0**). Conversely, an invalid escape sequence (too many characters placed in the command string) would be passed through as data (e.g., **+++ATI1I2**). The maximum length of the escape sequence is 10 characters.

2.2.18 - S-Register: **S50**
Usage: S50=n; S50?
Function: Caller Line ID (CLI)
Unit: Decimal ASCII code
Range: n=0 (disable),
=1 (enable with first RING only),
=2 (enable with all RING messages)
Default: 1 (enabled with first RING only)
Description: S50 determines whether the mechanism for identifying the two endpoints of a connection is enabled or disabled. Since RING messages appear only for ISDN digital calls, the CLI feature does not define a means of conveying Calling Party information to the terminal for analog calls. CLI information is included only with the first RING message for a given incoming call when S50=1. For example:

RING
FM: 5552000 TO: 5551000
RING

CLI information is included with all RING messages for a given incoming call when **S50=2**.
Example:

RING
FM: 5552000 TO: 5551000

If the Calling Party Number information is not included in the incoming SETUP message, then the RING message appears as follows:

RING
TO: 5551000

If the Called Party Number information is not included in the incoming SETUP message, then the RING message appears as follows:

RING
FM: 5551000

If neither the Called Party Number nor Calling Party Number is included in the incoming SETUP message, then the RING message contains no additional information.

2.2.19 - S-Register: **S52**
Usage: S52=n; S52?
Function: Auto-Protocol Detection
Unit: Decimal ASCII code
Range: n=**0** (Disable),
n=**1** (Detect),

n=**2** (Detect and Select)
Default: **1** (Detect)
Description: **S52** enables or disables the ability to identify the reception of V.120, X.75, or PPP data calls. The TA determines the type of call by checking for protocol information in the SETUP message or by matching protocol information received on the B-channel once connected if no protocol information is available in the SETUP message. Once the protocol is determined, the TA will switch its data protocol to match. If **S52=1** "Detect," then, upon disconnection, the TA will revert its data protocol selection back to the protocol that was selected before the call was received. If **S52=2** "Detect and Select", then the TA will not revert the protocol selection. Rather, it will keep the detected data protocol as the new protocol selection. "Detect and Select" is useful for applications where the TA receives a call and then the software performs callback. Because callback calls should be made with the same protocol that was used by the client, "Detect and Select" enables this possibility. However, if an initialization string or **&F***n* command is given to the TA that changes the protocol after the disconnection, then "Detect and Select" will not be effective. For correct data protocols on callback calls when using "Detect and Select," make sure that no such post-disconnection protocol changing commands are given to the TA.

2.2.20 - S-Register: S53
Usage: S53=n; S53?
Function: Maximum X.75 Buffer Size
Unit: 1 bytes
Range: n=**64-2048** (64-2048 bytes)
Default: **2048** (2048 bytes)
Description: **S53** allows the maximum buffer size of an X.75 frame to be customized. Typically, a smaller frame size is more compatible with software packages on a PC (such as HyperTerminal). Larger frame sizes introduce larger delay, which some software cannot deal with appropriately.

2.2.21 - S-Register: S54
Usage: S54=n; S54?
Function: B-Channel Origination Rate
Unit: Decimal ASCII code
Range: n=**0** (64Kbps, but use Progress Indicator IE),
n=**56** (56Kbps)
n=**64** (64Kbps)
Default: **0** (64Kbps, but use Progress Indicator IE)
Description: **S54** lets you force the TA to originate digital calls with a 56Kbps or 64Kbps B-channel rate. In some situations, it is necessary to force a 56Kbps connection; for example, when an originated call fails to connect because the end-to-end connection is not 64Kbps and the originating TA or the answering TA is not informed of this situation by the network. In some situations, it is necessary to force a 64Kbps connection when the originating TA is first informed that the call changed to 56Kbps but then later returned to the ISDN and switched back to 64Kbps. By default the TA will check for Progress Indicator Information Elements indicating changes in the routing of digital calls to determine whether the call needs to switch to 56Kbps or remain at 64Kbps.

2.2.22 - S-Register: S56
Usage: S56=n; S56?
Function: Calling Party Number IE Settings
Unit: Decimal ASCII code
Range: n=**128** (Disable),
n=**129** (Send Calling Party Number IE using defaults)
Otherwise, n=(Type of Number) + (Numbering Plan)
Type of Number
0—unknown,
16—international,
32—national,
48—network specific,

64—subscriber,
96—abbreviated
Numbering Plan
0—unknown,
1—ISDN/telephony,
3—data,
4—telex,
8—national standard,
9—private

Default: **128** (Disabled)

Description: **S56** modifies the Octet 3 value of the Calling Party Number Information Element that is sent within the SETUP message for digital calls. To set a specific number-type and numbering plan, select an option from the Type of Number section above and add its respective value to the respective value of an option in the Numbering Plan section above. For example, a National/ISDN Calling Party Number IE would be **S56=33**, where 32 (national) + 1 (ISDN/telephony) = 33 (National/ISDN). If there is no Data DN/MSN 1 stored (for digital calls), then no Calling Party Number IE will be sent. By default **S56=128**; this means no Calling Party Number IE is sent. If **S56=129**, then the Calling Party Number IE will be sent (if the appropriate DN/MSN is stored) with the default Type of Number and Numbering Plan used for the given switch type.

2.2.23 - S-Register: S57

Usage: S57=n; S57?

Function: Called Party Number IE Settings

Unit: Decimal ASCII code

Range: n=**128** (Disable),
Otherwise, n=(Type of Number) + (Numbering Plan)
Type of Number
0—unknown,
16—international,
32—national,
48—network specific,
64—subscriber,
96—abbreviated
Numbering Plan
0—unknown,
1—ISDN/telephony,
3—data,
4—telex,
8—national standard,
9—private

Default: **128** (disabled)

Description: **S57** modifies the Octet 3 value of the Called Party Number Information Element that is sent within the SETUP message for a data call and within each INFORMATION message sent when dialing from the POTS port. Called Party Number Information Elements are sent only by NET3, VN4, and INS64 switch types. To set a specific number-type and numbering plan, select an option from the Type of Number section above and add its respective value to the respective value of an option in the Numbering Plan section above. For example, a National/ISDN Called Party Number IE would be ***S57=33***, where 32 (national) + 1 (ISDN/telephony) = 33 (National/ISDN). By default S**57=128** which means no Called Party Number IE is sent.

2.2.24 - S-Register: S58

Usage: S58=n; S58?

Function: Client-side Authentication Protocol Negotiation

Unit: Decimal ASCII code

Range: n=1—PAP,
n=2—PAP between TA and PC, CHAP MD5 between TA and server, or
n=3—ANY authentication protocol

Default: **1** (PAP)

Description: **S58** determines which client-side authentication protocol can be negotiated during the Link Control Protocol (LCP) phase of PPP/ML-PPP negotiation. **S58** will not determine which authentication protocol is negotiated if the TA us used on the server-side. **S58=1** allows only PAP to be negotiated. **S58=2** allows PAP between the TA and PC and CHAP MD5 between the TA and server. **S58=3** allows any authentication protocol. If the server does not allow PAP, then set **S58=2** to try CHAP MD5 with the server. If the server does not allow CHAP MD5 or the PC does not allow PAP, then set **S58=3** to allow any authentication protocol that the server requests. MultiLink connections are possible if the authentication protocol is PAP (**S58=1 or S58=3**), CHAP MD5 (**S58=2 or S58=3**), MS-CHAP (**S58=3**) and possibly others (**S58=3**).

2.2.25 - S-Register: S59

Usage: S59=n; S59?

