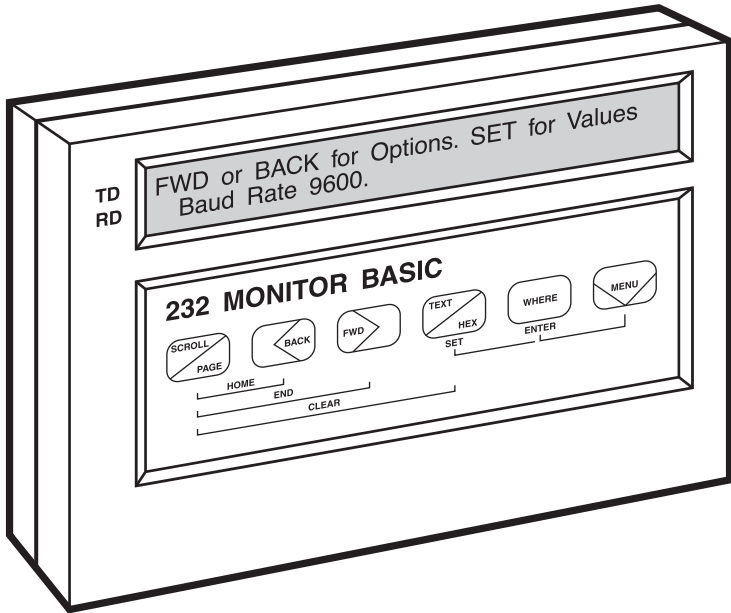




232 Monitor Basic



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This equipment generates, uses, and can radiate radio frequency energy and if not installed and used properly, that is, in strict accordance with the manufacturer's instructions, may cause interference to radio communication. It has been tested and found to comply with the limits for a Class A computing device in accordance with the specifications in Subpart J of Part 15 of FCC rules, which are designed to provide reasonable protection against such interference when the equipment is operated in a commercial environment. Operation of this equipment in a residential area is likely to cause interference, in which case the user at his own expense will be required to take whatever measures may be necessary to correct the interference.

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

This digital apparatus does not exceed the Class A limits for radio noise emission from digital apparatus set out in the Radio Interference Regulation of Industry Canada.

Le présent appareil numérique n'émet pas de bruits radioélectriques dépassant les limites applicables aux appareils numériques de la classe A prescrites dans le Règlement sur le brouillage radioélectrique publié par Industrie Canada.

**NORMAS OFICIALES MEXICANAS (NOM)
ELECTRICAL SAFETY STATEMENT****INSTRUCCIONES DE SEGURIDAD**

1. Todas las instrucciones de seguridad y operación deberán ser leídas antes de que el aparato eléctrico sea operado.
2. Las instrucciones de seguridad y operación deberán ser guardadas para referencia futura.
3. Todas las advertencias en el aparato eléctrico y en sus instrucciones de operación deben ser respetadas.
4. Todas las instrucciones de operación y uso deben ser seguidas.
5. El aparato eléctrico no deberá ser usado cerca del agua—por ejemplo, cerca de la tina de baño, lavabo, sótano mojado o cerca de una alberca, etc..
6. El aparato eléctrico debe ser usado únicamente con carritos o pedestales que sean recomendados por el fabricante.
7. El aparato eléctrico debe ser montado a la pared o al techo sólo como sea recomendado por el fabricante.
8. Servicio—El usuario no debe intentar dar servicio al equipo eléctrico más allá a lo descrito en las instrucciones de operación. Todo otro servicio deberá ser referido a personal de servicio calificado.
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11. El aparato eléctrico deberá ser conectado a una fuente de poder sólo del tipo descrito en el instructivo de operación, o como se indique en el aparato.

12. Precaución debe ser tomada de tal manera que la tierra física y la polarización del equipo no sea eliminada.
13. Los cables de la fuente de poder deben ser guiados de tal manera que no sean pisados ni pellizcados por objetos colocados sobre o contra ellos, poniendo particular atención a los contactos y receptáculos donde salen del aparato.
14. El equipo eléctrico debe ser limpiado únicamente de acuerdo a las recomendaciones del fabricante.
15. En caso de existir, una antena externa deberá ser localizada lejos de las líneas de energía.
16. El cable de corriente deberá ser desconectado del cuando el equipo no sea usado por un largo periodo de tiempo.
17. Cuidado debe ser tomado de tal manera que objetos líquidos no sean derramados sobre la cubierta u orificios de ventilación.
18. Servicio por personal calificado deberá ser provisto cuando:
 - A: El cable de poder o el contacto ha sido dañado; u
 - B: Objetos han caído o líquido ha sido derramado dentro del aparato; o
 - C: El aparato ha sido expuesto a la lluvia; o
 - D: El aparato parece no operar normalmente o muestra un cambio en su desempeño; o
 - E: El aparato ha sido tirado o su cubierta ha sido dañada.

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Quick Setup

This chapter is designed to help you get started using the 232 Monitor Basic as quickly as possible. If you are unfamiliar with using a data-line monitor or tester, read through the entire users' guide before you use the monitor.

Quick Start

Follow these steps to monitor data between two asynchronous devices:

1. Attach one or two data line cables to the monitor. The Monitor registers activity on pins 2, 3, 4, 6, 7, 8, 20, and 22, and the data cable you use should provide some of all of those pins. Figure Q-1 shows a two-cable configuration, and Figure Q-2 shows the recommended pinning for your cable.

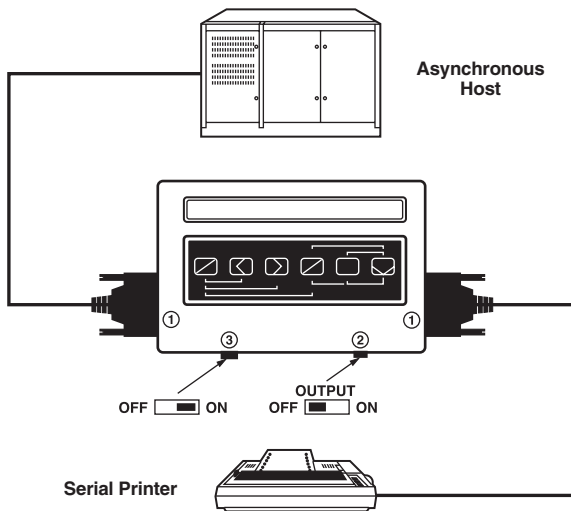


Figure Q-1. The 232 Monitor Basic.

