Chapter 5
Call Placement

GENERAL

This chapter details call operation and termination using AT commands. Your BitSURFR Pro communicates with your PC or terminal asynchronously any time the BitSURFR Pro is in AT command mode.

OPERATION MODES

The BitSURFR Pro functions in one of three modes:

- Off-line Command Mode (AT command mode)
- On-line Command Mode
- Data Mode

When the DTE data mode is set to synchronous, the BitSURFR Pro functions only in off-line command mode or data mode (there is no way to exit to on-line command mode).

☞ **Note**
*Your BitSURFR Pro will communicate with the DTE asynchronously when in the off-line command mode regardless of the DTE data mode setting (**&M**).*

Off-line Command Mode

AT commands can only be entered when the BitSURFR Pro is in the off-line or on-line command mode. Commands can be entered separately or in strings to change BitSURFR Pro options, rebuild profiles, store or change telephone numbers, initiate or receive phone calls, and go to the data mode. In off-line command mode (generally referred to as command mode), there is no data call active.

On-line Command Mode (Asynchronous Data Mode Only)

This mode is entered from the asynchronous data mode after the escape sequence (+++) has been entered. The data communication link remains established but data transmission is suspended. The BitSURFR Pro will now accept commands as it does in the off-line command mode.

Data Mode

The BitSURFR Pro switches to data mode (on-line) after it successfully connects with a compatible ISDN modem. In data mode, the BitSURFR Pro sends and receives data, but will not accept or execute command instructions.

Escape Sequence (Asynchronous Data Mode Only)

If the BitSURFR Pro is in the asynchronous data mode, using the escape sequence will return the BitSURFR Pro to the command mode and keep the BitSURFR Pro on-line. The escape sequence consists of a pause (normally 1 second), three escape characters, and then another pause. The default escape sequence characters are:

+ + +

The escape sequence character is stored in S-register two (S2) and can be changed if necessary. The escape sequence can also be disabled to prevent any possibility of false escapes into the command mode (set S2 to any value from 128 to 255).

After entering the escape sequence, the BitSURFR Pro will return to the AT command mode, but will not hang up or break the connection with the remote BitSURFR Pro. AT commands can now be entered to the BitSURFR Pro. The **ATO** command returns the BitSURFR Pro to the data mode. The **ATH** command hangs up the call.

CALL PLACEMENT STRATEGIES

Before a data call is placed, the BitSURFR Pro should be configured correctly. Correct configuration depends on the type of data to be sent, protocol, DTE speed, and ISDN speed. For more information on how to configure the BitSURFR Pro, refer to the Configuration section in the *Getting Started* guide and Chapter 4 "Option Configuration" in this manual.

Rate Adaption

When a data call is placed, the BitSURFR Pro will try to establish a physical data connection on the ISDN B-channel. The B-channel is a digital channel that can transfer data at either 56 kbps or 64 kbps, depending on the path the network chooses when routing the call.

A rate adaption protocol will be needed if your PC or terminal is asynchronous or the DTE rate is set at any rate other than 56kbps or 64 kbps. A rate adaption protocol adapts the lower speed of the PC or terminal to the higher speed of the ISDN B-channel. Use the **AT%A2=** command to select a rate adaption protocol.

Your BitSURFR Pro supports the V.120 rate adaption protocol. V.120 rate adaption protocol is an error-correcting protocol ensuring error-free data transfer at speeds up to 115.2 kbps. Note, however, that throughput is limited by channel speed to about 75 kbps. When using a rate adaption protocol, both the calling and called units must use the same protocol. Also, unless you are using V.120 in asynchronous mode, the PCs or terminals on both ends must be set to the same DTE speed before data can be transferred.

B-Channel Speed

The B-channel speed of a true end-to-end ISDN connection is 64 kbps. However, if a call is routed over intermediate 56 kbps circuits, the B-channel speed will be reduced to 56 kbps. The answering ISDN modem will automatically adjust to the B-channel speed of the incoming call. However, the originating ISDN modem must be configured for 56 kbps in order for the call to complete. Otherwise, a call attempted at 64 kbps over a line that is only capable of 56 kbps operation will fail.

Data Path Compatibility

In some instances, it may not be possible for the BitSURFR Pro to make a successful data call from one location to another because Circuit Mode Data (CMD) is not supported between the calling and called unit networks. In this case, the originate mode command (**%A98**) can be used to force the network to treat data calls as if they were speech or audio calls. Data calls placed and answered as speech or audio calls have an ISDN B-channel speed of 56 kbps regardless of the BitSURFR Pro's link speed setting. This allows the BitSURFR Pro to make a data call even if there is no true end-to-end ISDN 64 kbps data path.