Function: Dynamic Bandwidth Allocation (DBA) Scheme (for models supporting two B-channels)

Unit: Decimal ASCII code

Range: n=0—Disable,
n=1—MP+,
n=2—PPP

Default: **1** (MP+)

Description: **S59** determines whether Dynamic Bandwidth Allocation is disabled or enabled by the use of a specific scheme (MP+ or PPP). Setting **S59=0** disables Dynamic Bandwidth Allocation and, as a result, disables Bandwidth-On-Demand and Call Bumping. Setting **S59=1** (MP+) will instruct the TA to negotiate the MP+ option during the PPP LCP phase. If the MP+ DBA scheme is desired, but the server does not support MP+, then the TA will fall back to the PPP DBA scheme. Because of this fall-back ability, DBA on the client side is always possible. Setting **S59=2** to use PPP will instruct the TA to use basic PPP requests to perform Dynamic Bandwidth Allocation (this is the most widely accepted scheme). These basic PPP requests include the LCP Terminate Request command to disconnect a data channel and instructing the TA to add a second channel simply by dialing the second number given in the dial string (or dialing the same number if **&J1**).
If the TA is used as a host, then MP+ must be also supported by the client. The host TA must then set **S59=1** (MP+). If the TA is used as a host, but either MP+ is not supported by the client or the host did not set **S59=1** (MP+), then DBA is not possible. For example, if the host sets S59=1 but the client does not support MP+, then DBA is not possible. If the host sets **S59=2**, then DBA is not possible. MP+ is required to be negotiated by both the client and host if the host is to perform DBA. The PPP DBA scheme is the most widely accepted DBA scheme and this is why the TA will fall back to the PPP scheme if MP+ is not supported thus allowing DBA to be available at all times (for the client TA).
The second data directory number (Data DN 2) must be set if using the TA as a host with MP+ enabled as the DBA scheme. The TA uses the second data directory number to send to the client as the call-back number to have the client dial to set up the second data channel (the call-back number is sent as a part of the MP+ protocol). Because of the ability to send the client a call-back number, it is then possible to allow the host to perform Dynamic Bandwidth Allocation as well. The PPP DBA scheme cannot instruct the client to call back and because of this we cannot allow the PPP DBA scheme to drop a channel due to analog calls.

2.2.26 - S-Register: S60

Usage: S60=n; S60?

Function: Bandwidth-On-Demand (BOD) High Threshold Sampling Period (for models supporting two Bchannels)

Unit: 1 second

Range: n=**0** (BOD completely disabled),
n=**1-255** (1-255 seconds)

Default: **10** (10 Seconds)

Description: **S60** sets the Bandwidth-On-Demand High Threshold Sampling Period. With Dynamic Bandwidth Allocation enabled and BOD enabled, the client TA can always

use BOD. The host TA, however, can use BOD only if MP+ (**S59=1**) was negotiated successfully by both the client and the host. A short sampling period will cause the TA to respond to an increase in the throughput sooner than a long sampling period. By default the average throughput is determined over 10 seconds of time.

2.2.27 - S-Register: **S61**
Usage: S61=n; S61?
Function: Bandwidth-On-Demand (BOD) High Throughput Threshold (for models supporting two B-channels)
Unit: Kbps
Range: n=**0-64** (0Kbps-64Kbps)
Default: **52** (52Kbps)
Description: **S61** sets the Bandwidth-On-Demand High Throughput Threshold. This threshold is used to determine whether a second channel should be added or not due to high throughput. By default the average throughput during the High Threshold Sampling Period (**S60**) must exceed 52Kbps.

2.2.28 - S-Register: **S62**
Usage: S62=n; S62?
Function: Bandwidth-On-Demand (BOD) Low Threshold Sampling Period (for models supporting two Bchannels)
Unit: 1 second
Range: n=**0**—second channel will not disconnect
n=**1-255** (1-255 seconds)
Default: **10** (10 Seconds)
Description: **S62** sets the Bandwidth-On-Demand Low Threshold Sampling Period. Setting **S62=0** will cause the TA not to disconnect the second channel when it is added unless Call Bumping is enabled and an analog call bumps the data call on the second channel. Setting ***S62*** to any value other than 0 will cause the TA to take an average of the throughput. A short sampling period will cause the TA to respond to a decrease in the throughput sooner than a long sampling period. By default the average throughput is determined over 10 seconds of time.

2.2.29 - S-Register: **S63**
Usage: S63=n; S63?
Function: Bandwidth-On-Demand (BOD) Low Throughput Threshold (for models supporting two B-channels)
Unit: Kbps
Range: n=0-64 (0Kbps-64Kbps)
Default: **26** (26Kbps)
Description: **S63** sets the Bandwidth-On-Demand Low Throughput Threshold. This threshold is used to determine whether the second channel should be disconnected or not because of low throughput. By default the average throughput during the Low Threshold Sampling Period (**S62**) must be equal to or less than 26Kbps.

2.2.30 - S-Register: **S73**
Usage: S73=n; S73?
Function: MultiLink Endpoint Discriminator Type (for models supporting two B-channels)
Unit: Decimal ASCII code
Range: n=**0**—Null Class,
n=**1**—Locally Assigned Address,
n=**2**—IP Address,
n=**3**—IEEE 802.1 Globally Assigned MAC Address,
n=**4**—PPP Magic-Number Block,
n=**5**—Public Switched Network Directory Number
Default: **4** (PPP Magic-Number Block)
Description: **S73** allows the MultiLink PPP Endpoint Discriminator type to be set. The Endpoint Discriminator is used to help determine if a channel is to be bundled with any other channels (forming a MultiLink Group or Bundle) or if it is a new bundle. Currently, the Null Class (**S73=0**), PPP Magic-Number Block (**S73=4**), and Public Switched Network Directory Number (**S73=5**) are complete. The PPP Magic-Number Block

contains 5 Magic-Numbers in this implementation and is the default type. The Public Switched Network Directory Number option uses Data Directory Number 1 as the Endpoint Discriminator (if it is blank, then Endpoint Discriminator is blank). The Locally Assigned Address (**S73=1**), IP Address (**S73=2**), and IEEE 802.1 Globally Assigned MAC Address (**S73=3**) options currently generate a random value similar to the PPP Magic-Number Block, except that the length of the Endpoint Discriminator follows according to the specifications for the respective type. See RFC 1990 for more information about the MultiLink Endpoint Discriminator option and its types.

2.2.31 - S-Register: S74

Usage: S74=n; S74?
Function: Maximum CLEAR Buffer Size
Unit: 1 byte
Range: n=**0** (256 bytes),
n=**64-255** (64-255 bytes)
Default: **0** (256 bytes)
Description: **S74** allows the maximum CLEAR buffer size to be customized. An adjustable packet size facilitates higher compatibility with devices that cannot handle a large delay. Reducing the CLEAR buffer size
reduces delay.

2.2.32 - S-Register: S80

Usage: S80=n; S80?
Function: Persistent DTR Dialing Delay
Unit: 1 second
Range: n=**0** (no delay),
n=**1-255** (1-255 seconds)
Default: **0** (no delay)
Description: Once DTR is detected as present (active high) and other conditions required for the TA to dial are met, a delay of **S80** seconds will occur before stored number 0 is dialed. Some conditions include the TA not being in the @**CONFIG** configuration menu, not having a data call present at the time, and Persistent DTR Dialing must be enabled. By default the TA will not delay before dialing when all conditions are satisfied.