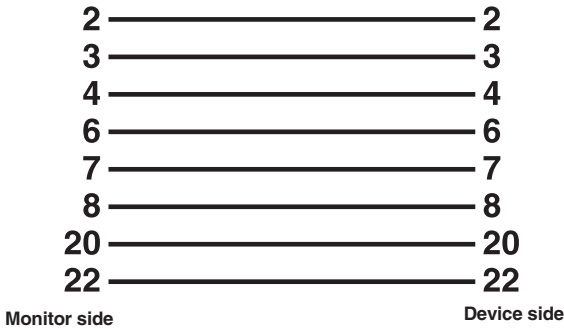


Figure Q-2. Monitor cable pinning.

2. Make sure the OUTPUT switch is set to OFF.
3. Turn the Monitor's power switch to ON.

The data traveling between your devices should appear on the screen. If it does not appear, see the list of quick hints in the next section.

Quick Hints

If data is not appearing on your Monitor, press MENU. Use the arrow keys to scroll through the Monitor's options and make sure they match the settings of the device(s) you are testing. **Appendix A** shows all of the Monitor's options and all possible option values. Italicized values are the factory-set defaults. To change the value of one of the Monitor's options:

1. Press MENU to put the Monitor in Menu Mode.
2. Press FWD or BACK to scroll through the Monitor's options.
3. Press SET (TEXT) to find the proper value. The displayed value will be stored when you press either FWD or BACK again.

The six buttons on the face of your Monitor control over forty functions; each button serves multiple purposes. Although this keeps the design compact, exactly which button does what may seem confusing at first. Here are a few hints:

- The Monitor has two major operational modes, Menu Mode and View Mode. Use *Menu Mode* to change options and their values, or to output data. (See

Chapter 3 for more on this mode.) Use *View Mode* to view data or execute keyboard commands. (See **Chapter 4** for more information on this mode.)

- You can move between Menu Mode and View Mode by pressing MENU.
- The names on the Monitor buttons, and on the labels above and below the buttons, help you to make distinctions between functions.
- **Appendix A** contains a list of every option and all values for every option.
- To change any option, enter the Menu Mode. Then scroll through options by pressing FWD. Scroll through (and simultaneously change) values by pressing SET (TEXT).
- Holding down a button increases the speed of the activity you are performing.
- The Monitor remembers settings, a trigger string, and all captured data, even if you turn the power off.

Overview of this Users' Guide

Here's a description of the rest of this manual. When you first begin using your Monitor, this overview can help you see what chapter you should turn to for specific information.

CHAPTER 1: SPECIFICATIONS

CHAPTER 2: INTRODUCTION

CHAPTER 3: MENU MODE

This chapter describes the Monitor options and their values. Use this Mode to set options and values for your application. Toggle between the Menu and View Modes by pressing MENU.

CHAPTER 4: VIEW MODE

This chapter describes those functions of the Monitor that allow you to view data. When you first turn on the Monitor (or press MENU from the Menu Mode), you are in View Mode.

CHAPTER 5: EXAMPLES

Here are two examples to help you understand how to use the Monitor. The first example demonstrates how to set a trigger string. The second example is a case study for troubleshooting a serial printer.

APPENDIX A: MENU OPTIONS AND VALUES

Here's a handy reference table with all the Monitor's options and all possible values for those options.

APPENDIX B: SAMPLE HEX DUMP PRINTOUT

Here is a sample of a typical ASCII HEX printout.

APPENDIX C: BATTERIES

Instructions on how to change the battery along with a few suggestions on how to avoid battery trouble and extend battery life.

APPENDIX D: TROUBLESHOOTING

Some problems and their solutions.

1. Specifications

Protocol—Asynchronous

Speed—150 bps to 38.4 kbps asynchronous

Data Format—ASCII, Hex, EBCDIC

Interface—RS-232

Indicators—LCD display: 2 rows of 40 characters

Connectors—(1) DB25 male, (1) DB25 female

Power—Both models: (1) 9-VDC alkaline battery; DT100A: 120 VAC, 60 Hz power supply; DT100AE: 230 VAC, 50 Hz power supply

Size—1.3"H x 8"W x 5"D (3.3 x 20.3 x 12.7 cm)

Weight—1.2 lb. (0.5 kg)

2. Introduction

The 232 Monitor Basic makes monitoring, testing, and troubleshooting your RS-232 equipment quick and easy. Small and lightweight, it's designed with an assortment of features usually found on more expensive, non-portable testers.

The 232 Monitor Basic is small enough to hold in one hand while you type commands with the other. Use it to analyze, on-line, each byte and interface signal traveling along your communications line. You can see not only printable characters, but also control characters and escape sequences.

The lightweight construction and soft-touch keypad make the Monitor easier to carry and use than other laptop- or PC-sized monitors. You can either monitor the signals sent between your RS-232 devices or generate signals to test your RS-232 equipment's response. You can even store in the monitor's 28 K memory to be analyzed later at your convenience the signals traveling between devices. Plus, the Monitor can operate as a Bit Error Rate Tester (BERT).

Operating the Monitor is simple and straightforward. You choose options and operational modes through the keyboard. If the monitor doesn't match the devices you're testing in word format, speed, or parity, the automatic configuration feature will set it up for you.

Battery-powered operation means you can take it anywhere—without worrying about finding an AC outlet.

The 232 Monitor Basic is designed to work in your asynchronous communications environment. Captured data is displayed on the 2-line by 40-character LCD screen in ASCII, Hex, or EBCDIC. The Monitor can operate at data rates between 150 bps and 38.4 kbps. Use it to test the terminals, modems, and printers on your RS-232 communications line.

3. Menu Mode

This chapter explains how to enter Menu Mode, scroll through the list of options for the Monitor, and configure the monitor for your application. Table 3-1 lists the Monitor's options and explains each.

Here's how to enter Menu Mode and configure the Monitor.

1. Enter the Menu Mode by pressing MENU.

The TEXT and WHERE buttons also have the additional functions of SET and ENTER in the Menu Mode (Figure 3-1).

2. Use FWD or BACK to scroll through the various options shown in this Mode.
3. Once you've selected an option, use SET (TEXT) to scroll through the values for that option. The Monitor is set for the last value shown when you exit that option. Exit an option by pressing FWD or BACK.
4. Press FWD or BACK to scroll to the next option, or press MENU to return to the View Mode.

Use these steps to set all of the options for your application. Table 3-1 lists all the options, along with their values and a brief description.



Figure 3-1. The SET and ENTER buttons.

Table 3-1. Monitor options and their values.