Echo Canceling

To eliminate echoes, the network may route speech calls through an echo canceller. The echo canceller disrupts data calls and can cause the calling ISDN modem to fail to connect with the called unit. When placing data calls over speech circuits, you should turn on the Echo

Disable Tone using the **%A96** command. When this option is selected, the BitSURFR Pro sends a tone at the beginning of the data call to disable the echo canceller.

Dialing D

The **D** command causes the BitSURFR Pro to dial a number. For example, to dial the number 555-1212, enter:

ATD 555-1212

Use spaces, hyphens, parentheses, or other punctuation (except dial modifiers) to make the command line easier to read and enter. For example, the following are all treated as the same command:

ATD 1-800-555-1212
ATD 1 (800) 555-1212
ATD18005551212

☞ **Note**
Except for the semicolon modifier, standard dial modifiers are ignored by your BitSURFR Pro.

Any Key Abort

If you want to abort the dialing sequence at any time before a connection is established, just press any key on the PC or terminal. This feature is called *Any Key Abort.*

Directory Register

The BitSURFR Pro stores up to 10 numbers in directory registers 0 - 9. These numbers are maintained in the stored profile to allow the most frequently used numbers to be dialed easily. For each stored number, the BitSURFR Pro retains the entire dial command with all its modifiers. The stored numbers remain in the stored profile until they are written over with new numbers. Removing power from the BitSURFR Pro does not affect the directory of stored phone numbers.

Store Phone Number &Z*n*=*x*

To store a phone number using AT commands, enter the **&Z*n*=*x*** command, where *n* is the directory register number (0 - 9), and *x* is the

dial command sequence (digits and modifiers) you wish to store in that register. For example:

AT&Z1= 9 1-800-555-1212

This stores the dial command above beginning with the 9 into directory register number 1. The total length of the dial command (counting only digits and modifiers, not spaces or punctuation) may not exceed 40 characters.

A slightly shorter form of the **&Z** command, without the register number and equals sign, can also be used to store a phone number into register zero. For example:

AT &Z 1-800-555-1212

The **&Z** commands are disabled if the DTE guard feature is enabled (refer to the section on DTE Guard option in Chapter 4 "Option Configuration" in this guide).

Display Stored Phone Number &Zn?

To display a number that is stored in the phone number directory, use the **&Zn?** command. To cause the BitSURFR Pro to display (i.e., send to your PC or terminal) the dial command stored in directory register 1, for example, you would enter:

AT &Z1?

To display all of the stored phone numbers, enter:

&V=Z

Dialing a Stored Phone Number S=*n*

Use the **S** dial modifier to dial a previously stored number. Once a number is stored, it can be dialed by entering **ATDS=*n*** where *n* represents any number between 0 to 9.

For example, **ATDS=1** dials the number stored in location 1. Alternatively, the shorthand syntax **ATDS** may be used to dial the number stored in location 0. This is equivalent to entering **ATDS=0**.

For maximum flexibility, the stored numbers can be linked in series with each other or other digits on the command line. For example, if you were to enter **ATDS=0S=11212** where stored number 0 is “1800” and stored number 1 is “555”, the BitSURFR Pro will dial the number 1-800-555-1212.

ANSWERING CALLS A

When your BitSURFR Pro detects an incoming call, it asserts the RI signal on the PC interface and sends a RING message to the PC or terminal after each ring. If your BitSURFR Pro is set to auto answer, it will answer. You can also answer the call manually by sending the **ATA** command to your BitSURFR Pro. Each of these answering methods is described below.

Auto Answer S0=*n*

Your BitSURFR Pro can automatically answer incoming calls if the following conditions are met:

- The auto answer option is set. (See details below.)
- The DTR signal is forced "on" using the DTR option. Refer to the “TERMINAL INTERFACE AND PIN OPTIONS” section in Chapter 4 in of this guide.
- The BitSURFR Pro is in off-line mode.

After the specified number of rings, the BitSURFR Pro answers and begins the connect sequence.

Auto answer is controlled by command **S0**. This command determines on which ring the BitSURFR Pro will answer. You can set **S0** to any value between 1 and 255 for auto answer.

Setting **S0** to 0 (the factory default) disables auto answer.

Connecting

After the physical link between your BitSURFR Pro and the remote ISDN modem is established, the BitSURFR Pro attempts to establish a rate adaption protocol.

Return On-line O

When the BitSURFR Pro has established the link-layer protocol, it enters the On-line Data Mode and is ready to send and receive data. Normally, the BitSURFR Pro remains in this mode until the PC or terminal sends the data mode escape sequence (+++) or until the call is terminated.

If the PC or terminal sends the escape sequence to the BitSURFR Pro while it is on-line and in asynchronous data mode, the BitSURFR Pro enters the on-line command mode. In this mode, the PC or terminal can send AT commands to the BitSURFR Pro. To return to data mode, send the **ATO** command.

Hang Up Command H

To disconnect a call, escape to the command mode and enter the **ATH** command. Your BitSURFR Pro will then disconnect and hang up.