2.2.33 - S-Register: S81

Usage: S81=n; S81?
Function: Link Setup Timeout
Unit: 100ms
Range: n=**0** (discard pending call),
n=**1-255** (100ms-25.5s)
Default: **30** (3 seconds) for the INS64 switch type
10 (1 second) for all other switch types
Description: When all layers are down and no TEIs are assigned or the switch dropped the TEIs without informing the TA, then, when there is an incoming call or the TA attempts to originate a call, it must first bring up Layer 1, Layer 2, and request a TEI. If, for some reason, the switch does not respond to the request for a TEI or none of the layers come up successfully, then the TA should timeout and report NO CARRIER or NO DIALTONE. By default **S81** allows 3 seconds (INS64 switch type) or 1 second (all other switch types) for the link to set up. Typically the link is set up within 2 seconds for the INS64 switch type and 200ms for all other switch types.

2.2.34 - S-Register: S84

Usage: S84=n; S84?
Function: Data to Terminal Delay
Unit: 10ms
Range: n=**0** (no delay),
n=**1-255** (10ms-2.55s)
Default: **0** (no delay)

Description: **S84** controls the delay time for data sent from the TA to the terminal. The timer for this S-register is started at the time the *CONNECT* message is printed. Any data received from the B-channel after the *CONNECT* message but before the timer expires is stored in a queue in the order in which it is received. Once the timer expires, any queued data will be sent to the terminal in the order in which it was received. This delay timer is useful for use with some applications that are not ready for to receive data too soon after the *CONNECT* message is given.

2.2.35 - S-Register: S85
Usage: S85=n; S85?
Function: Data to B-channel Delay
Unit: 10ms
Range: n=**0** (no delay),
n=**1-255** (10ms-2.55s)
Default: **0** (no delay)
Description: **S85** controls the delay time for data sent from the TA to the appropriate B-channel. The timer for this S-register is started at the time the *CONNECT* message is printed. Any data received from the terminal after the *CONNECT* message but before the timer expires is stored in a queue in the order in which it is received. Once the timer expires, all queued data will be sent to the appropriate Bchannel in the order in which it was received.

2.2.36 - S-Register: S154
Usage: S154=n; S154?
Function: B-Channel Answer Rate
Unit: Decimal ASCII code
Range: n= **0** (64Kbps, but use Progress Indicator IE),
n= **1** (64Kbps, ignore Progress Indicator IE, check Bearer Capability IE),
n=**56** (54Kbps),
n=**64** (64Kbps)
Default: **0** (64Kbps, but use Progress Indicator IE)
Description: **S154** allows the ability to force the TA to answer digital calls with a 56Kbps or 64Kbps B-channel rate. In some situations it is necessary to force a 56Kbps connection. Such a situation may occur when a call fails to connect because the end-to-end connection is not 64Kbps and the originating TA or the answering TA is not informed of this situation by the network. In some situations it is necessary to force a 64Kbps connection when the TA is first informed that the call changed to 56Kbps but then later returned to the ISDN and switched back to 64Kbps. It may be more likely that setting **S154=1** is the best solution to the “not end-to-end ISDN” message given by the network. In this case (**S154=1**), the TA will assume 64Kbps unless the Bearer Capability Information Element indicates a 56Kbps connection. The TA will then ignore all Progress Indicator Information Elements when **S154=1**. By default the TA will check for Progress Indicator Information Elements indicating changes in the routing of digital calls to determine whether the call needs to switch to 56Kbps or remain at 64Kbps.

3 - Result Codes

When the MT128SMI receives an AT command from the computer or terminal, it attempts to execute the command, and then it sends a status message to the computer or terminal that reports the result of the command. The MT128SMI provides you with several of these response messages, or *result codes,* which can be displayed on your monitor or intercepted and used by your communications software. Using the *V* command, you can select whether the result codes are *terse* (numbers) or *verbose* (words).

The MT128SMI’s result codes are listed below. Note that the speed of an ISDN channel is always either 56 Kbps or 64 Kbps. *Connect* messages indicate the speed of the connection between the MT128SMI and your computer or terminal except when the serial speed is greater than the B-channel rate (56000 or 64000) in which case the speed will be given as CONNECT 56000 or CONNECT 64000 (the slowest speed between the computer or terminal and the remote side).

terse	verbose	definition
0	OK	TA executed the command without error
1	CONNECT	TA established an ISDN connection
2	RING	TA detected a ring caused by incoming call
3	NO CARRIER	TA did not detect carrier within time allotted by register S7
4	ERROR	Error in the AT command
5	CONNECT 1200	TA connected at 1200 bps
6	NO DIALTONE	TA has a poor connection to ISDN network
7	BUSY	TA detected a busy signal
8	CONNECT 300	TA connected at 300 bps
10	CONNECT 2400	TA connected at 2400 bps
11	CONNECT 4800	TA connected at 4800 bps
12	CONNECT 9600	TA connected at 9600 bps
14	CONNECT 19200	TA connected at 19200 bps
28	CONNECT 38400	TA connected at 38400 bps
17	CONNECT 56000	TA connected at 56000 bps
18	CONNECT 57600	TA connected at 57600 bps
19	CONNECT 64000	TA connected at 64000 bps
78	SOFTBONDING	TA using SoftBonding protocol
79	PPPC PROTOCOL	TA using Point-to-Point protocol
80	HDLC PROTOCOLI	TA using raw HDLC protocol
83	V.120 PROTOCOL	TA using V.120 rate adaption protocol
84	X.75 PROTOCOL	TA using X.75 rate adaption protocol
87	CLEAR PROTOCOL	TA using CLEAR (transparent) protocol

4 - Using AT Commands

You can configure and operate the MT128SMI entirely with AT commands if you like. But remember, you can issue AT commands only from a terminal or from a computer running a communications program in terminal mode. This section describes how to use AT commands for some basic operations.

4.1 - Modes of Operation

The MT128SMI has three modes of operation:

- **Offline Command Mod**e -MT128SMI communicates with the terminal or computer and responds to AT commands. There is no data communications link with a remote device.
- **Data Mode** -MT128SMI enters data mode when it makes a successful data communications link with a remote device. In data mode, the TA can send/receive data, but it does not respond to AT commands. Instead it treats them as data and transmits them to the remote device.
- **Online Command Mode** - MT128SMI responds to AT commands while maintaining a data communications link; however, transmission of data is suspended. To enter online command mode from data mode, type the escape sequence **+++AT<CR>**. To return to data mode from online command mode, type **ATO<CR>**.

4.2 -Making a Call

Before you can place a data call, configure the MT128SMI for the local switch type, serial port speed, and the data type of the ISDN device you want to call. See Configuration Utilities.

4.3 - Dialing

To dial a number using AT commands, you must first start a data communications program. In the program's terminal mode, type **ATDxxxxxxx<CR>**, where xxxxxxx is the telephone number you want to dial, and <CR> is the carriage return character that is sent when you press the ENTER key, e.g., **ATD7853500<CR>**. The dial string can contain up to 80 characters.
For easier reading, the dial string can use hyphens, spaces or parentheses. These characters are ignored by the MT128SMI. For example, the MT128SMI will read the following dial strings the same way:

ATD16127853500 <CR>

ATD 1-612-785-3500 <CR>
ATD 1 (612) 785-3500 <CR>

4.4.1 - Dialing Information for Models Supporting Two B-Channels:
To place an ML-PPP call, use an ampersand character (*&*) to join two telephone numbers; e.g., **ATD7853500&7853502<CR>**. The telephone numbers can be the same or different. Using this method, two Bchannels are activated to transmit data at an aggregate speed of 128 Kbps.