Option	Values and Description
Baud Rate	38400 19200 9600 4800 2400 1200 600 300 150 The various speeds or baud rates the Monitor can be set to accept.
Stop Bits	1 2 The number of stop bits the Monitor can be set to read.
Data Bits	7 8 The number of data bits the Monitor can be set to read.
Parity	Odd Even None The parity your Monitor can be set to read. Choosing Odd or Even assumes a parity bit appended to a seven- or eight-bit data string. If parity is set wrong, View Mode displays a parity error message.

Trigger Off TD RD
Use Off if you don't want to use the Trigger.
Use RD to trigger capture when the UserString appears on the RD channel. Use TD when you want to begin capturing data the TD channel. If you choose this option, the Monitor will begin capturing data at the point it encounters the String specified in the Edit UserString option. (NOTE: After it has captured the data it will automatically return the Trigger to the Off position.)

Edit UserString>ENTER=GO:

Allows you to enter a Trigger String, as follows: With YES showing, press enter. The following screen will appear.

```
BACK & FWD scroll values. SET moves the cursor.
ENTER for next char. MENU exit.
```

This screen tells you how to construct and store your Trigger string in the Monitor's memory. Here's what it's telling you:

- Press FWD or BACK to increase or decrease the selected (underlined) nibble.

Table 3-1 (continued). Monitor options and their values.

Option	Values and Description
	<ul style="list-style-type: none"> • Press SET (TEXT) to select (underline) the desired nibble. • Press ENTER (WHERE) to go to the next byte. • Press MENU to store your string and exit to the first level of the Options Menu. <p>See Section 5.1 for more on setting a Trigger string. Now press any button to continue. You'll see this screen:</p> <div style="border: 1px solid black; padding: 10px; margin: 10px 0;"> <pre>Hex Char String (Current Size is: 00) 00 #01 ssss</pre> </div> <p>The options HEX, Char#, String, and Current Size are defined as follows:</p> <p>HEX</p> <p>Under this heading is the HEX value (from 0 to FF) of the current character. One of the two nibbles will have a cursor under it. Press these buttons to change that underlined nibble:</p> <ol style="list-style-type: none"> 1. Press FWD or BACK to increase or decrease, respectively, the selected nibble. 2. Press SET (TEXT) to move the cursor between high and low nibbles. 3. Press ENTER (WHERE) to accept a byte and move on to the next byte. 4. Under "String" the Monitor will display an ASCII representation of your string as it is built. It is updated every time you press ENTER (WHERE). <p>NOTE: Press FWD and BACK simultaneously to duplicate the previous byte.</p> <ol style="list-style-type: none"> 5. After you have selected the last byte of your string, press MENU. This will enter the entire string into the Monitor's memory and bring you back to Menu Mode. <p>See Section 5.1, Setting a Trigger String, for an example of how to create a HEX value string.</p> <p>Char # 00–FF</p> <p>This shows the current character in the string.</p>

Table 3-1 (continued). Monitor options and their values.

Option	Values and Description
String	<p>ssss</p> <p>This gives you an ASCII representation of the string as you build it character by character.</p>
Current Size	<p>This is the size of the string in HEX. Check the size before leaving the screen to make sure you have selected all of the bytes.</p> <p>From this screen you can construct and store a Trigger string in the Monitor.</p> <p>Pressing more than one key at a time can move you quickly through menu options (refer to Figure 3-2).</p>
<p>Figure 3-2. Pressing combinations of buttons.</p>	
<ol style="list-style-type: none"> 1. SCROLL and BACK activate the HOME function, which will move you to the string's beginning. 2. SCROLL and FWD activate the END function, which will move you to this string's end. 3. SCROLL and TEXT activate the CLEAR function, which erases this string completely. <p>So if you want to move quickly from the fifteenth character to the fifth, just press SCROLL with BACK to get to the first character in the string. Then press ENTER (WHERE) four times to get to the fifth character.</p>	

Table 3-1 (continued). Monitor options and their values.

Option	Values and Description
Trigger Channel	<p>TD RD</p> <p>TD searches for the Trigger string on the Transmit Data (TD) line, then captures data on both lines. TD is Pin 2 on both the Monitor's male and female connectors.</p> <p>RD searches for the Trigger string on the Receive Data (RD) line, then captures data on both lines. RD is Pin 3 on both the Monitor's male and female connectors.</p>
Display Mode	<p>Compressed Expanded</p> <p>In Compressed Mode, each data-line character follows the previous character with no intervening spaces. In Expanded Mode, each data line character is followed by a space (example: l i k e t h i s) to facilitate reading the data at high speeds.</p>
Buffer Action	<p>Stop when full Discard oldest data</p> <p>If you set this option to Stop when full, the Monitor will stop collecting data when the buffer is full.</p> <p>If you choose Discard oldest data, the Monitor will clear the buffer when it is full and then begin collecting data anew.</p>
Status Messages	<p>Yes No</p> <p>If you choose Yes, the Monitor will notify you of certain events (for example, when the buffer is full, the message "END OF BUFFER" will be displayed).</p> <p>If you find these messages annoying, toggle them off by choosing No.</p>

Table 3-1 (continued). Monitor options and their values.

Option	Values and Description
Error Messages	<p data-bbox="242 298 639 326">Fatal Warn Disable Autoconfig</p> <p data-bbox="242 334 974 505">The Monitor will stop scrolling (receiving continues) at certain hardware errors, such as a change in line speed. When Fatal is showing, press any button and the Monitor will begin scrolling again. You may also enter the Options Menu and change a parameter before returning to View Mode.</p> <p data-bbox="242 513 985 857">Warn advises you of errors but continues scrolling after the message. If Autoconfig (the default) is set, when the Monitor gets a framing or break error, then it will attempt to do a software autoconfigure. It will change the speed, data, and parity until the errors stop. This works best with a constant flow of data. When autoconfig is enabled, it has a standard sequence of tests that it performs and if it cannot determine the correct settings, it will inform you and stop. To reset this sequence, clear the buffer by pressing scroll/page and text view/hex view at the same time until “buffer clear” appears on the screen.</p> <p data-bbox="242 865 942 971">If you find the Error Messages annoying, for example, when watching a line that changes speed in normal operation, you may toggle them Off and they will not display.</p> <p data-bbox="242 979 953 1073">NOTE: In monitor mode (not output mode), the Monitor will always pass data, even if it cannot recognize the speed or other configuration parameters.</p>
Suppress Capture	<p data-bbox="242 1122 559 1149">Off RD TD Both</p> <p data-bbox="242 1157 719 1185">When you choose Off, data will be captured.</p> <p data-bbox="242 1193 900 1221">When you choose RD, data on the RD line won't be captured.</p> <p data-bbox="242 1229 900 1256">When you choose TD, data on the TD line won't be captured.</p> <p data-bbox="242 1265 985 1328">Data will not be captured on either line when Both is set. This is used when Collecting Modem Control Transitions is active.</p>
User String Xmit Count	<p data-bbox="242 1373 453 1401">(Enter=Change) 00</p> <p data-bbox="242 1409 985 1507">If you want to limit the number of times the User String is transmitted by the Output UserString Command on the keyboard, then hit Enter at this option. You may then scroll the repeat count. If you enter a 0,</p>

Table 3-1 (continued). Monitor options and their values.