CALL STATUS INDICATIONS

DTE Status LED

The DTE status LED, located on the front of the BitSURFR Pro, indicates whether a data call is connected and the number of channels connected. During call establishment, the DTE status LED will blink slowly. Once the call is connected, the DTE status LED will indicate the number of channels connected using the sequence that is described below. The maximum number of channels connected is dependent on the type of protocol that is selected.

Some protocols, such as V.120, are designed to only connect one channel. These protocols are referred to as single-link protocols. Other protocols, such as AIMux and Multi-link PPP, are designed to connect multiple channels. These protocols are commonly known as *multi-link protocols*.

DTE status LED operation observes the following rules for single-link and multi-link protocols when the call is connected:

- If a single-channel protocol is selected and the call is connected, the DTE status LED will glow a steady green.
- If a multi-channel protocol is selected and only one channel is connected, the DTE status LED will blink rapidly.

- If a multi-channel protocol is selected and two channels are connected, the DTE status LED will glow a steady green.

For detailed information regarding the operation of the DTE status LED for a specific protocol, please refer to the chapter on that protocol.

Status and Connect Messages

When the PC or terminal sends your BitSURFR Pro a command, the BitSURFR Pro attempts to execute it, and then sends a status message to the PC or terminal, when enabled, reporting the results of the command. For that reason, the status messages returned by the BitSURFR Pro are also called *result messages*. If the command is a dial command, then the message that is returned is called a *connect message*. Status messages may also be sent as the result of other conditions detected by the BitSURFR Pro; however, they are sent only when the BitSURFR Pro is in AT command mode (not data mode).

The messages that are sent depend upon the message configuration options that are in effect: worded messages or number codes for the **V** command, and normal or extended messages for **X** and **W** commands. For more information, see Chapter 4 "Option Configuration" in this guide.

Table 5-1 lists the status and connect messages in number codes, in words, and with their corresponding meanings.

Table 5-1. Normal Status and Connection Messages

Number Code	Word Message	Meaning
0	OK	Command received OK.
1	CONNECT	Connection made at 0-300 bps, or at any speed while X command in effect.
2	RING	Incoming ring detected.
3	NO CARRIER	Valid carrier not detected within period specified by register S7, or carrier lost for 300 ms or more. Message is also sent when incompatible protocols are configured for the originating and answering ISDN modem
4	ERROR	Command not recognized or too long.

Table 5-1. (Cont.) Normal Status and Connection Messages

Number Code	Word Message	Meaning
5	CONNECT 1200	Connection made at 1200 bps.
6	NO DIALTONE	ISDN Link is not synchronized.
7	BUSY	Dialed number busy.
10	CONNECT 2400	Connection made at 2400 bps.
11	CONNECT 4800	Connection made at 4800 bps.
12	CONNECT 9600	Connection made at 9600 bps.
14	CONNECT 19200	Connection made at 19200 bps.
28	CONNECT 38400	Connection made at 38400 bps.
32	CONNECT 48000	Connection made at 48000 bps.
17	CONNECT 56000	Connection made at 56000 bps.
18	CONNECT 57600	Connection made at 57600 bps.
19	CONNECT 64000	Connection made at 64000 bps.
20	CONNECT 112000	Connection made at 112000 bps.
21	CONNECT 128000	Connection made at 128000 bps.
22	CONNECT 115200	Connection made at 115200 bps.
57	CARRIER 56000	ISDN Line Speed is 56000.
59	CARRIER 64000	ISDN Line Speed is 64000.
79	PROTOCOL: PPPC	Point-to-Point Protocol.
81	PROTOCOL: ISDN	Clear Channel Protocol.
83	PROTOCOL: V.120	V.120 Rate Adaption Protocol.
85	PROTOCOL: BOND	BONDING Protocol.
96	CHANNEL B1	Using Channel B1.
97	CHANNEL B2	Using Channel B2.

Call Termination

Your BitSURFR Pro will terminate a call when any of the configured call termination conditions occur. These conditions are listed in Table 5-2 below.

Table 5-2. Call Termination Conditions

Termination Condition	Selective Disable	Notes
Any Key Abort	No	Only during the connect sequence, before the connection is established.
ATH Command	No	BitSURFR Pro must be in the command mode.
Loss of DTR	Yes	Depends upon S25.
Call Placement Failure	Partial	Due to no dial tone, busy signal, or no carrier; timeout set in S7.
Rate Adaption Protocol Link Establish Failure	No	Unable to establish the rate adaption protocol.
Protocol Disconnect Request Received	No	A disconnect request was received from remote ISDN modem.
Protocol Error Detected	No	Fatal protocol error detected.
BitSURFR Pro Reset or Powered Off	No	BitSURFR Pro automatically disconnects when reset or powered off.