4.4.1.1 - Channel Bundling Flag Dialing

The command AT&Jn is used to indicate whether outgoing calls should be made on two B-channels by default. The command AT&J1&W0<CR>, configures the TA to place a call, dialing on two B-channels by default. If no second number is given in the dial string, that single number is dialed twice. This compensates for the interworking issues with Windows Dial-Up Networking. On the other hand, if the user explicitly indicates two numbers in the dial string, then two numbers are dialed (e.g., **ATD7853500&785 3502<CR>**). The command AT&J0&W0<CR>, disables automatic call bundling. Note other valid characters joining two telephone numbers include a plus sign (**+**), and an exclamation mark (**!**).
In Windows Dial-Up Networking, if the **Use Country Code** and **Area Code** boxes are checked in the **Properties** window for dial-up connection, the bundling modifier (i.e., &, + or !) is removed from the dialing string when attempting to make a connection. Solution: Do not check these boxes or simply add the bundling dial modifier to the phone number at the time of connection.

4.5 - Canceling a Call

To cancel a call before the MT128SMI makes a connection, press any key.

4.6 - Storing a Telephone Number

To store a telephone number, type **&Zn=**x in terminal mode, where *n* is the number of the memory register in which the number is to be stored, and *x* is the dial command string that you want to store. For example, type **AT&Z9=612-785-3500 <CR>** to store the number 612-785-3500 in memory register 9.

4.7 - Dialing a Stored Telephone Number

To dial a stored telephone number, type **DS**n in terminal mode, where *n* is the location of the number you wish to dial.
For example, type **ATDS3 <CR>** dials a telephone stored in memory register 3 location.

4.8 - Displaying a Stored Number

To display a stored telephone number, type **&Zn?** in terminal mode, where *n* is the memory register in which the number is stored. For example, type **AT&Z5? <CR>** to display the telephone number in memory register 5. To list all ten telephone numbers stored in memory, type **ATL <CR>**.

4.9 - Answering a Call

You can answer incoming calls to the MT128SMI either manually or automatically. When the TA detects an incoming call, it turns on the RI signal on the V.24 interface and sends a RING result code to the computer or terminal after each ring. If autoanswer is enabled, the TA automatically answers the call. You can manually answer the call with the **A** command. Both methods are described below.

4.10 - Answering Manually

If your communication program is in terminal mode when the RING result code appears on your monitor, you can manually answer the call by typing **ATA <CR>**.

4.11 - Answering Automatically

To cause the MT128SMI to automatically answer a call:

1. Enable autoanswer by setting register **S0** to the ring on which you want the TA to answer (e.g., in terminal mode, type **S0=4** to make the TA answer on the fourth ring). You also can use either of the configuration utilities to the turn on autoanswer and set the number of rings.
2. Make sure that the TA is offline.
   The TA answers the call after the number of rings specified by **S0**. To disable autoanswer, use a configuration utility or the command **S0=0**.
   Note: If the user wants to accept calls while DTR is low, the TA must be configured to ignore DTR. To do this, enter AT&D0<CR>. With this configuration, the TA can accept calls while DTR is low. If this configuration setting is not made, the TA rejects incoming calls until DTR is high while calls come in.

4.12 - Hanging Up

To hang up a call, escape to online command mode (**+++AT<CR>**), then enter the H command (**ATH<CR>**). The escape sequence and hang up command can be combined into one command string: **+++ATH<CR>**.

5 - Troubleshooting the TA

5.1 - Specific Troubleshooting Situations

5.1.1 - SITUATION 1:

The **!H**n and ***!H**n commands can be very useful for certain RAS environments that require at least 1 second to initialize a port after a call has disconnected (such as Citrix and Novell). For example, when a call disconnects, Citrix and Novell will begin initializing the port that just disconnected. However, it typically takes more than 1 second and during that time a call may be received by the digital or analog port. When this happens, Citrix and Novell do not answer the call nor do they finish the initialization process. To prevent this problem, setting **!H5** and/or ***!H5** will set the TA to hold of digital and/or analog calls for 5 seconds after the respective port(s) disconnect(s). This should give enough time for the digital and/or analog port to be initialized by Citrix or Novell and enter the "waiting for a call" state.

5.1.2 - SITUATION 2:

The autobauding code cannot differentiate between 7 data bits, no parity, 1 or 2 stop bits (7N1 or 7N2) and 7 data bits, mark parity, 1 or 2 stop bits (7M1 or 7M2). The TA assumes 7 data bits, mark parity, 1 stop bit (7M1) and this case covers 7N1, 7N2, 7M1 and 7M2. However, if for some reason the assumption of 7M1 causes a problem, then there is a workaround. The addition of the **%S3** command and use of **$SB**n, @**P3=**n, @**P4=**n, and @**P6=**n will help work around this limitation. See the description for the **%S**n command.

5.1.3 - SITUATION 3:

The autobauding code cannot differentiate between 8 data bits, no parity, 1 or 2 stop bits (8N1 or 8N2) and 7 data bits, space parity, 1 or 2 stop bits (7S1 or 7S2). The TA assumes 8 data bits, no parity, 1 stop bit (8N1) and this setting covers 7S1, 7S2, 8N1 and 8N2. However, if for some reason the assumption of 8N1 causes a problem, then there is a workaround. The addition of the **%S3** command and use of **$SB**n, @**P3=**n, @**P4**=n, and @**P6**=n will help work around this limitation. See the description for the **%S**n command.

5.1.4 - SITUATION 4:

The autobauding code does not report the number of stop bits. This may become a problem if the terminal is expecting a certain number of stop bits. The addition of the **%S3** command and use of **$SB**n, @**P3=**n, @**P4=**n, and @**P6=**n will help work around this limitation. See the description for the **%S**n command.

5.2 - Debugging/Logging/TroubleshootingCommands

The AT commands in this section can be used in attempting to troubleshoot or debug a current problem. Some commands may be enhanced or limited by the debugging/logging/troubleshooting S-registers described in the Debugging/Logging/Troubleshooting S-registers section.

5.2.1 - Debugging/Logging/Troubleshooting Command Summary

AT Command	Function
>Dn	Embedded Protocol Analyzer (EPA)
*FSn	Reset TA
*Ln	Fatal Error Information
>LOG	Display Logging Buffer Contents
>Sn	Logging Variables
>TIME	Display Current Timestamp
*V	Various State Information

5.3 - Command Descriptions

5.3.1 - Command: **Dn**

Function: Embedded Protocol Analyzer (EPA)

Unit: Decimal ASCII code

Values: ANLYZER/DECODER COMMANDS

n=0---Displays B-channel data using V.120 decoder
n=1---Displays Layer 2 & 3 data using Q.921 & Q.931 decoders
n=2---Displays Layer 2 data using Q.921 decoder
n=3---Displays complete Layer 3 data using long-form Q.931 decoder
n=38--Displays Layer 3 data using short-form Q.931 decoder with hex data
n=39--Displays Layer 3 data using short-form Q.931 decoder
n=4---Displays B-channel data using X.75 decoder
n=5---Displays Asynchronous Port data using PPP decoder
n=51--Displays Asynchronous Port data as raw asynchronous PPP data
n=6---Displays B-channel data using PPP decoder
n=61--Displays B-channel data as raw synchronous PPP data
n=7---Displays B-channel data in raw hexadecimal form
n=8---Displays Layer 1 data using I.430 decoder

EMBEDDED PROTOCOL ANALYZER (EPA) INITIALIZATION COMMANDS

n=98--Disables saving to the decode buffer
n=99--Initializes the decode buffer and begins saving all data specified by S102

Default: n/a

Description: The Embedded Protocol Analyzer (EPA) records and analyzes various protocols on the B-channel, D-channel, and DTE-DCE interface. The EPA is useful as a diagnostic tool, in that essential data messages are displayed. This offers the ability to observe interactive operations of the TA, Central Office, and remote communications equipment. All EPA information stored in the decode buffer contains a timestamp. The timestamp has the form [DD, HH:MM:SS:mmm] where DD is the day, HH is the hour, MM is the minute, SS is the second, and mmm is the millisecond at which the information was recorded. This time is the time since the TA was powered on or reset. For example, when the TA is powered on, the first immediate timestamp would be [00, 00:00:00:000]. Three minutes after power-on the timestamp would be [00, 00:03:00:000]. Timestamping is useful for aiding in cross-referencing the order of events between the logging buffer and decode buffer. It is also useful for determining the amount of time between events in question. Refer to S-register **S102** for details on what types of information can be stored or ignored--useful for focusing on a certain type of information.