Option	Values and Description									
	<p>then the string is output continuously when the Output UserString command is issued. Press Enter to store the value.</p> <p>The Monitor is set at the factory to transmit on pin 2 (like a DTE) out the right, male connector. To attach it to another DTE device (to make it transmit on pin 3 of the female connector, left side) change the Output Connector option, documented below.</p> <p>The Monitor uses X-ON/X-OFF, DTR, or DSR flow control. To change this, see the Flow Control on Transmit option.</p>									
Output	<table border="0" data-bbox="242 618 808 716"> <tr> <td>Off</td> <td>RD Buffer</td> <td>TD Buffer</td> </tr> <tr> <td>Rotating ASCII</td> <td>Bert Test</td> <td></td> </tr> <tr> <td colspan="3">Capture Data Formatted Report</td> </tr> </table> <p>The Off setting won't have any effect on the Monitor.</p> <p>RD Buffer and TD Buffer will output the contents of the RD or TD buffers, respectively.</p> <p>Rotating ASCII will output the ASCII character set, beginning with 0, over and over again. This also turns your Monitor into a pocket terminal tester.</p> <p>The Bert Test will generate a random test pattern, count, and report errors. (See the Timeout option in this table.)</p> <p>Capture Data Formatted Report will output a formatted report to a printer. This report includes each character received (in HEX, ASCII, or EBCDIC, depending on the Code option) and its location relative to the beginning of the buffer.</p> <p>NOTE: See the sample HEX dump in Appendix B.</p> <p>To choose what to output:</p> <ol style="list-style-type: none"> 1. Scroll through the output values and stop on whatever it is you want to output. 2. Press ENTER and see the following screen. 	Off	RD Buffer	TD Buffer	Rotating ASCII	Bert Test		Capture Data Formatted Report		
Off	RD Buffer	TD Buffer								
Rotating ASCII	Bert Test									
Capture Data Formatted Report										
	<p>Slide OUTPUT switch to ON. Hit PAGE to start/stop. MENU to End.</p>									

Table 3-1 (continued). Monitor options and their values.

Option	Values and Description
	<ol style="list-style-type: none"> 3. Slide the output switch at the right front of the Monitor to ON. 4. Flip the smaller switch on the front of your Monitor to the ON position. 5. Press SCROLL. Your Monitor will output the Trigger String once, if you chose Once, or over and over again if you chose Forever. 6. To temporarily pause, press SCROLL. Then press SCROLL again to resume. 7. When you have finished, press MENU to return to the top of the Options Menu.
	<p>Push SET for choices. ENTER to accept. option: ASCII</p>
	<p>Then choose the format you would like for outputting the captured data by pressing SET (TEXT) to scroll through the choices: ASCII outputs once in ASCII format. ASCII repeat outputs over and over again in ASCII format. (To output in HEX, use the HEX dump value.) If you've chosen Rotating ASCII, Bert Test, or HEX Dump, you'll see this screen:</p>
	<p>Slide OUTPUT switch to ON. Hit PAGE to start/stop. MENU to end.</p>
	<ol style="list-style-type: none"> 1. Slide the output switch at the right front of the Monitor to ON. 2. Press SCROLL to start transmission. 3. Press SCROLL to pause. 4. Press MENU to stop the output.

Table 3-1 (continued). Monitor options and their values.

Option	Values and Description
Load Trigger String	<p>Off</p> <p>From TD buffer</p> <p>From RD buffer</p> <p>When you choose From TD buffer or From RD buffer, you can load the current data in the named buffer (or to its first 80 bytes) as the Trigger String. With this option, you could enter a string via computer or terminal rather than entering it one byte at a time (using Select/View String on the Monitor).</p> <p>Here's how to do it:</p> <ol style="list-style-type: none"> 1. Capture the desired string in the appropriate buffer. 2. Choose From TD buffer or From RD buffer. 3. Leave this option (press MENU or any button), and the Trigger String will now be the contents from the respective buffer. 4. You may now check or edit this string through the Select/View String value in the Trigger option.
Flow Control or Transmit	<p>Off DTR DSR</p> <p>When you select Off, you are setting the Monitor for X-ON/X-OFF flow control only.</p> <p>If you select DTR, a high DTR signal enables transmission, and a low DTR signal inhibits transmission.</p> <p>If you select DSR, a high DSR signal enables transmission, and a low DSR signal inhibits transmission.</p>
Gather Modem Signals	<p>Enable Disable</p> <p>If you select Enable, as the Monitor begins gathering data it will simultaneously capture the modem-control signal with each byte. (See Chapter 4 to learn how to display captured signals.)</p> <p>If you select Disable, the Monitor won't capture signals along with data. This frees 9K of buffer for more data.</p>

Table 3-1 (continued). Monitor Options and their Values.

Option	Values and Description
Code	ASCII EBCDIC Choosing ASCII or EBCDIC prepares the Monitor to receive data in that particular code.
Output Connector	Male (DTE) Female (DCE) If you choose Male (DTE), the Monitor transmits on Pin 2 and receives on Pin 3 of the male connector on the right side of the Monitor. If you choose Female (DCE), the Monitor receives on Pin 2 and sends on Pin 3 of the female connector on the left side of the Monitor. NOTE: This option affects both Output and Output Trigger String options.
Timeout (seconds)	2 4 6 8 60 This option sets the amount of time, in seconds, that the Monitor will wait if it receives no response after a Bert Test pattern has been transmitted, before displaying a Timeout Error.
TOOLS> Enter=GO	OFF Search TD BUF Search RD BUF When you press Enter, the Monitor will search the specified Capture Buffer for the UserString. The search will continue forward through the TD buffer from the current cursor location until it finds a match of the Trigger String. To find out how to set the Trigger String, see "Example 1: Setting a Trigger String." Once the desired string is found, you may then wish to check its location in the buffer by using the Interface/View screen.