5.3.2 - Command: ***FSn**

Function: Reset TA

Unit: Decimal ASCII code

Values: n=0--reset and delay in boot code
n=1-255--reset immediately

Default: ***FS0** (reset and delay in boot code)

Description: ***FSn** may be used to perform a quick reset of the TA without powering it off and on. For any value of n other than 0, the TA will reset immediately (most commonly ***FS1** is used).

5.3.3 - Command: ***Ln**
Function: Fatal Error Information
Unit: Decimal ASCII code
Values: n=blank--display fatal error information
n=1--perform a fatal error
n=2--reset fatal error information
Default: ***L** (display fatal error information)
Description: ***L** displays the most recent fatal errors. ***L**n may be used to perform a pseudo fatal error or reset the fatal error information.

5.3.4 - Command: **>LOG**
Function: Display Logging Buffer Contents
Unit: n/a
Values: n/a
Default: n/a
Description: **>LOG** displays the logging buffer contents. Without the source code, some information is still useful to the user. However, when debugging problems the source code relevant to the build (version/model) of the firmware is necessary. All log_msg() information stored in the logging buffer contains a timestamp. The timestamp has the form [DD, HH:MM:SS:mmm] where DD is the day, HH is the hour, MM is the minute, SS is the second, and mmm is the millisecond at which the information was recorded. This time is the time since the TA was powered on or reset. For example, when the TA is powered on, the first immediate timestamp would be [00, 00:00:00:000]. Three minutes after power-on the timestamp would be [00, 00:03:00:000]. Timestamping is useful for aiding in cross-referencing the order of events between the logging buffer and decode buffer. It is also useful for determining the amount of time between events in question.

5.3.5- Command: **>Sn=x,**
>S?
Function: Logging Buffer Commands and Variables
Unit: Decimal ASCII code
Values: LOGGING COMMANDS
n=98, x=0--Stop logging to buffer
n=99, x=0--Clear logging buffer
n=255 ,x=0--Disable all logging variables
n=255, x=1--Enable all logging variables
LOGGING VARIABLES (n)
n=Varies, so use **>S?** to get available listing
x=0--disable variable n
x=1--enable variable n
Default: n/a
Description: The Logging Buffer stores debug/trace information that may be relevant to capturing a bug or troubleshooting interoperability problems. The logging variables correspond to logging variables in the source code and as such the logging buffer contents require the source code when tracing events or problems.

5.3.6 - Command: **>TIME**
Function: Display Current Timestamp
Unit: n/a
Values: n/a
Default: n/a
Description: **>TIME** displays the current timestamp which is the time since the TA was powered on or reset. The timestamp has the form [DD, HH:MM:SS:mmm] where DD is the day, HH is the hour, MM is the minute, SS is the second, and mmm is the number of milliseconds. The maximum value of the timestamp is [49, 17:02:47.295] which is 49 days, 17 hours, 2 minutes, 47 seconds, and 295 milliseconds. When the maximum timestamp value is reached, the timestamp restarts at [00, 00:00:00.000].

5.3.7 - Command: ***V**
Function: Various State Information
Unit: n/a
Values: n/a
Default: n/a
Description: ***V** displays analog port state information, digital port state information, NLS state information, LAP state information, and I.430 state information.

5.4 - Debugging/Logging/Troubleshooting SRegisters

The S-registers in this section can be used in attempting to troubleshoot, debug, or even correct a current problem. Some S-registers modify functionality of various features. Some S-registers modify the functionality of the debugging/logging/troubleshooting commands described in the debugging/logging/troubleshooting commands detail section.

5.4.1 - Debugging/Logging/Troubleshooting S-Register Summary

S-Register	Function
S72	EuroISDN Variant
S90	Local PPP Capabilities
S91	Remote PPP Capabilities
S92	Channel ID Information Element Octet 3 Settings
S94	Minimum Buffer Space After Trigger
S95	Logging Buffer Functionality
S96	Decode (EPA) Buffer Functionality
S98	ISDN_MSG Size
S99	Startup Options
S100	Flow Control High Threshold
S101	Flow Control Low Threshold
S102	Data to Save for Decoding
S111	Minimum AutoBaud Delay After Response

5.5 - S-Register Descriptions

5.5.1 - S-Register: **S72**
Usage: S72=n; S72?
Function: EuroISDN Variant
Unit: Decimal ASCII code
Range: n=0--No Variant
n=1--Telia Variant
Default: **0** (No Variant)
Description: **S72** was implemented for customers in Sweden attached to the Telia ISDN network and allows the use of the Keypad Information Element as opposed to the Called Party Number Information Element.

5.5.2 - S-Register: **S90**
Usage: S90=n; S90?; S90.b=n; S90.?
b=bit number, n=value
Function: Local PPP Capabilities
Unit: Decimal ASCII code
Range: bit 0--allow PFC,
bit 1--allow ACFC,
bit 2--TA Does MultiLink,
bit 3--allow Short Sequence Numbers,
bit 4--allow IP Header Compression,
bit 5--send MultiLink Even For 1 channel,
bit 6--allow MultiLink Endpoint Discriminator
Default: 31 decimal, 1F hexadecimal
bit 0 = 1 (allow PFC)

bit 1 = 1 (allow ACFC)
bit 2 = 1 (TA Does MultiLink)
bit 3 = 1 (allow Short Sequence Numbers)
bit 4 = 1 (allow IP Header Compression)
bit 5 = 0 (do NOT send ML even for 1 channel)
bit 6 = 1 (allow MultiLink Endpoint Discriminator)

Description: **S90** can enable or disable LCP and IPCP options during the setup of a PPP/ML-PPP connection.
S90 handles the options requested by the TA. Setting a bit-value to 1 enables an option. Setting a bit-value to 0 disables an option. **S90** is mostly used for debugging purposes but can also be used to disable specific PPP options.

5.5.3 - S-Register: S91

Usage: S91=n; S91?; S91.b=n; S91.?
b=bit number, n=value

Function: Remote PPP Capabilities

Unit: Decimal ASCII code

Range: bit 0--allow PFC,
bit 1--allow ACFC,
bit 2--TA Does MultiLink,
bit 3--allow Short Sequence Numbers,
bit 4--allow IP Header Compression,
bit 5--allow MultiLink Endpoint Discriminator

Default: 31 decimal, 1F hexadecimal
bit 0 = 1 (allow PFC)
bit 1 = 1 (allow ACFC)
bit 2 = 1 (TA Does MultiLink)
bit 3 = 1 (allow Short Sequence Numbers)
bit 4 = 1 (allow IP Header Compression)
bit 6 = 1 (allow MultiLink Endpoint Discriminator)

Description: **S91** can enable or disable LCP and IPCP options during the setup of a PPP/ML-PPP connection.
S91 handles the options requested by the peer. Setting a bit-value to 1 enables an option. Setting a bit-value to 0 disables an option. **S91** is mostly used for debugging purposes but can also be used to disable specific PPP options.

5.5.4 - S-Register: S92

Usage: S92=n; S92?; S92.b=n; S92.?
b=bit number, n=value

Function: Channel ID Information Element Octet 3 Settings

Unit: Decimal ASCII code

Range: bit 6--Interface ID present
bit 5--Interface Type
bit 4--0 spare
bit 3--Preferred/Exclusive
0 = Preferred
1 = Exclusive
bit 2--D-channel Indicator
bit 1--Info. Channel Selection
bit 0--Info. Channel Selection
00 = No Channel
01 = B1 Channel
10 = B2 Channel
11 = Any Channel

Default: **3** (00000011 binary) Preferred, Any Channel

Description: **S92** allows octet 3 of the Channel Identification Information Element to be modified, but currently only bits 3,1, and 0 can be modified. Bit 3 controls the Preferred/Exclusive setting. Bits 1 and 0 control the Information Channel Selection. To force a call on B2, set bit 3 to 1 (S92.3=1), set bit 1 to 1 (**S92.1=1**), and set bit 0 to 0 (**S92.0=0**)--or simply set **S92=10** which does the same as setting each bit individually. By default, the Channel ID is preferred/any channel.

5.5.5 - S-Register: **S94**
Usage: S94=n; S94?
Function: Minimum Buffer Space after Trigger
Unit: 10 bytes
Range: n=**0-255** (0-2550 bytes)
Default: **10** (100 bytes)
Description: When **S95** and/or **S96** are set to continuously store information until a specific event (or trigger) occurs, then once that trigger occurs a minimum number of bytes will be freed (if needed) in the respective buffer. **S94** sets the minimum number of bytes requested to be freed in the respective buffer once a trigger has occurred. By default a minimum of 100 bytes are freed in the respective buffer.

5.5.6 - S-Register: **S95**
Usage: S95=n; S95?
Function: Logging Buffer Functionality
Unit: Decimal ASCII code
Range: n=0--Stop when full,
n=1--Wrap continuously,
***** The Following Are Triggers *****
n=2--Line Not Ready
n=3--X.75 Sent FRMR
n=4--X.75 Received REJ
n=5--RESTART Received
n=6--XQueue Full
Default: **0** (Stop when full)
Description: The logging buffer has the capability "Stop when full," "Wrap continuously," or continuously store information until a specific event (or trigger) occurs. "Stop when full" causes the TA to stop accepting new information when the buffer is full. "Wrap continuously" will always accept new information into the buffer, but the oldest information will be thrown away to make room for the new information. Specifying a trigger will set the TA to wrap continuously, however once the specified event (or trigger) occurs, then the TA will free a minimum number of bytes specified by **S94** and then stop when the buffer is full. **ATS95?<CR>** will give further information about the logging buffer such as the number of bytes in the buffer, the type of trigger in use, and whether the trigger has occurred. **AT>LOG<CR>** retrieves the logging information. **AT>S99=0<CR>** clears the buffer. By default the logging buffer will stop accepting information when the buffer is full.

5.5.7 - S-Register: **S96**
Usage: S96=n; S96?
Function: Decode (EPA) Buffer Functionality
Unit: Decimal ASCII code
Range: n=0--Stop when full,
n=1--Wrap continuously,
***** The Following Are Triggers *****
n=2--Line Not Ready
n=3--X.75 Sent FRMR
n=4--X.75 Received REJ
n=5--RESTART Received
n=6--XQueue Full
Default: **0** (Stop when full)
Description: The decode buffer has the capability "Stop when full," "Wrap continuously," or continuously store information until a specific event (or trigger) occurs. "Stop when full" causes the TA to stop accepting new information when the buffer is full. "Wrap continuously" will always accept new information into the buffer, but the oldest information will be thrown away to make room for the new information. Specifying a trigger will set the TA to wrap continuously, however once the specified event (or trigger) occurs, then the TA will free a minimum number of bytes specified by **S94** and then stop when the buffer is full. **ATS96?<CR>** will give further information about the decode buffer such as the number of bytes in the buffer, the type of trigger

in use, and whether the trigger has occurred. **>D**n commands retrieve the decode information. **AT>D99<CR>** clears the buffer. By default the decode buffer will stop accepting information when the buffer is full.

5.5.8 - S-Register: **S98**
Usage: S98=n; S98?
Function: ISDN_MSG Size
Unit: 1 byte
Range: n=**0-255** (0-255 bytes)
Default: **50** (50 bytes)
Description: Sets the maximum number of bytes per packet that are stored in the decode buffer. Since the decode buffer has a limited size it is useful to "see" a broader picture rather than each packet in detail. Data packets may typically be larger than 255 bytes. By default only 50 bytes per packet are stored.

5.5.9 - S-Register: **S99**
Usage: S99=n; S99?; S99.b=n; S99.?
b=bit number, n=value
Function: Startup Options
Unit: Decimal ASCII code
Range: bit 0--Initialize the Logging buffer,
bit 1--Initialize the EPA buffer,
bit 2--Save to Log buffer (same as >S99=0),
bit 3--Save to EPA buffer (same as >D99),
bit 4--Save logging (>Sn) flags,
bit 5--Allow tst_CheckPoint() calls
Default: **7** (Init Log, Init EPA, Save to Log)
Description: **S99** controls startup features. If buffers are set to not be initialized, then if the TA resets those buffers will not be initialized and thus the data can be retrieved (assuming that **>S99=0** or **>D99** were given prior to the reset or fatal error). If the TA will be reset several times, but the data should be kept after each reset, then the buffers should not be initialized (except to initially give the **>S99=0** and/or **>D99** command) and the save to EPA and/or save to Log bits would need to be set. The "Save logging flags" bit when set will store the **>S**n logging flag settings in the E2PROM so that on power-up those flags will be set and logging can begin immediately. When the bit is cleared, the **>S**n flags are not modified nor will the flags be changed from default when the TA powers up. tst_CheckPoint() helps in the debugging of an unrecoverable fatal error or power-up problem.

5.5.10 - S-Register: **S100**
Usage: S100=n; S100?
Function: Flow Control High Threshold
Unit: 1 buffer
Range: n=**0-255** (0-255 buffers)
Default: varies
Description: **S100** may be used to increase or decrease the high threshold for flow control (the point at which flow control is asserted).

5.5.11 - S-Register: **S101**
Usage: S101=n; S101?
Function: Flow Control Low Threshold
Unit: 1 buffer
Range: n=**0-255** (0-255 buffers)
Default: varies
Description: **S101** may be used to increase or decrease the low threshold for flow control (the point at which flow control is negated).

5.5.12 - S-Register: **S102**
Usage: S102=n; S102?; S102.b=n; S102.?
b=bit number, n=value
Function: Data to Save for Decoding

Unit: Decimal ASCII code
Range: bit 0--Layer 1
bit 1--Layer 2 (D)
bit 2--Layer 3 (D)
bit 3--B1
bit 4--B2
bit 5--Async Port 1
Default: **127** (Layer 1, Layer 2, Layer 3, B1, B2, Async Ports 1)
Description: **S102** allows complete control over the types of data stored in RAM for decoding at a later time and/or the types of data allowed for Real-Time Decoding. "Layer 1" consists of the I.430 state transitions and events (decoded by >D8). "Layer 2" consists of the Q.921 messages sent and received on the D-channel (decoded by **>D2**). "Layer 3" consists of the Q.931 messages sent and received on the D-channel (decoded by **>D3**, **>D38**, or **>D39**). B1 consists of digital data sent and received on B-channel 1 (decoding depends on data protocol). B2 consists of digital data sent and received on B-channel 2 (decoding depends on data protocol). Async Port 1 consists of data sent and received between port 1 of the TA and the asynchronous terminal (decoded by **>D5** if PPP). **S102?** will give bit-level details of this S-register. Refer to the **>D**n command for details on decoding data stored in RAM. By default all options (bits) are enabled (set to 1).