4. View Mode

You enter View Mode when you first turn on the Monitor. To enter View Mode from the Menu Mode, first press Menu Mode. Press Menu to enter the View Mode. View Mode displays data both as it is being captured and after it has been captured, as well as the state of modem-control signals in real-time or historical modes. In View Mode, the Monitor's buttons give you many options. The rest of this chapter lists these buttons with explanations of what they do.

The 232 Monitor Basic's Buttons

SCROLL—Toggles the Monitor between the “Scroll” and “Page” modes in View Mode. Page advances one full screen (40 characters on the TD lines and 40 characters on the RD lines) at a time. Scroll advances one character at a time. When you first turn on the Monitor, you are in Scroll mode. Press the Scroll/Page button once to enter Page mode; once again to return you to Scroll mode.

BACK—Press at one-second intervals to scroll backwards through captured data one character at a time in Scroll Mode and one page a time in Page Mode.

Press Back twice quickly to initiate reverse auto-scrolling. In reverse auto-scrolling mode, holding down the BACK button increases the rate of scrolling. Press FWD again to slow it down and finally return to forward scrolling.

BACK and **SCROLL** (or **HOME**)—Press and hold **BACK** with **SCROLL** for one second or more to move to the first character in the buffer.

FWD—Press at one-second intervals to scroll forward through captured data, one character at a time in Scroll Mode, and one page at a time in Page Mode.

Press **FWD** twice quickly to initiate forward auto-scrolling. In forward auto-scrolling mode, holding down this button increases the rate of scrolling. Press **BACK** to slow auto-scrolling down and finally reverse the direction of scroll.

FWD and **SCROLL** (or **END**)—Press and hold **FWD** with **SCROLL** for one second or more to move to the last character in the buffer.

TEXT—Use this button to toggle between **TEXT** and **HEX** modes. When you first turn on the Monitor, you are in **TEXT** mode.

TEXT and **SCROLL** (or **CLEAR**)—Press and hold **TEXT** and **SCROLL** for one second or more to permanently delete all data in the buffer.

WHERE—Press **WHERE** to display the **WHERE** screen (shown in Figure 4-1).

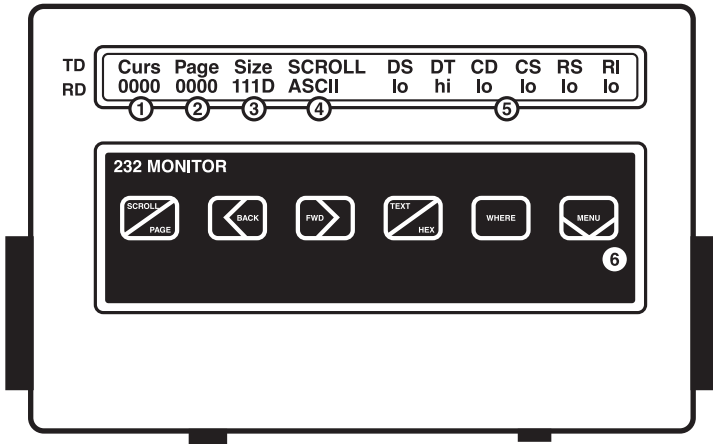


Figure 4-1. The WHERE screen on the 232 Monitor Basic.

- | | |
|------------------------------|-----------------------------------|
| 1. Current cursor position | 4. Mode of display |
| 2. Page number | 5. Ready states—modem signals** |
| 3. Amount of data in buffer* | 6. MENU shows the historical mode |

*NOTE

If you plan to use the cursor location value (Curs) from the WHERE screen as an exact count of characters received on either the TD or RD buffer, remember that the cursor value reflects the number of characters received from *both* the TD pin and the RD pin *less* any characters received at the same time (characters received at the same time on the Monitor appear on above the other). If you need an exact count of characters in the buffer, either use only one buffer to receive data, or use the Suppress Capture option to disable one buffer.

**NOTE

This portion of the screen displays the ready states (“hi” indicates a high state and “lo” indicates a low state) of the signal lines. Each state corresponds to the signal above it on the Monitor’s screen.

Here’s what each signal abbreviation on the WHERE screen stands for:

- DS: Data Set Ready
- CD: Carrier Detect

- DT: Data Terminal Ready
- RS: Request to Send
- CS: Clear to Send
- RI: Ring Indicator

All information in the WHERE screen is dynamically updated. If you watch the screen for any length of time, you'll see the values on the screen change as new data passes through the Monitor.

WHERE and **MENU** (or Historical Mode)—When you choose the “Gather Modem Signals” option, the state of the modem control signals at that instant is captured along with data characters. This information on the historical state of modem-control signals is available by pressing the **WHERE** button.

To view signals in Historical Mode, from View Mode get to the WHERE screen by pressing **WHERE**. When you first call up the WHERE screen, you are in “real time”—you are viewing data as it is captured. Press **MENU** and the words “Historical Mode” will display briefly on the screen. Then the Monitor will display the historical information on the state of the modem-control signals as received via the data line at a certain point in transmission. That point is relative to the character number of the cursor position under “Curs” in the display.

To move through the captured characters and check on the state of the modem controls historically, use the Monitor buttons shown in Figure 4-2.

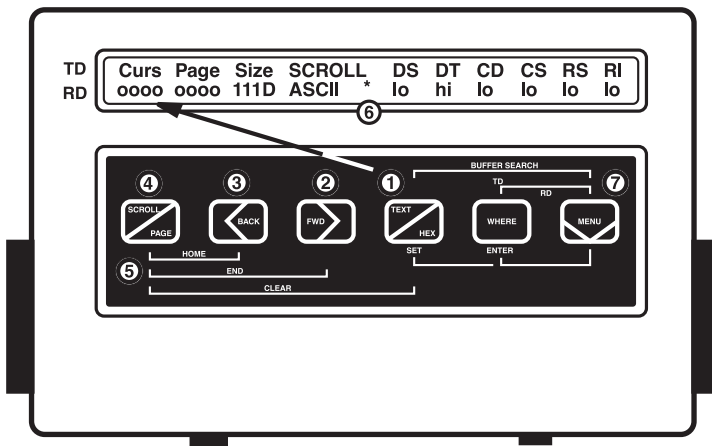


Figure 4-2. The Where screen in historical mode.