5.5.13 - S-Register: S111
Usage: S111=n; S111?
Function: Minimum AutoBaud Delay after Response
Unit: 5 ms
Range: n=**0-255** (0-1275 ms)
Default: **2** (10 ms)
Description: Some operating systems may send new AT commands immediately after receiving a response from the TA (for example, immediately after receiving \r\nAT\r\n from the TA) and in some cases the new AT command will be missed because the TA is in the process of re-enabling AutoBaud mode (if %S0). In such a case then S111 may be used to lengthen or shorten the minimum delay to re-enable AutoBaud mode after the TA sends a response to an AT command. By default there will be at least a 10 ms delay before re-enabling AutoBaud mode. If this happens to be a time that another system always sends the next AT command, then the delay may be lengthened (assuming the next AT command has the same baud rate) or shortened (to re-enable AutoBaud mode again before the next AT command).

5.6 - Test Commands

5.6.1 - Test Command Summary

AT Command	Function
>LBn	Loopback Control
Unm	B-channel Loopback

5.7 - Test Command Details

5.7.1 - Command: >LBn
Function: Loopback Control
Unit: Decimal ASCII code
Values: n=0---no loopback,
n=1---loopback B-channel data, but do not pass data to DTE,
n=2---loopback B-channel data, but also pass data to DTE,
n=16--loopback DTE data, but do not pass to B-channel,
n=32--loopback DTE data and pass to B-channel if available
Default: **>LB0** (no loopback)
Description: **>LB**n is a test command that can aid in testing various data protocols, performance, and integrity of the data by using an external tester to send data via the B-channel or

DTE, loop the data back, and the external tester can keep track of the integrity and performance of various data protocols. When performing B-channel loop-back (n=1, n=2), then DTE loop-back (n=16, n=32) is not available.
When performing DTE loop-back (n=16, n=32), then B-channel loop-back (n=1, n=2) is not available. To break out of DTE loop-back, use the escape sequence followed by **AT<CR>** (such as **+++AT<CR>**).

5.7.2 - Command: **Unm**
Function: B-channel Loopback
Unit: Decimal ASCII code
Values: n=1--Loopback on B1 only,
n=2--Loopback on B2 only,
n=3--loopback on both B-channels
m=0--disable loopback,
m=1--enable loopback
Default: **U30** (no loop-back)
Description: **>LB**n is a test command that is used mainly for conformance testing. Unm puts specific B-channels in loopback within the ISDN transceiver as opposed to the processor dealing with loopback as is the case for the **>LB**n command. For example, **ATU31<CR>** sets the ISDN transceiver to loopback both B-channel 1 and B-channel 2 data. **ATU30<CR>** disables loopback on both B-channels.

6 - Appendix A – Factory Profiles

6.1 - Factory Profile Summary

Profile	Description
0	0 Modem-Like Asynchronous Operation
2	2 V.120 Asynchronous Operation
3	3 X.75 Asynchronous Operation
4	4 PPP Asynchronous Operation
5	5 SoftBonding Asynchronous Operation
6	6 HDLC Asynchronous Operation
7	7 CLEAR Asynchronous Operation

6.2 - Profile 0 (&F0) -- Modem-Like Asynchronous Operation

AT Command	Description
&C1	DCD functions normally
$D0	Disable persistent DTR dialing
&D1	Hang up when DTR drops
E1	Enable command mode echo
&E4	Enable hardware flow control
&E6	Discard XON/XOFF characters
#X0	Disable Sending Multiple Xoff Characters
&J0	Disable Automatic Channel Bundling
%E1	Enable +++ escape method
%E4	No OK response to +++ or <BREAK> escape
&M0	Asynchronous mode
@P3=4	No parity at power-up@P4=8 8 data bits
@P6=1	1 stop bit
&R1	CTS always high
&RF1	CTS is independent of RTS
S0=1	Answer after 1 ring
S2=43	Set escape character to + (ASCII 43)
S3=13	Set carriage return character to CR (ASCII 13)
S4=10	Set line feed character to LF (ASCII 10)
S5=8	Set backspace character to BS (ASCII 8)
S7=45	Wait 45 seconds for connection before aborting
S10=20	Set DCD drop time to 700 ms
S25=5	Set DTR detect time to 500 ms
S26=10	Delay DTR monitoring for 5 seconds after connect
S32=20	Set escape sequence guard time to 2 seconds
S34=2	Set maximum escape sequence character length
S50=1	Caller Line ID Enabled
S52=1	Auto-Protocol Detection Enabled
S53=2048	Maximum X.75 Buffer Size (2048 bytes)
S74=0	Maximum CLEAR Buffer Size (256 bytes)
&S0	DSR is always high
$SB1152	Select 115,200 bps for DTE interface
V1	Select verbose messages
!Z=x	The data protocol is not modified

6.3 - Profile 2 (&F2)--V.120 Asynchronous Operation

AT Command	Description
&C1	DCD functions normally
$D0	Disable persistent DTR dialing
&D1	Hang up when DTR drops
E1	Enable command mode echo
&E4	Enable hardware flow control
&E6	Discard XON/XOFF characters
&E13	Enable pacing
#X0	Disable Sending Multiple Xoff Characters
&J0	Disable Automatic Channel Bundling
%E1	Enable +++ escape method
%E4	No OK response to +++ or <BREAK> escape
&M0	Asynchronous mode
@P3=4	No parity at power-up
@P4=8	8 data bits
@P6=1	1 stop bit
&R1	CTS always high
&RF1	CTS is independent of RTS
S0=1	Answer after 1 ring
S2=43	Set escape character to + (ASCII 43)
S3=13	Set carriage return character to CR (ASCII 13)
S4=10	Set line feed character to LF (ASCII 10)
S5=8	Set backspace character to BS (ASCII 8)
S7=45	Wait 45 seconds for connection before aborting
S10=20	Set DCD drop time to 700 ms
S25=5	Set DTR detect time to 500 ms
S26=10	Delay DTR monitoring for 5 seconds after connect
S32=20	Set escape sequence guard time to 2 seconds
S34=2	Set maximum escape sequence character length
S50=1	Caller Line ID Enabled
S52=1	Auto-Protocol Detection Enabled
S53=2048	Maximum X.75 Buffer Size (2048 bytes)
S74=0	Maximum CLEAR Buffer Size (256 bytes)
&S0	DSR is always high
$SB1152	Select 115,200 bps for DTE interface
V1	Select verbose messages
!Z=5	Enable V.120 data protocol

6.4 - Profile 3 (&F3)--X.75 Asynchronous Operation

AT Command	Description
&C1	DCD functions normally
$D0	Disable persistent DTR dialing
&D1	Hang up when DTR drops
E1	Enable command mode echo
&E4	Enable hardware flow control
&E6	Discard XON/XOFF characters
&E13	Enable pacing
#X0	Disable Sending Multiple Xoff Characters
&J0	Disable Automatic Channel Bundling
%E1	Enable +++ escape method
%E4	No OK response to +++ or <BREAK> escape
&M0	Asynchronous mode
@P3=4	No parity at power-up
@P4=8	8 data bits
@P6=1	1 stop bit
&R1	CTS always high
&RF1	CTS is independent of RTS
S0=1	Answer after 1 ring
S2=43	Set escape character to + (ASCII 43)
S3=13	Set carriage return character to CR (ASCII 13)
S4=10	Set line feed character to LF (ASCII 10)
S5=8	Set backspace character to BS (ASCII 8)
S7=45	Wait 45 seconds for connection before aborting
S10=20	Set DCD drop time to 700 ms
S25=5	Set DTR detect time to 500 ms
S26=10	Delay DTR monitoring for 5 seconds after connect
S32=20	Set escape sequence guard time to 2 seconds
S34=2	et maximum escape sequence character length
S50=1	Caller Line ID Enabled
S52=1	Auto-Protocol Detection Enabled
S53=2048	Maximum X.75 Buffer Size (2048 bytes)
S74=0	Maximum CLEAR Buffer Size (256 bytes)
&S0	DSR is always high
$SB1152	Select 115,200 bps for DTE interface
V1	Select verbose messages
!Z=12	! Enable X.75 data protocol