1. Press **SET (ASCII)** to move the cursor to any one of the four positions of the Curs location display.
2. **FWD** increases the value of the position you've selected.
3. **BACK** decreases the value of the position you've selected.
4. Press **SCROLL** and **BACK (HOME)** together to move to the first character in the buffer (the first one received by the Monitor).
5. Press **SCROLL** and **FWD (END)** together to move to the last character in the buffer (note that the buffer begins its numbering from zero).
6. The asterisk in the LCD panel indicates that you are in Historical Mode.
7. Press **MENU** to re-enter the real-time **WHERE** screen.

To check the modem-control signals associated with a specific character received, use View Mode to help you easily scroll to the specific character as follows:

1. Press **MENU** to leave the **WHERE** screen and get back into View Mode. Then scroll until the cursor is positioned one character beyond the position you want to check.
2. To see the state of the modem-control signals at the desired point, press **WHERE** (to return to the **WHERE** screen), followed by **MENU**. Increasing or decreasing the cursor location number will show you the state of the modem-control signals before and after the character was received.

MENU—Pressing **MENU** toggles you back and forth between View Mode and Menu Mode.

MENU and **WHERE**—Press and hold **MENU** and **WHERE** together for one second or more while you are looking at data, and the Monitor will begin a search routine. It searches forward through the **RD** buffer from the current cursor location until it finds a match of the Trigger String. To see how to set the Trigger String, see Example 1 in **Section 5.1**.

Once the desired string is found, you may then wish to check its location in the buffer by using the **WHERE** screen.

MENU and **TEXT**—To begin a search routine, press and hold **MENU** and **TEXT** together for one second or more while you are looking at data. The search will continue forward through the **TD** buffer from the current cursor location until it finds

a match of the Trigger String. To find out how to set the Trigger String, see Example 1 in **Section 5.1**.

Once the desired string is found, you may then want to check its location in the buffer by using the **WHERE** screen.

MENU and **SCROLL**—Before you begin collecting data, press **MENU** and **SCROLL** together for one second or more to collect modem-control transitions. The screen will display the message “Collecting Modem Control Transitions.” Now, whenever a transition occurs on any of the six modem control signals, a marker (HEX FF) will be posted to the RD buffer. The signals are checked 60 times a second, so each time a transition occurs, it will be marked by HEX FF, which shows as a “0.”

After your data is captured, if you want to check for any transitions in the modem-control signals:

1. Load FF HEX into the Trigger String.
2. Enter the View Mode and move to the first character (HOME) by pressing **BACK** and **SCROLL** at the same time.
3. Press **WHERE** and **MENU** at the same time. The Monitor will display “RD buffer search” and begin searching forward for FF.
4. After it finds the first transition FF, the page it appears on will appear with the cursor on the transition.
5. Press **WHERE** to get into the **WHERE** screen.
6. Press **MENU** to enter Historical Mode.
7. Now press **FWD** and **BACK** to scroll through the changing states, and you can see where transitions (HEX FF) have taken place in your data.

To turn Collecting Modem Control Transitions off, press **MENU** and **SCROLL** together again.

5. Examples

The 232 Monitor Basic's advanced features may seem hard to program, even after you've carefully read through this manual. This section shows examples of how to use the Monitor in your applications. Example 1 shows how to set a Trigger string and Example 2 describes how to use the Monitor to troubleshoot a serial printer.

5.1 Example #1: Setting a Trigger String (a HEX String)

Purpose—You need to create a Trigger String (a HEX string).

Method—You can set a Trigger string by using another device and downloading it, or you can set it with the Monitor itself. In this example, we'll create a HEX string with the Monitor itself.

Procedure—Follow these steps for the quickest way to set a string with the Monitor:

1. Press MENU to enter MENU mode. Next, scroll through the options (FWD or BACK) until you get to Trigger.
2. Use the SET (TEXT) button to scroll through the values until your screen looks like this:

```
FWD/BACK for Options. SET for Values.
Trigger      Select/View String
```

3. Now enter the Select/View String submenu by pressing MENU.

The Monitor will display the instructions you need to set the Trigger String:

```
BACK & FWD scroll values. SET moves the cursor.
ENTER for next char. MENU exit.
```

4. Next, press any button to get the following screen:

```
Hex   Char  String      (Current Size is: 00)
00    #01
```

NOTE

If your screen does not look like this, press and hold the **SCROLL** and **TEXT** buttons simultaneously. This will **CLEAR** (see “CLEAR” on the Monitor front panel) the string. Then begin this procedure again.

This is the screen you will use to build your Trigger String. Notice that **HEX 01** has no printable ASCII representation. Notice too that the rightmost zero (the low nibble) is underlined. That means it is the currently selected nibble. We would like to increase the high nibble so we will now select the high nibble.

5. Press **SET (NEXT)** to move the cursor.

The leftmost zero (the high nibble) is now selected (underlined). To increase the selected nibble, press **FWD**; to decrease it, press **BACK**.

6. Press **FWD** four times to increase the high nibble to four.

Now your screen should look like this:

Hex	Char	String (Current Size is: 00)
40	\$01	@

To increase the low nibble:

7. Press **SET (TEXT)** to move the cursor.

8. Press **FWD** once.

HEX “41” is ASCII “A” and that should now be showing on your screen under the word “String.”

9. Press **ENTER (WHERE)** to accept this first character and prepare to enter your second character.

Your screen now should look like this:

Hex	Char	String (Current Size is: 01)
00	#02	A

Your string is now one byte long (Current Size is: 01), but you have already been put in position to work on the second byte, Character #02. The first byte is HEX 41. The second byte is currently HEX 00.

Now we'll change the second byte from HEX "00" to HEX "42."

10. Press SET (TEXT) to move the cursor to the high nibble.
11. Then press FWD four times.

Your screen should look like this:

Hex	Char	String	(Current Size is: 01)
40	#02	A@	

12. Now select the low nibble: Press SET (TEXT) to move the cursor under the rightmost zero.
13. Press FWD twice to increment the low nibble from 0 to 2.
14. Press ENTER (WHERE) to accept this byte and move to the next one.

Your screen should look like this:

HEX	Char	String	(Current Size is: 02)
00	#03	AB	

15. Now we'll set the third character. Press SET (TEXT) to select the high nibble.
16. Press FWD four times to change the high nibble from 0 to 4.
17. Press SET (TEXT) to select the low nibble.
18. Press FWD three times to change the low nibble to 3.
19. Press ENTER (WHERE) to accept this byte and move on to the next.

Now you have set byte three to ASCII C and are positioned to define the fourth byte. Let's use a shortcut.

20. Press FWD and BACK simultaneously and hold them down for at least one second.

You've just learned the shortcut for copying the previous byte. The HOME, END, and CLEAR labels offer shortcuts, too. By pressing SCROLL with BACK (HOME), you will go to the first character in your string. SCROLL with FWD (END) takes you to the last, and SCROLL with TEXT erases the entire string (CLEAR).

Your screen should look like this:

```
HEX   Char   String (Current Size is: 03)
43    #04    ABCC
```

21. Now change the fourth character: Press FWD once to change the low nibble to 4.

Your screen should look like this:

```
HEX   Char   String (Current Size is: 03)
44    #04    ABCD
```

22. Press ENTER (WHERE) to accept this character.

Your screen should look like this:

```
HEX   Char   String (Current Size is: 04)
00    #05    ABCD
```

23. Press MENU. That stores your Trigger string, and brings you out to Menu Mode.

5.2 Example 2: Troubleshooting a Serial Printer

Purpose—You have just purchased, or been asked to repair, a serial printer that is attached to your computer through an asynchronous link. The printer won't print exactly what the computer sends. The clues are: The printer prints some characters correctly and some incorrectly. Notably, "a," "b," and "d" seem to be incorrect, while "c," "e," and "f" print correctly.

Method—Use the Monitor to view what the computer is sending to the printer.

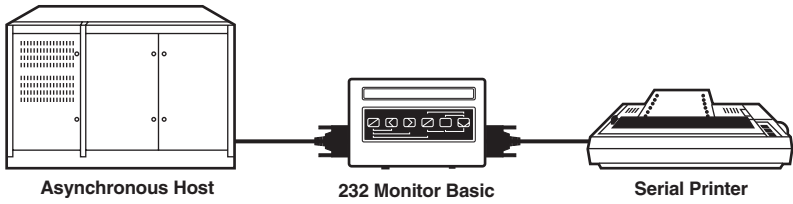


Figure 5-1. Troubleshooting a serial printer.

Procedure—Connect the Monitor between the computer and the printer (see Figure 5-1).

1. Disconnect the printer cable from the printer. Attach the Monitor to the cable and then either plug the Monitor directly into the printer, or, if it is more convenient, use a cable, as in Figure 5-1.
2. Make sure that the Monitor's output switch is off.
3. Slide the Monitor's power switch (the larger switch) to the ON position.
4. Press MENU. The screen should now look like this:

```
FWD or BACK for Options. SET for Values
Baud Rate: 9600
```

5. If the baud rate shown is not the same as the computer's, press SET (TEXT) until the correct baud rate value is displayed.
6. Press FWD to see Stop Bits. If the Stop Bits entry is incorrect, press SET (TEXT) again until the correct value is showing. If you miss the correct value, keep pushing SET (TEXT) until it comes around again.

Now your screen should look like this:

```
FWD or BACK for Options. Set for Values
Stop Bits: 1
```

7. Press FWD to see Data Bits. Use SET (TEXT) again to get the correct setting.

FWD or BACK for Options. SET for Values
Data Bits: 8

8. Press MENU to exit the Menu Mode.

NOTE

There are many more things you can do in Menu Mode. Please refer to Chapter 3 for a detailed description of each option in Menu Mode.

9. Check to see that the OUTPUT switch is in the OFF position. In the ON position, it can interrupt the flow of data between the computer and the printer. Now you are ready to start the test.
10. Press WHERE, and check to see that the Monitor is in Scroll Mode. If it is not in Scroll Mode, it will show the word "PAGE" next to the heading "Size." If the Monitor is not in Scroll Mode, press WHERE again, then press SCROLL. When you press WHERE to enter the Where screen, the word "SCROLL" should appear next to "Size" on the screen.
11. Press WHERE to leave the WHERE screen. Now clear the buffer by hitting SCROLL and TEXT simultaneously. Hold these buttons down until the display says "Buffer Clear."
12. Start the computer sending data to the printer. You should see data scrolling across the Monitor's display. Continue printing until the printer makes mistakes.
13. Now put the printer off-line. That should stop transmission.
14. Examine the printout to find the last character that the printer printed correctly. For this example, let's say it was an "f."
15. Now scroll to the correct character, "f," on the Monitor. Scroll the Monitor as follows:

Each time you press the BACK button, it will scroll faster and faster backward. If it goes too fast, hit the FWD button to slow the backward scrolling. If you continue to press the FWD button, you will cause the cursor to slow and stop and then scroll in the forward direction.

If scrolling one character at a time is too laborious, press **SCROLL** to enter Page mode. Now you can move through one page (screen) of data each time you press **FWD** or **BACK**.

16. Now manipulate the cursor one character back, to an erroneous character. Let's say it is a "D."
17. Press **TEXT**. The Monitor will change to HEX representation and automatically place the cursor on the "D."

In our test case, the "D" appears as a "C4." An ASCII "D" is normally a 44 HEX. Since we are seeing a C4, then the high-order (8th) bit is turned on. Examination will tell us that a 44 HEX has 2 bits high (1's). The high-order bit has been set to a 1; this tells us that the sending computer has set it to achieve ODD parity. (In Odd parity, the total count of all high bits in any byte must be an odd number. That is why some letters, those which already have an odd number of bits high, are not affected.)
18. To correct this problem, set the computer to either **NO** parity or **SPACE** parity. Or you could set the printer to **ODD** parity.
19. If you capture a lot of data and have only one or two errors, you can let the **MONITOR** search for the bad character or string and save yourself the effort. To do this, hit **SCROLL** and **BACK** simultaneously until you see the message "Buffer Home."
20. You can then do an **RD** or **TD** buffer search for the "Trigger." To enter the trigger string, refer to **Chapter 3**. After you input the Trigger, the Monitor will find the character or string and place the cursor on it for evaluation.
21. To start the **TD** buffer search (search through only the **TD** buffer), position the cursor in front of where you want to start the search. Then press **TEXT** and **MENU** simultaneously. The Monitor screen will read "TD buffer search" and the Monitor will place the cursor on the string when it is found. You can then examine the character in **HEX**.

5.3 Troubleshooting Hints

Another common data communications problem is improper handshaking. Handshaking, or back pressure, occurs when the printer, for some reason such as being off-line or out of paper, cannot accept any more characters. When this happens, the printer is responsible for doing one of two things: Either it can drop a modem control signal or send a stop-transmission signal to the computer. In the latter case, usually the printer would send an **X-OFF** (13HEX). The computer might send from 1 to 9 more characters to be printed and then should stop.