6.4 - Profile 4 (&F4)--ML-PPP Asynchronous Operation

AT Command	Description
&C1	DCD functions normally
$D0	Disable persistent DTR dialing
&D1	Hang up when DTR drops
E1	Enable command mode echo
&E4	Enable hardware flow control
&E6	Discard XON/XOFF characters
&E13	Enable pacing
#X0	Disable Sending Multiple Xoff Characters
&J0	Disable Automatic Channel Bundling
%E1	Enable +++ escape method
%E4	No OK response to +++ or <BREAK> escape
&M0	Asynchronous mode
@P3=4	=4 No parity at power-up
@P4=8	8 data bits
@P6=1	1 stop bit
&R1	CTS always high
&RF1	CTS is independent of RTS
S0=1	Answer after 1 ring
S2=43	Set escape character to + (ASCII 43)
S3=13	Set carriage return character to CR (ASCII 13)
S4=10	Set line feed character to LF (ASCII 10)
S5=8	Set backspace character to BS (ASCII 8)
S7=45	Wait 45 seconds for connection before aborting
S10=20	Set DCD drop time to 700 ms
S25=5	Set DTR detect time to 500 ms
S26=10	Delay DTR monitoring for 5 seconds after connect
S32=20	Set escape sequence guard time to 2 seconds
S34=2	Set maximum escape sequence character length
S50=1	Caller Line ID Enabled
S52=1	Auto-Protocol Detection Enabled
S53=2048	Maximum X.75 Buffer Size (2048 bytes)
S74=0	Maximum CLEAR Buffer Size (256 bytes)
&S0	DSR is always high
$SB1152	Select 115,200 bps for DTE interface
V1	Select verbose messages
!Z=9	Enable ML-PPP data protocol

6.5 - Profile 5 (&F5)--SoftBonding Asynchronous Operation

AT Command	Description
&C1	&C1 DCD functions normally
$D0	$D0 Disable persistent DTR dialing
&D1	&D1 Hang up when DTR drops
E1	E1 Enable command mode echo
&E4	&E4 Enable hardware flow control
&E6	&E6 Discard XON/XOFF characters
&E13	&E13 Enable pacing
#X0	#X0 Disable Sending Multiple Xoff Characters
&J0	&J0 Disable Automatic Channel Bundling
%E1	%E1 Enable +++ escape method
%E4	%E4 No OK response to +++ or <BREAK> escape
&M0	&M0 Asynchronous mode
@P3=4	@P3=4 No parity at power-up
@P4=8	@P4=8 8 data bits
@P6=1	@P6=1 1 stop bit
&R1	&R1 CTS always high
&RF1	&RF1 CTS is independent of RTS
S0=1	S0=1 Answer after 1 ring
S2=43	S2=43 Set escape character to + (ASCII 43)
S3=13	S3=13 et carriage return character to CR (ASCII 13)
S4=10	S4=10 Set line feed character to LF (ASCII 10)
S5=8	S5=8 Set backspace character to BS (ASCII 8)
S7=45	S7=45 Wait 45 seconds for connection before aborting
S10=20	S10=20 Set DCD drop time to 700 ms
S25=5	S25=5 Set DTR detect time to 500 ms
S26=10	S26=10 Delay DTR monitoring for 5 seconds after connect
S32=20	S32=20 Set escape sequence guard time to 2 seconds
S34=2	S34=2 Set maximum escape sequence character length
S50=1	S50=1 Caller Line ID Enabled
S52=0	S52=0 Auto-Protocol Detection Disabled
S53=2048	S53=2048 Maximum X.75 Buffer Size (2048 bytes)
S74=0	S74=0 Maximum CLEAR Buffer Size (256 bytes)
&S0	&S0 DSR is always high
$SB1152	$SB1152 Select 115,200 bps for DTE interface
V1	V1 Select verbose messages
!Z=8	!Z=8 Enable SoftBonding data protocol

6.6 - Profile 6 (&F6)--HDLC Asynchronous Operation

AT Command	Description
&C1	DCD functions normally
$D0	Disable persistent DTR dialing
&D1	Hang up when DTR drops
E1	Enable command mode echo
&E4	Enable hardware flow control
&E6	Discard XON/XOFF characters
&E13	Enable pacing
#X0	Disable Sending Multiple Xoff Characters
&J0	Disable Automatic Channel Bundling
%E1	Enable +++ escape method
%E4	No OK response to +++ or <BREAK> escape
&M0	Asynchronous mode
@P3=4	No parity at power-up
@P4=8	8 data bits
@P6=1	1 stop bit
&R1	CTS always high
&RF1	CTS is independent of RTS
S0=1	Answer after 1 ring
S2=43	Set escape character to + (ASCII 43)
S3=13	Set carriage return character to CR (ASCII 13)
S4=10	Set line feed character to LF (ASCII 10)
S5=8	Set backspace character to BS (ASCII 8)
S7=45	Wait 45 seconds for connection before aborting
S10=20	Set DCD drop time to 700 ms
S25=5	Set DTR detect time to 500 ms
S26=10	Delay DTR monitoring for 5 seconds after connect
S32=20	Set escape sequence guard time to 2 seconds
S34=2	Set maximum escape sequence character length
S50=1	Caller Line ID Enabled
S52=0	Auto-Protocol Detection Disabled
S53=2048	Maximum X.75 Buffer Size (2048 bytes)
S74=0	Maximum CLEAR Buffer Size (256 bytes)
&S0	DSR is always high
$SB1152	Select 115,200 bps for DTE interface
V1	Select verbose messages
!Z=7	Enable HDLC data protocol

6.7 - Profile 7 (&F7)--CLEAR Asynchronous Operation

AT Command	Description
&C1	DCD functions normally
$D0	Disable persistent DTR dialing
&D1	Hang up when DTR drops
E1	Enable command mode echo
&E4	Enable hardware flow control
&E6	Discard XON/XOFF characters
&E13	Enable pacing
#X0	Disable Sending Multiple Xoff Characters
&J0	Disable Automatic Channel Bundling
%E1	Enable +++ escape method
%E4	No OK response to +++ or <BREAK> escape
&M0	Asynchronous mode
@P3=4	No parity at power-up
@P4=8	8 data bits
@P6=1	1 stop bit
&R1	CTS always high
&RF1	CTS is independent of RTS
S0=1	Answer after 1 ring
S2=43	Set escape character to + (ASCII 43)
S3=13	Set carriage return character to CR (ASCII 13)
S4=10	Set line feed character to LF (ASCII 10)
S5=8	Set backspace character to BS (ASCII 8)
S7=45	Wait 45 seconds for connection before aborting
S10=20	Set DCD drop time to 700 ms
S25=5	Set DTR detect time to 500 ms
S26=10	Delay DTR monitoring for 5 seconds after connect
S32=20	Set escape sequence guard time to 2 seconds
S34=2	Set maximum escape sequence character length
S50=1	Caller Line ID Enabled
S52=0	Auto-Protocol Detection Disabled
S53=2048	Maximum X.75 Buffer Size (2048 bytes)
S74=0	Maximum CLEAR Buffer Size (256 bytes)
&S0	DSR is always high
$SB1152	Select 115,200 bps for DTE interface
V1	Select verbose messages
!Z=11	Enable CLEAR data protocol