Suppose the Monitor shows the X-OFF going from the printer to the computer, but the computer doesn't stop transmitting. You might have a bad cable, or the computer might not be set up to look for X-OFF/X-ON handshaking. When the printer is ready to accept data again, it will send an X-ON (11HEX).

If the computer isn't responding properly, you would see the X-OFF from the printer to the computer without a later X-ON from the printer. This problem might cause the printer to output garbled information, or it might simply cause the printer to go off-line.

The second form of back pressure is flow control: the printer drops an interface signal, usually DTR (Data Terminal Ready). The Monitor collects the state of all six modem-control (interface) signals with each byte captured. To find the historical state of any modem-control signal, place the cursor on the character for which you want to know the signals. Press WHERE and then MENU. This puts the WHERE mode screen into historical mode. The state of the modem-control signals shown on the right-hand side of the display is now what they were when the character number under the "Curs" heading was received.

Push FWD or BACK to change the cursor location. If the modem control signals changed, that change will be reflected in the state display.

By holding down FWD or BACK, you can scroll through the various locations until you see a modem-control signal change.

If you suspect that the printer is changing modem-control signals, it's a good idea to find the location in the capture buffer, either visually by scrolling, or by using the search capabilities. Then enter the WHERE screen (Historical mode) and use FWD with BACK until you see if there was any change in the modem-control signals.

Appendix A: Menu Options and Values

This appendix lists all the 232 Monitor Basic options and their possible values. Factory-set defaults are listed in italics.

Baud Rates: 150, 300, 600, 1200, 2400, 4800, *9600*, 19200, or 38400 bps

Stop Bits: 1 or 2

Data Bits: 7 or 8

Parity: Odd, Even, or None

Trigger: *Off*, TD, RD

Edit UserString>Enter=Go: No, Yes

Display Mode: *E x p a n d e d*, Compressed

Buffer Action: Discard oldest data, *Stop when full*

Status Messages: *Yes*, No

Error Messages: Autoconfig, *Fatal*, Warn, Disable

Suppress Capture: *Off*, RD, TD, Both

UserString XMIT CNT: (Enter=Change) 00

Output Trigger String: *Off*, Once, Forever

Output: *Off*, TD buffer, RD, buffer, Rotating ASCII, Bert test, Capture Data Formatted Report

Load Trigger String: *Off*, From TD buffer, From RD buffer

Flow Control on Transmit: *X-OFF*, DTR, DSR

Gather Modem Signals: *Enable*, Disable

Code: *ASCII*, EBCDIC

Output Connector: *Male (DTE)*, Female (DCE)

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Timeout (seconds): 2, 4, 8, 38, or 60

Tools>Enter=Go: OFF, Search Table, Search RD Buffer

Appendix B: Sample HEX Dump Printout

```

Page number: 01          code: ASCII
0000Td 00 01 02 03 04 05 06 07 08 09 0A 0B 0C 0D 0E 0F
Rd      54 68 69 73 20 69 73 20 61 6E 20 65 78 61 6D 79 This is an exampl
0010Td 6C 65 20 6F 66 20 64 61 74 61 20 63 61 70 74 75 le of data captu
0020Td 72 65 64 20 6F 6E 20 74 68 65 20 52 44 20 6C 69 red on the RD li
0030Td 6E 65 20 61 6E 64 20 74 68 69 73 20 69 73 20 64 this is d
Rd      61 74 61 20 63 61 70 74 75 72 65 64 20 6F 6E 20 ata captured on
0040Td 74 68 65 20 54 44 20 6C 69 6E 65 20 61 6E 64 20 the TD line and
Rd      70 72 69 6E 74 65 64 20 77 69 74 68 20 74 68 65 printed with the
0050Td 20 48 45 58 20 64 75 6D 70 20 6F 70 74 69 6F 6E HEX dump option
Rd

```

Appendix C: Batteries

Your 232 Monitor Basic is powered by two batteries. The primary battery is a 9-volt alkaline battery. Alkaline batteries provide the longest, most reliable service. If you decide to use a rechargeable NiCad battery, we recommend that you carry a charged spare because a NiCad can deliver only about 40% of the capacity of a fresh alkaline.

When your battery is running low, you'll receive a BATTERY LOW warning on your screen. You must then change your battery or plug the Monitor into a wall outlet with the AC adapter. The Monitor can receive AC power even with the 9-volt battery installed, and you can switch from battery power to AC power without turning off the Monitor.

The second battery in the Monitor is a lithium cell used to preserve memory and menu configuration when the Monitor is powered off. If you notice that your 232 Monitor Basic "forgets" either memory or menu configuration, it's time to replace your lithium cell.

Replacing the Lithium Cell

Follow these steps to replace the lithium cell in your Monitor:

1. Lay the Monitor face down on a soft cloth and remove the five screws that hold the Monitor housing together. *Note that the middle screw is a different size.* Remove the back cover. Replace the two upper screws in their posts to secure the plastic spacers (between the Monitor's circuit boards) so they won't get lost.
2. Carefully remove the circular lithium cell from its holder, using the tip of a small screwdriver to lift the battery up and out. Replace it with a BR-2325-type lithium battery or its equivalent—3.0-volt only.
3. Remove the two screws and gently refit the case. First reinsert the upper two screws, then find the *smallest* screw and insert it in the middle.

CAUTION

Do not insert a long screw in the center post. This could damage your Monitor.

Appendix D: Troubleshooting

Symptom	Resolution
Data is scrolling by and you want it to stop.	Press the SCROLL button to enter PAGE mode.
Monitor doesn't show data or the cursor.	Install a new 9-volt battery or try the wall transformer.
WHERE shows size is not changing. Nothing is happening on screen.	Check to see that the trigger is not set to ON and that SUPPRESS CAPTURE is not set to RD or TD. (The Monitor will tell you on power-up if either of these options is enabled.)
Monitor shows only 9s and squares.	Clear the screen by pushing SCROLL TEXT simultaneously for one second or more. If the symptom persists, contact Black Box Technical Support at 724-746-5500.
No data is being captured.	Check to see that the output switch on the front of the Monitor is switched off.
Incorrect Capture Data message is being displayed.	<p>Two possible causes:</p> <ol style="list-style-type: none"> 1. The AC adapter has been pulled from the socket before the Monitor was turned off. To avoid this, always turn the Monitor off before you remove the AC adapter from the wall socket. 2. Your lithium battery is low. Refer to Appendix C.



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1000 Park Drive • Lawrence, PA 15055-1018 • 724-746-5500 • Fax 724-746-0746